**Sewage-based epidemiology as a means of comparing geographical and temporal trends of illicit drug use in European city populations in the period 2011-2015**

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Sewage-based epidemiology (SBE) is an approach that has been developed over the past decade and that is best described as a large diluted urine test. Municipal wastewater represents anonymous urine samples of thousands of people containing traces of almost everything they consume. Specific human excretion products of drugs, including illicit drugs such as cocaine, heroin, cannabis, and amphetamine-like stimulants can be quantified with sophisticated, sensitive and selective hyphenated chromatography-mass spectrometry techniques. The potential of this method has been demonstrated, as it provides a new and much needed tool for addressing a range of pressing information needs in this area which include: rapidly reporting on changes in illicit drug use at the population level, providing objective estimates of consumption, identifying the use of novel substances, and providing a ‘hard’ pre- and post-measure for intervention studies. A Europe-wide network (Sewage analysis CORE group - SCORE) was initiated in 2010 with the aim of standardizing the SBE approach and coordinating international studies through the establishment of a common protocol of action. The protocol covers many aspects of SBE from practical guidelines on sampling, analytical quality control, and interlaboratory exercises, to back calculation procedures, data interpretation and uncertainty reduction.

The established best practice protocol was applied in comparative studies that have been conducted yearly since 2011 in European cities. The number of cities investigated raised from 19 in 2011 to 50 in 2014. In 2014 also cities from North America and Australia participated. The population covered in these studies raised from 14.1 (2011) to 29.1 (2014) million people and involved 16 different European countries (2014). These studies provided information on the spatial differences and temporal changes in illicit drug use in large populations in Europe. The profiles of use varied greatly across Europe with a higher use of cocaine and ecstasy in Western and Central Europe and of amphetamines in Northern and Eastern Europe. These results were in accordance with traditional surveillance data demonstrating the reliability of the SBE approach to estimate drug use. Its unique ability is to quantify drug use objectively, and more quickly and regularly than the current national surveys, and to create estimates where such data do not exist. The potential of SBE to complement and extend the existing epidemiology-based approaches was recognized and explored by the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA).

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