



# UNODC

United Nations Office on Drugs and Crime

## Use of waste-water analyses for drug epidemiology opportunities and challenges



**Chloé Carpentier**  
Chief, Drug Research Section

16 October 2019

# Worldwide coverage of international cooperation in waste-water analysis for drug epidemiology, 2011-2018



Countries conducting waste-water analyses 2011-2015



Additional countries conducting waste-water analyses 2016-18

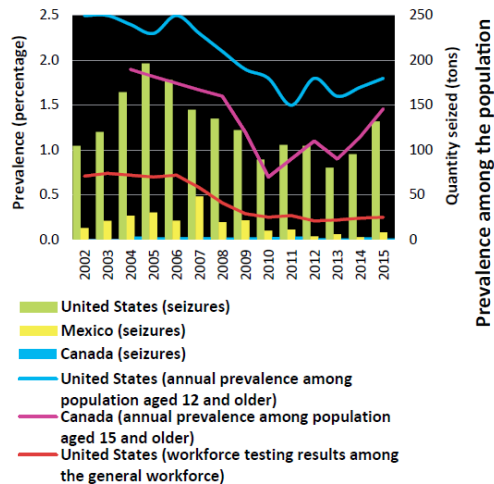
Supported by:



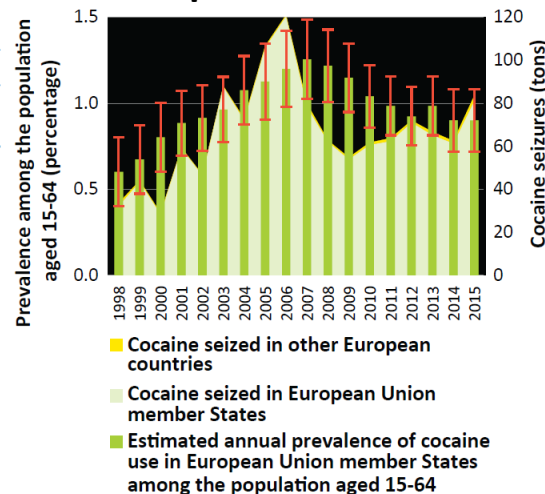


# Expansion of cocaine markets

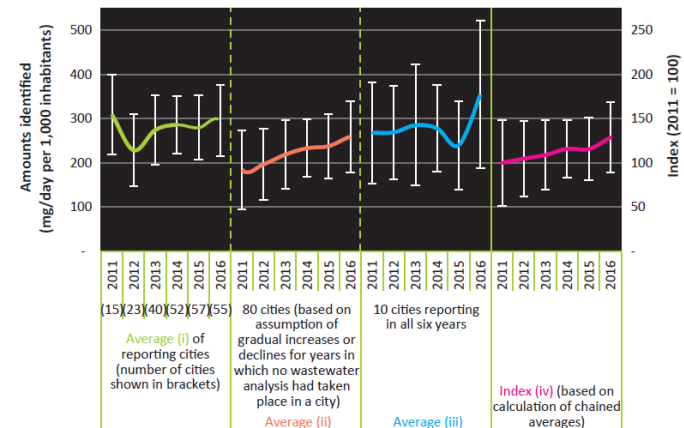
## Quantities of cocaine seized in North America and annual prevalence of cocaine use in the United States and Canada



## Quantities of cocaine seized in Europe and annual prevalence of cocaine use in the European Union



## Benzoylcegonine (cocaine metabolite) found in wastewater per 1,000 inhabitants in Europe (based on data from 80 European cities)



Sources: Responses to the annual reports questionnaire data; the United States National Household Survey on Drug Use and Health; Quest Diagnostics, "Quest Diagnostics Drug Testing Index", full year 2015 tables (September 2016), and previous years; the Canadian Tobacco, Alcohol and Drugs Survey (CTADS) 2015 and, for previous years, Health Canada, Canadian Alcohol and Drug Monitoring Surveys (CADUM).

Sources: UNODC calculations based on responses to the UNODC annual report questionnaire; and EMCDDA, Statistical bulletin 2016 and previous years.

