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Drugs

HOW CAN WE MONITOR USAGE USING WASTEWATER

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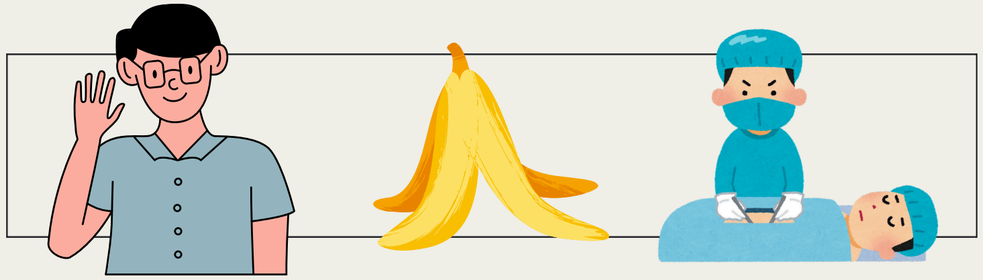
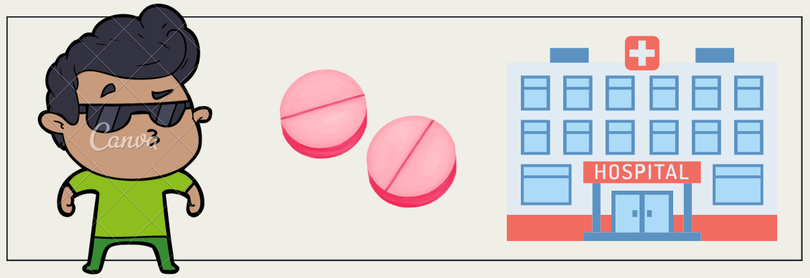
THE PROBLEM: HOW CAN WE MONITOR DRUG USAGE IN CANADIAN CITIES THROUGH THE USE OF WASTEWATER?

How and why are drugs used?





Rehabilitation

Prescribed Pain Killers

- Opioids are a class of drugs that can help patients manage immense pain following major procedures such as surgeries (Morgan et al. 2013)

Psychiatric Treatment

Managing Mental Health

- Stimulants and hallucinogens are classes of drugs that are also known to help patients treat mental disorders, such as depression, schizophrenia, PTSD (Morgan et al. 2013)

Institutional Stress

Hospital Overload

- Overdose spikes have been known to overfill emergency rooms, especially throughout the COVID-19 pandemic (King et al. 2021)

Economic Detriment

Safety, Costs of Crime

- Estimated that drug-related crime costs $61 billion annually (Glei and Weinstein, 2019)
- Drug-related impairment can increase the chance of car accidents by up to 30 fold (Glei and Weinstein, 2019)

WHY IS MONITORING USEFUL

Unprescribed Drugs

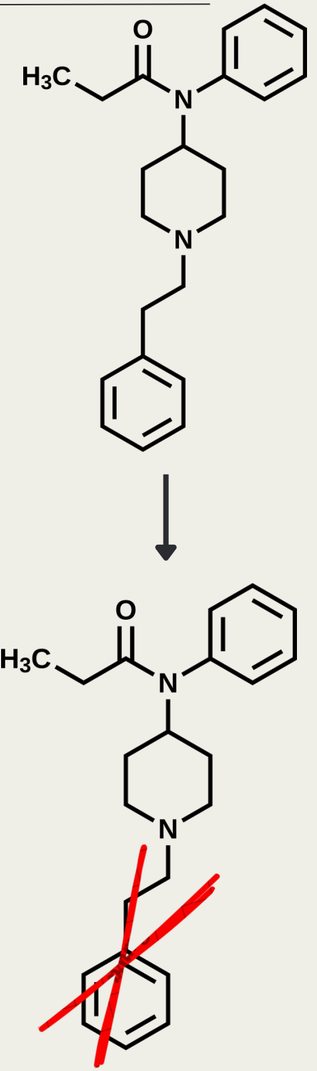
- Determine unreported cases
- Which drugs are heaviliy used in selected cities
- Narrow down source/distributor
- Target Health Interventions

Prescribed Drugs

- Determine/monitor overprescription
- Change public health policy
- Target Health Interventions

WHAT ARE DRUG METABOLITES? AND HOW ARE THEY FOUND IN WASTEWATER?

A drug metabolite is a byproduct formed during the breakdown of the drug.



How it works:

1. After the drug is used, the body breaks it down into metabolites.
2. Resulting metabolites are flushed out of the body and enter the wastewater system.
3. Metabolites travel their way to the wastewater treatment facility where the samples are retrieved for analysis.

HOW WE WILL MONITOR DRUGS USAGE

- Using Statistics Canada Dataset: Drug metabolites in wastewater in select Canadian cities (2022 to 2023)
    - relates to economic and social statistics that include health and lifestyle conditions
- Dataset covers all the major cities
- Comparing drug usage between cities
- Finding patterns using heat maps and line charts

Drugs mentioned in the dataset

- Amphetamine
- **Cannabis**
- Cocaine
- **Codeine**
- Ecstasy
- **Fentanyl**
- **Methadone**
- Methamphetamine
- **Morphine**
- **Oxycodone**

GOING FURTHER

Regression Analysis:

- Predict future drug concentrations based on historical trends using regression models.
- Linear Regression (Time vs Concentration), Polynomial regression.
- Regression Coefficients like β1, β2
- Possible enhancements: Seasonal effects, External factors.

Visualization:

- Line Charts, Heat Maps, Box Plots.

SOURCES

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Thank you!