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Using wastewater-based epidemiology to monitor population alcohol and tobacco use

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Over the last decade, wastewater-based epidemiology has become a solid approach to back-estimate illicit drug use in a population. The potential of using wastewater-based epidemiology to assess other population indicators of lifestyle-related health risk has been discussed in the literature. Recently, wastewater-based epidemiology has been used to monitor community-wide alcohol and tobacco use. This presentation aims to (a) introduce how alcohol and tobacco use can be estimated using wastewater-based epidemiology; (b) provide an overview of previous studies that have used this methodology to estimate use of these substances in different countries; and (c) discuss the potential limitations of the method.

Similar to illicit drugs, human excreted biomarkers of alcohol and tobacco use in wastewater samples are analysed using state-of-the-art analytical instruments. These biomarkers include ethyl sulfate for alcohol use and cotinine and trans-3'-hydroxycotinine for nicotine use (a proxy for tobacco use). Concentrations of these biomarkers are measured using liquid chromatography coupled with tandem mass spectrometry. Consumption of these substances is back-calculated through multiplying the biomarker concentration measured by the total daily wastewater flow rate and the molar excretion factor. The approach was first used in Norway for monitoring alcohol use and in Italy to assess tobacco use. Similar studies have been conducted in Australia, Belgium, China, New Zealand, and Spain. These studies generally showed elevated alcohol drinking on the weekends compared to weekdays, whereas tobacco smoking was relatively steady throughout the week. The level and spatial profile of tobacco use identified by the approach in the northern and southern Italy was consistent with that described in the national population survey. Different spatial patterns in alcohol consumption were observed among different countries e.g. higher levels in large cities compared to small villages in Belgium and greater levels in rural towns than urban areas in Australia. Also, temporal variations in alcohol use were observed in Belgian cities. Overall, wastewater-based epidemiology can provide objective information on alcohol and tobacco use in the population of different communities within and between countries and over time. This method will be useful for authorities in identifying regions with high priority, and planning and evaluating interventions for reducing alcohol and tobacco use and their related harms to the society.