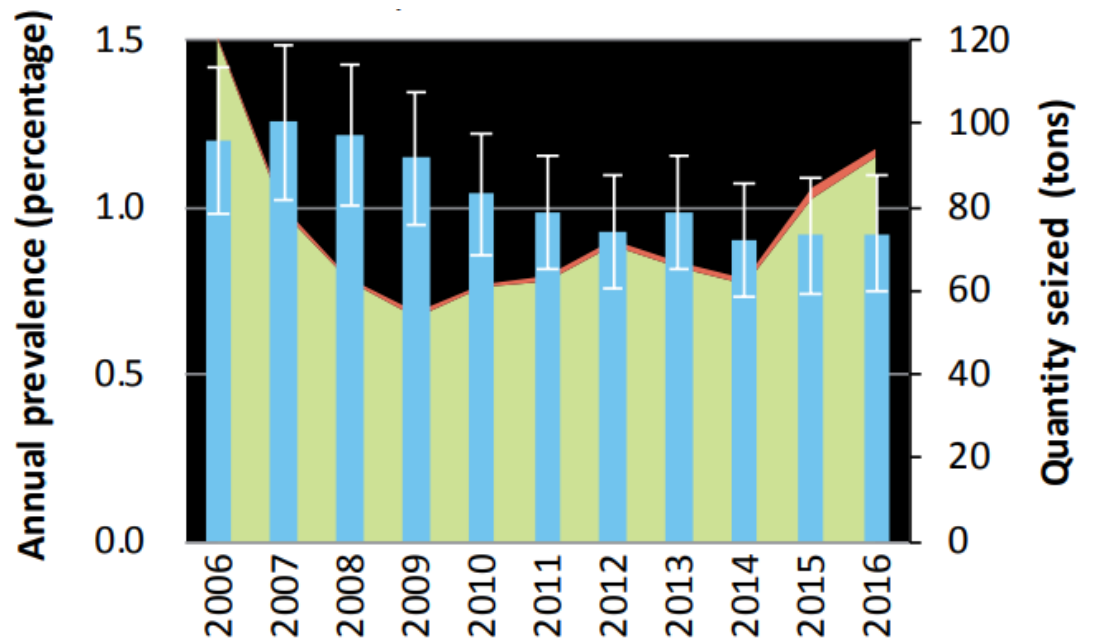
Source: Calculations based on Sewage Analysis CORE Group Europe (SCORE).

Note: The wastewater analysis took place in 26 countries over the period 2011-2016. All city results have been weighted by the population served by the respective drug treatment plants. The analysis in each city was based on the amounts of benzoylcegonine identified in wastewater over a seven-day period, which allowed for the calculation of a daily average of benzoylcegonine per 1,000 inhabitants living in the area served by the respective wastewater treatment plant. For details of the calculation methods, see the online methodology section of the present report.



# Expansion of cocaine markets

## Seizures of cocaine in Europe and annual prevalence of cocaine use in the European Union



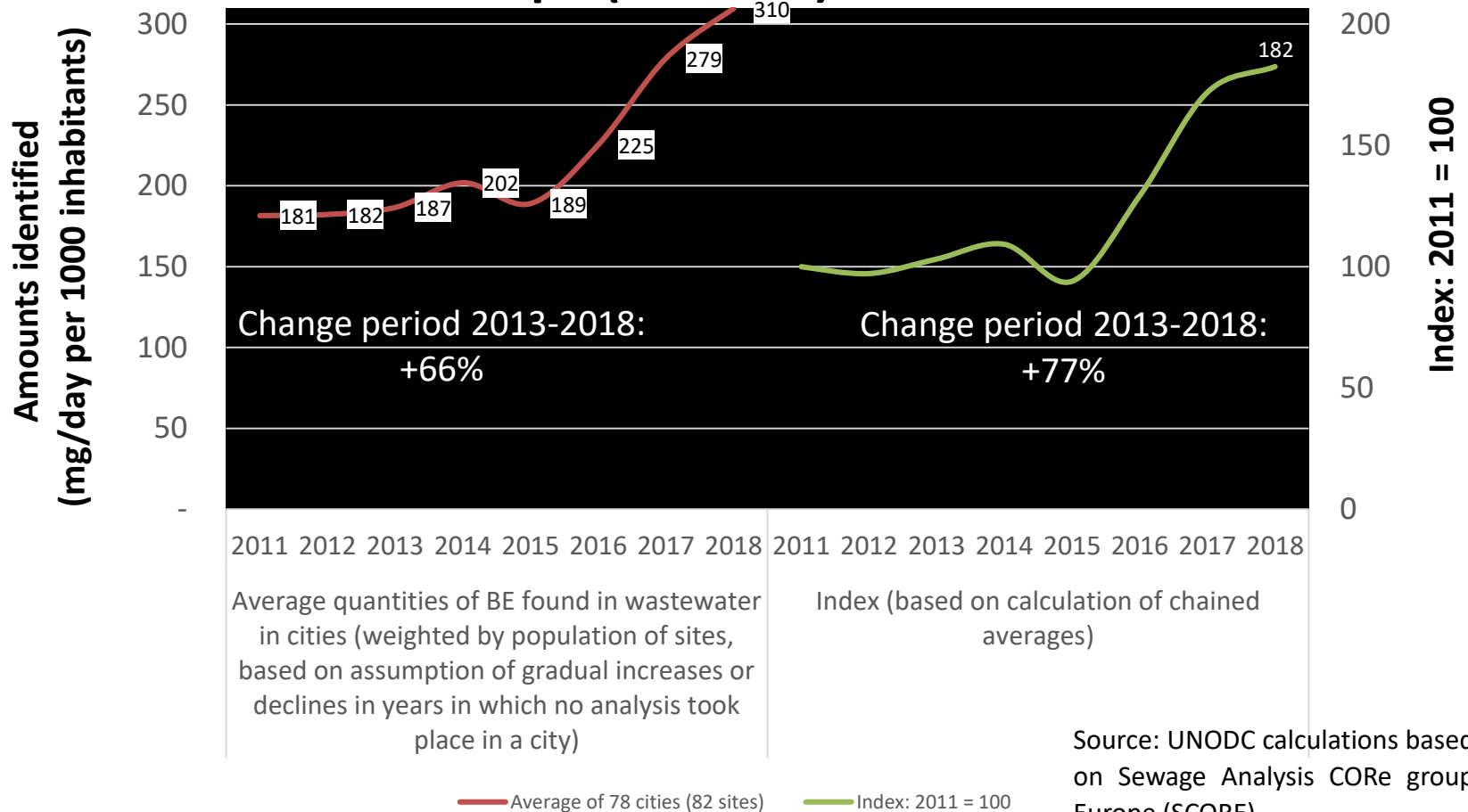
- Cocaine seized in other European countries
- Cocaine seized in European Member States
- Estimated annual prevalence of cocaine use in the European Union Member States among the population aged 15–64 years

