

Comparing sewage-based epidemiology with survey research on drug use in the general population

Guido Van Hal

*J van Wel*¹, *J Kinyua*², *E Gracia Lor*³, *S Salvatore*⁴, *A van Nuijs*²,
*A Covaci*², *J Bramness*³, *S Castiglioni*³, *G Van Hal*¹

¹Department of Epidemiology and Social Medicine, University of Antwerp, Belgium

²Department of Pharmaceutical Sciences, University of Antwerp, Belgium

³Department of Environmental Health Sciences, Istituto di Ricerche Farmacologiche "Mario Negri" (IRCCS), Italy

⁴Norwegian Centre for Addiction Research (SERAF), University of Oslo, Norway

Contact: guido.vanhal@uantwerpen.be

Both licit and illicit drug use is prevalent in the European Union (for example, more than 70% of inhabitants (15-64 years of age) use alcohol while over 21% indicate having ever used cannabis). These estimations are based on population surveys. However, these suffer from response biases. In order to add more objective data on drug use to the existing measures, a new method has been developed; wastewater-based epidemiology (WBE). In this method, wastewater is analyzed for the presence of drugs and their metabolites. In this study, the usefulness of WBE for assessing illicit drug use in a community is evaluated by comparing wastewater data with that from a population survey.

During a 12-week period (Autumn 2014), a website was opened on which inhabitants of a selected community (a town of <30.000 inhabitants) were asked to indicate their drug use in the past week. Concomitant wastewater samples were taken from the wastewater treatment plant (WWTP) collecting from the community. This way, comparisons could be drawn between what inhabitants of the city reported themselves about their drug use and the drug concentrations present in the water. The wastewater samples were analyzed using a validated method based on solid phase extraction (SPE) and liquid chromatography coupled to tandem mass spectroscopy (LC-MS/MS).

Answers on the questionnaires (average N = 263) showed that apart from alcohol and tobacco (60.8% and 17.5% users on average per week respectively), cannabis was the most used drug each week among the persons answering the questionnaire (1.3% on average weekly) but response rates were very low. In the chemical analyses, alcohol and tobacco were used the most. Cannabis was the most consumed illicit drug detected in the community, followed by amphetamine, benzoylecgonine, MDMA and EDDP.

This research provides evidence for the usefulness of sewage-based epidemiology as addition to traditional epidemiological measures on licit and illicit drug use. It was difficult to compare wastewater with survey data on illicit drug use since response rates were low. Future research on combining the two approaches should focus on either a more general approach, e.g. national population surveys, or take place in a more focused setting, such as festivals, where a higher degree of drug use can be expected.

Key messages

- Sewage-based epidemiology is a useful addition to traditional epidemiological measures to provide information about licit and illicit drug use
- Combining survey research and sewage-based epidemiology in an ecologically valid way should be approached with strong caution as response rates on this sensitive topic are an issue