Source: UNODC, responses to the annual report questionnaire; EMCDDA and national reports.



# Expansion of cocaine markets

## Benzoylcegonine (cocaine metabolite) found in waste-water in Europe (78 cities)

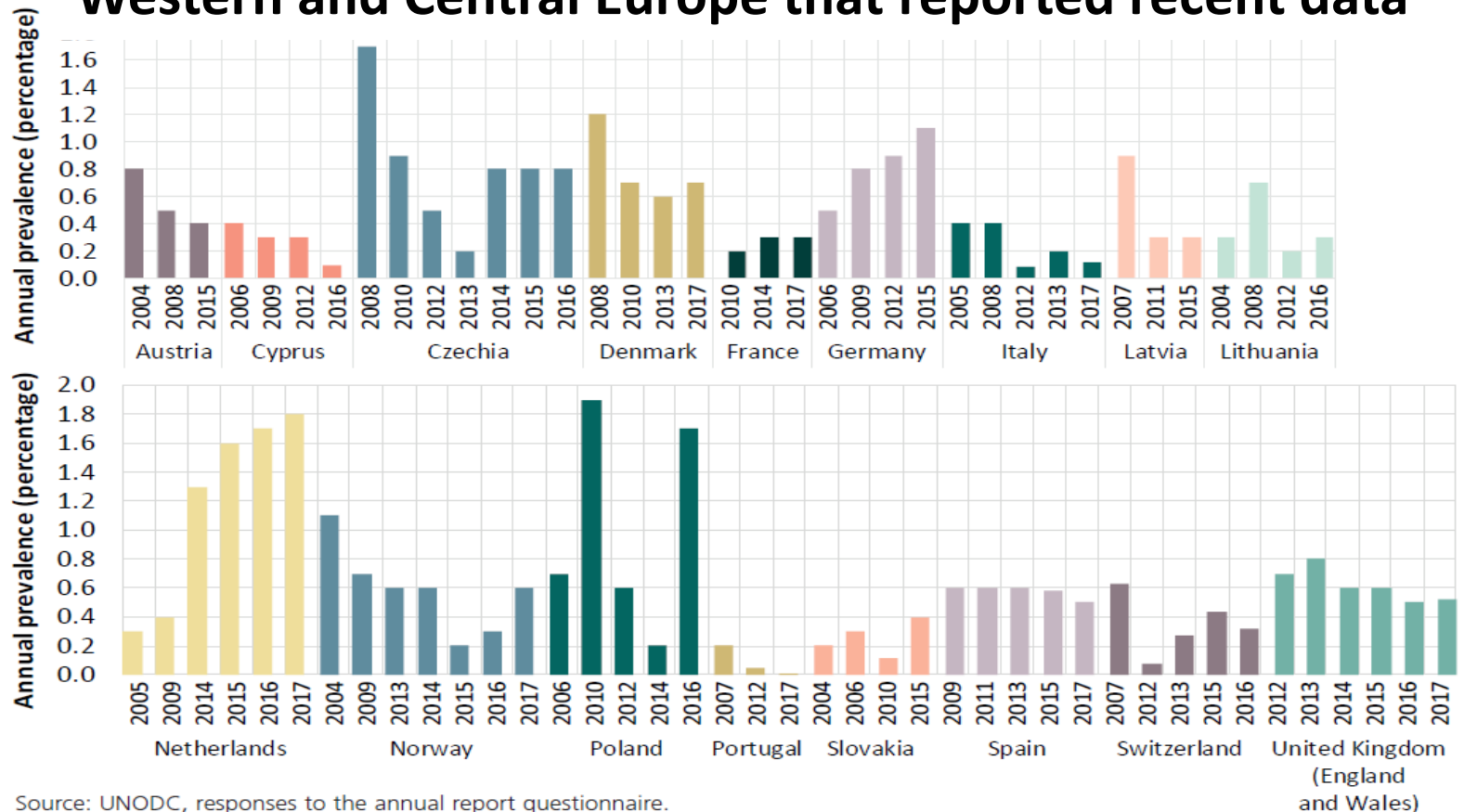


Source: UNODC calculations based on Sewage Analysis CORE group Europe (SCORE).



# Amphetamine vs. methamphetamine

**Trends in the use of amphetamines in countries in Western and Central Europe that reported recent data**

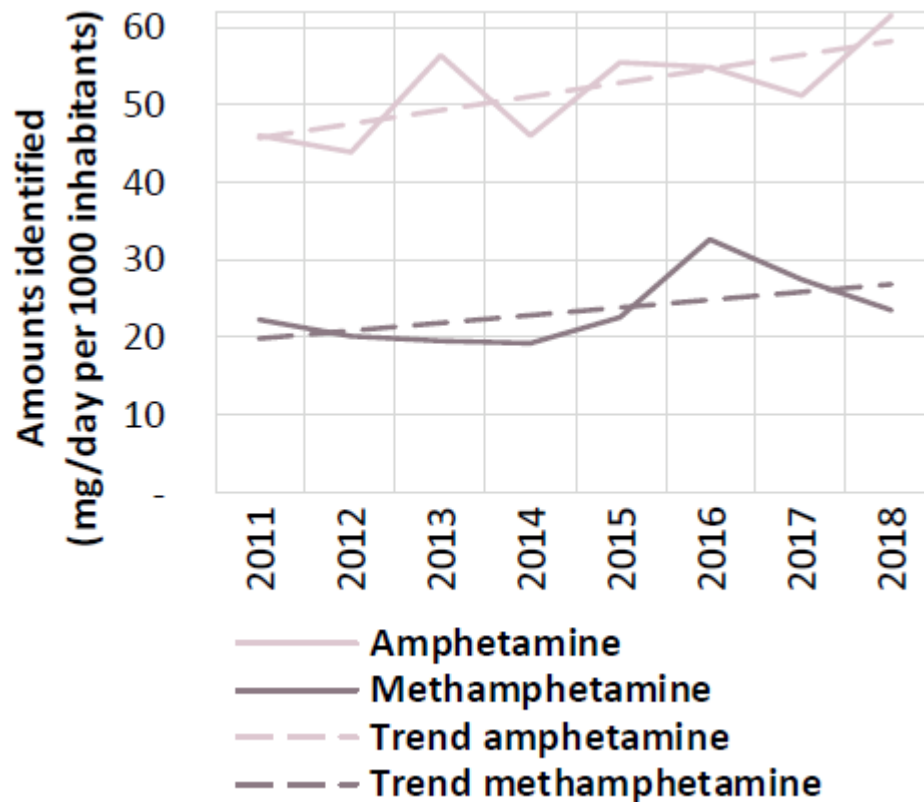


Source: UNODC, responses to the annual report questionnaire.



# Amphetamine vs. methamphetamine

## Quantities of amphetamines found in wastewater, in 80 cities in Europe



Source: UNODC calculations based on wastewater data provided by SCORE Europe.

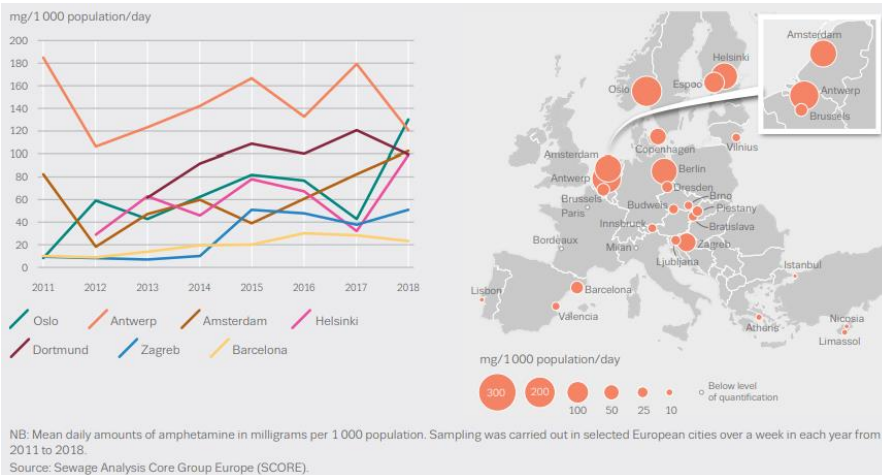
*\* Note: Average quantity of benzoylecgonine found in wastewater in 80 cities (82 sites) weighted by the population of the sites: assumption of gradual increase/decrease in years in which no analysis took place in a city and no change since latest available data.*



# Amphetamine vs. methamphetamine

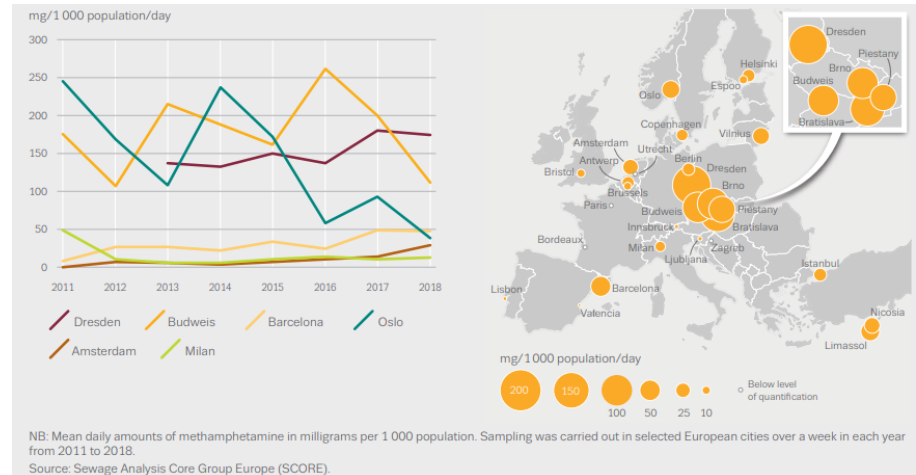
## Amphetamines residues in wastewater in selected European cities in 2018 and trends

### Amphetamine



Source: EMCDDA, European Report 2019.

### Methamphetamine

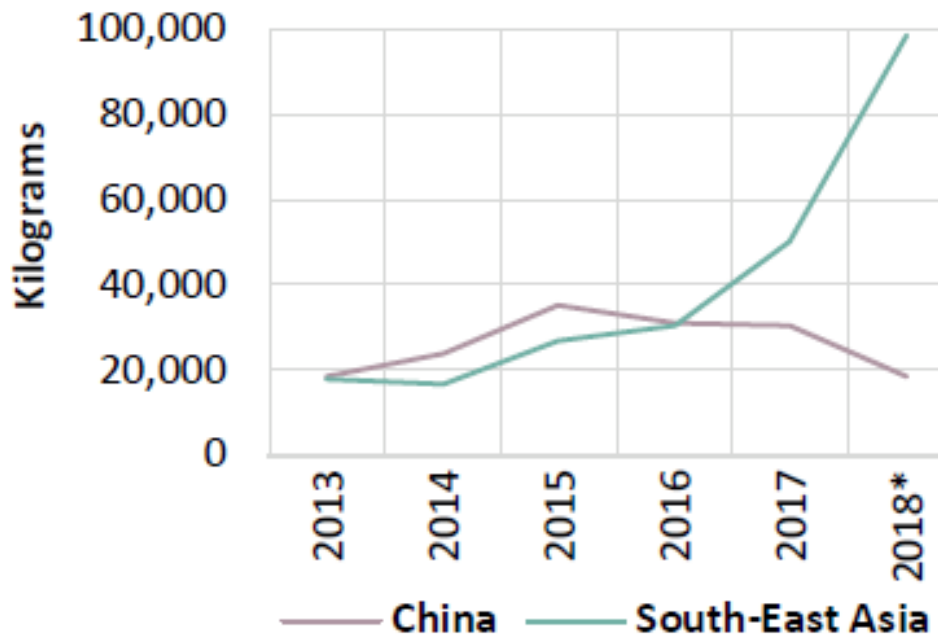






# Methamphetamine market displacement

## Quantity of methamphetamine seized



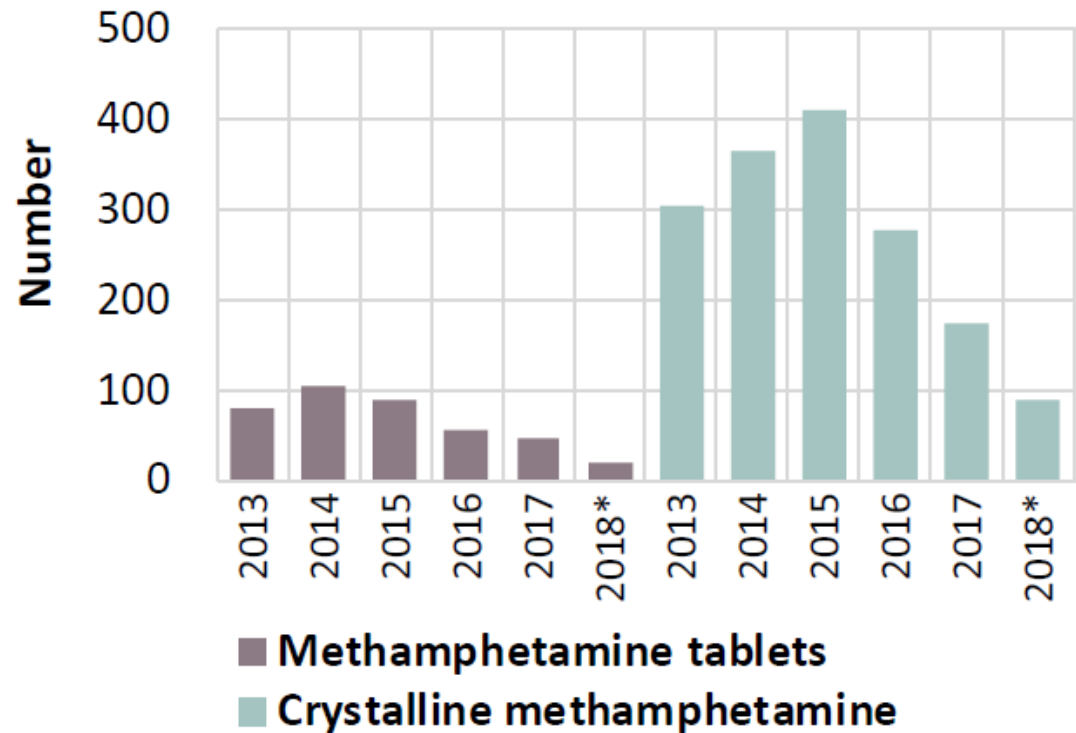
Source: UNODC, *Synthetic Drugs in East and South-East Asia*.

*\*Data for 2018 are still preliminary; at the time of writing, Brunei Darussalam, Cambodia, the Lao People's Democratic Republic, Malaysia, Myanmar, the Philippines, the Republic of Korea, and Thailand, all provided drug seizure data for the whole year 2018. China, Indonesia and Singapore provided data up to September 2018, Viet Nam for the first 11 months of 2018, and Japan for the first half of the year 2018*



# Methamphetamine market displacement

**Methamphetamine manufacturing facilities dismantled in China**



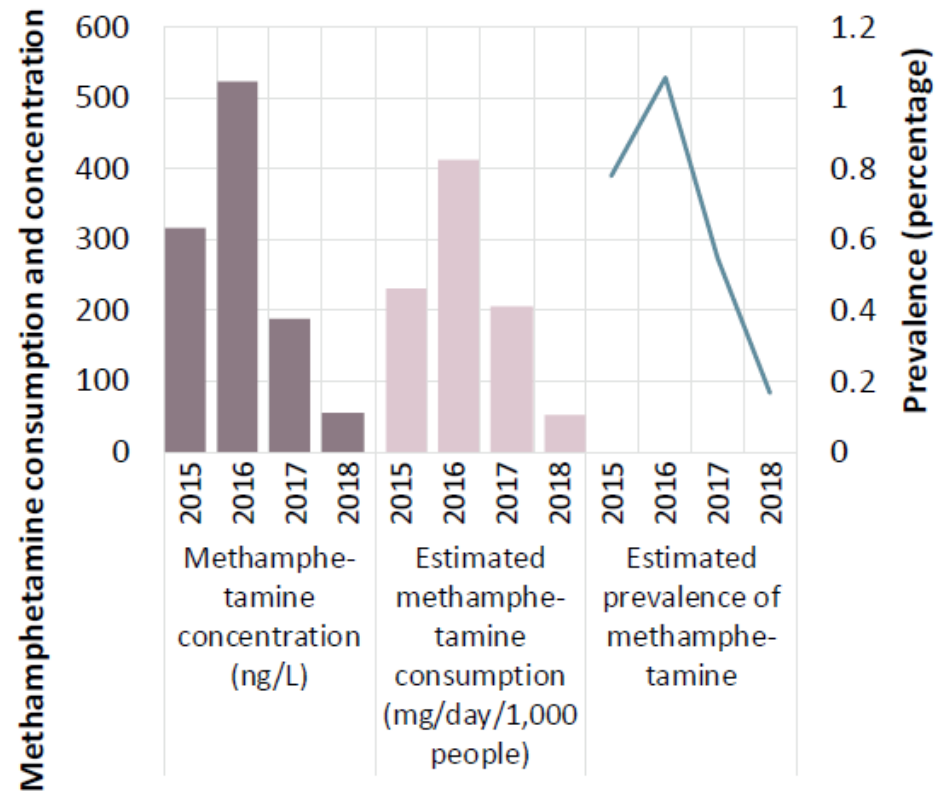
Source: UNODC, Synthetic Drugs in East and South-East Asia: Trends and Patterns of Amphetamine-type Stimulants and New Psychoactive Substances, (March 2019).

\*Data for 2018 cover the first 10 months of the year.



# Methamphetamine market displacement

## Methamphetamine use in Dalian, China

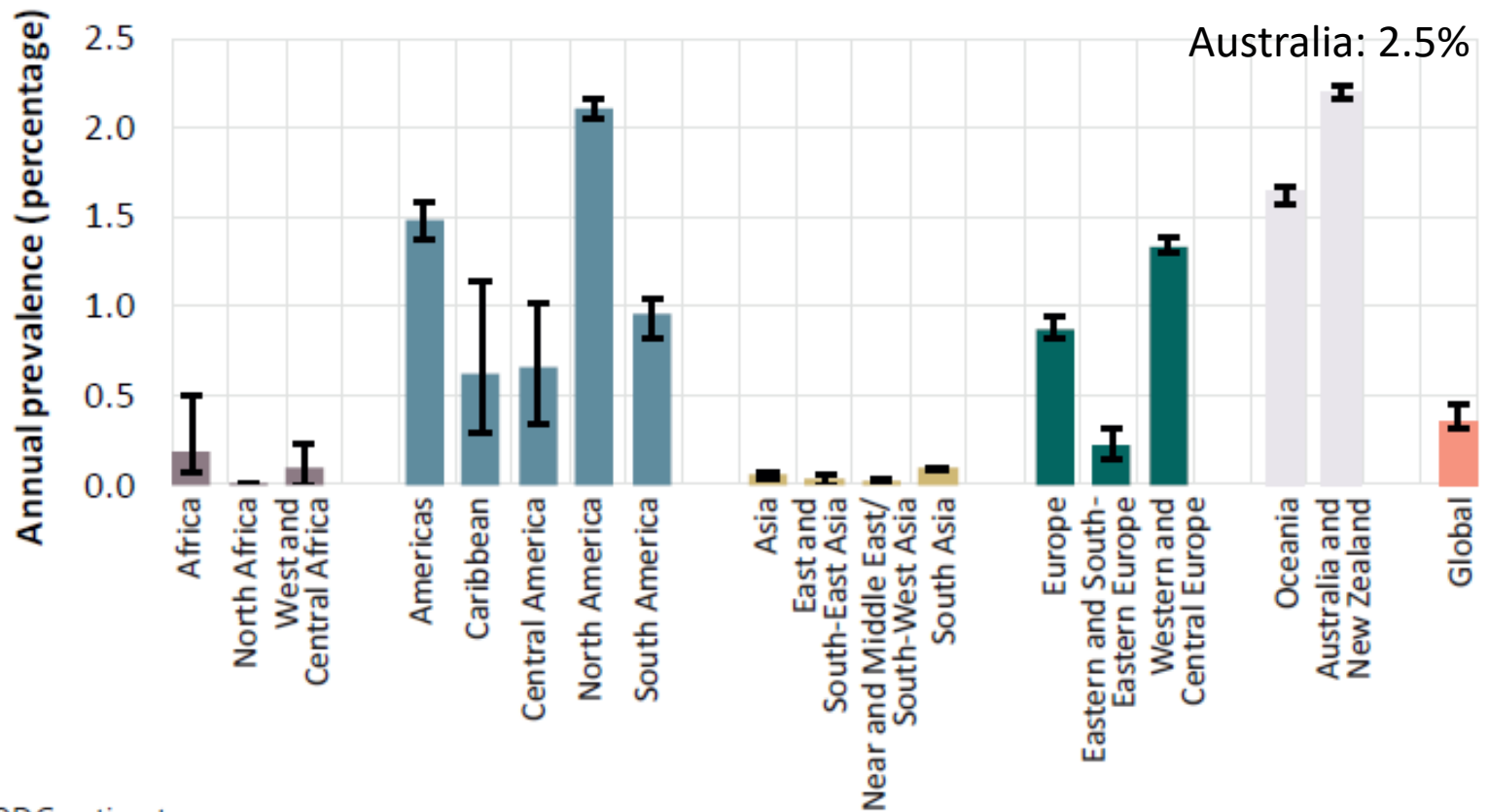


Source: Zhe Wang and others, "Reduction in methamphetamine consumption trends from 2015 to 2018 detected by wastewater-based epidemiology in Dalian, China", *Drug and Alcohol Dependence*, vol. 194 (January 2019).



# Cocaine users vs. consumption

## Cocaine use, by subregion, 2017

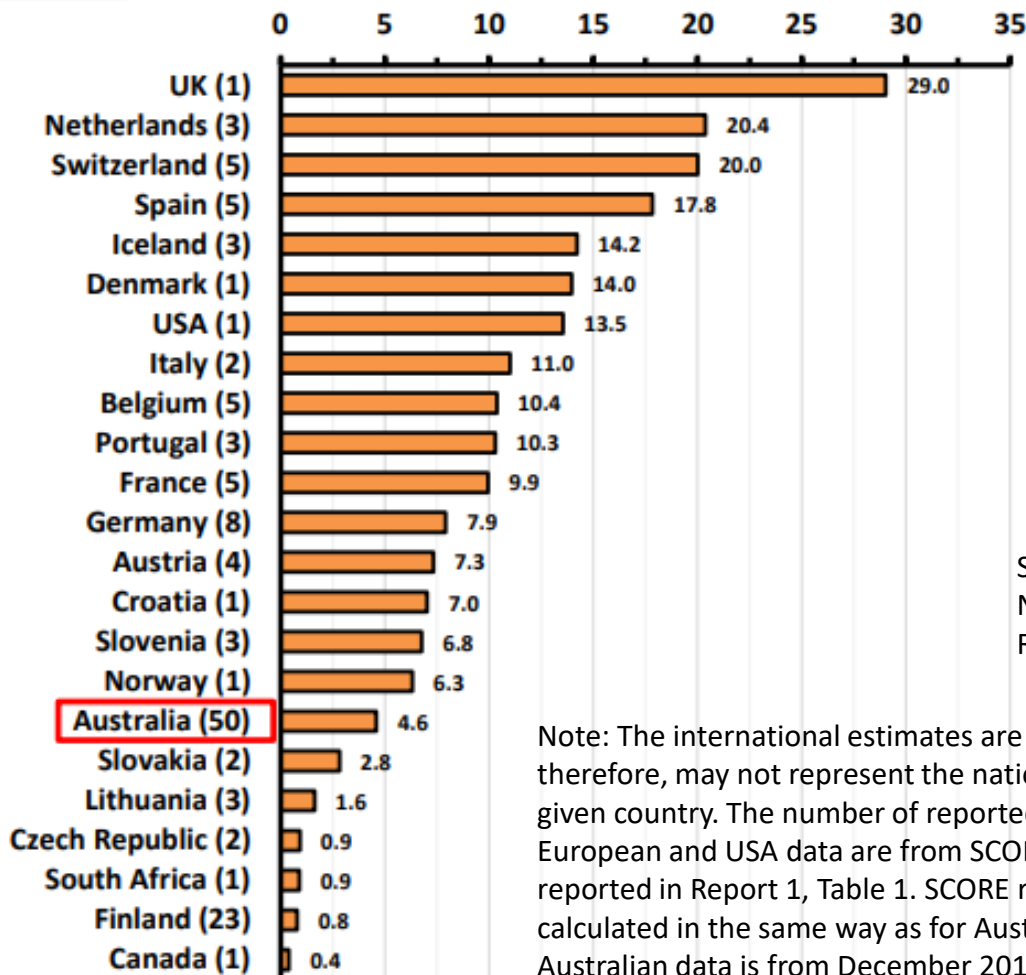


Source: UNODC estimates.



# Cocaine users vs. consumption

## Cocaine consumption (doses/day/1000 persons), 2018



Source: Australian Criminal Intelligence Commission, National Wastewater Drug Monitoring Program – Report 7, April 2019.

Note: The international estimates are based on data of a few WWTPs per country only and, therefore, may not represent the national per capita consumption for a given analyte in a given country. The number of reported cities is given in brackets after the country name. European and USA data are from SCORE (2019) and various excretion factors applied are reported in Report 1, Table 1. SCORE reports measured raw loads in sewers and doses were calculated in the same way as for Australia. All SCORE data were from March 2018. Australian data is from December 2018.

Objective and timely measure

Assists in better understanding the drug market

Methodologies/standards applied across countries

Trend results and cross-country (for metabolites of cocaine, cannabis, amphetamine, methamphetamine and ecstasy)

Challenges remain:

- extrapolation to amounts of drugs consumed

- excretion ratios (THC)

- opiates (licit morphine vs illicit opiates)

**THANK YOU  
FOR YOUR ATTENTION**



For more information:  
<http://www.unodc.org/>