

Interpreting wastewater data alongside other population-level indicators of stimulant use

Hayley Jones

Population Health Sciences, Bristol Medical School,
University of Bristol, UK

 [@DrHayleyJones](https://twitter.com/DrHayleyJones)

Acknowledgements

All co-authors of:

Goulding N, Hickman M, Reid M, Amundsen EJ, Baz-Lomba JA, O'Brien JW, Tscharke BJ, de Voogt P, Emke E, Kuijpers W, Hall W, Jones HE. **A comparison of trends in wastewater-based data and traditional epidemiological indicators of stimulant consumption in three locations.** *Addiction. In press*

Funding from the **European Commission**
(HOME/2015/ISFP/PR/DRUG/0062)

Bristol has been named as the cocaine capital of Europe following a study...

Researchers examined wastewater in 73 European cities to study drug use habits across the continent

Bristol named cocaine capital of Europe following sewage study

Southwest city has higher concentration of cocaine by-product in wastewater than Amsterdam or Barcelona, research finds

Tom Barnes | @thomas_barnes | Thursday 14 March 2019 18:39 |



Bristol has been named as the **cocaine** capital of Europe following a study examining traces of the drug in sewage across the continent.

Researchers looked at wastewater in dozens of cities in a bid to understand drug-taking habits, testing for benzoylecgonine (BE), the compound produced when the body breaks down the Class A substance.

Bristol topped the list, with the average daily concentration of BE in the city's wastewater standing at 969.2mg per 1,000 people in 2018, up from 754.7mg the year previous.

Amsterdam recorded the second highest figure in 2018, with 932.4mg, followed by Zurich at 856.0mg, Antwerp Zuid with 771.8mg and **Barcelona**, where the average reading was 733.2mg.

Bristol was the only UK city participating in last year's research. **London's** wastewater, which has taken the European cocaine crown in previous studies, was not included.

Cocaine use in Britain has more than doubled in five years, analysis of waste water reveals



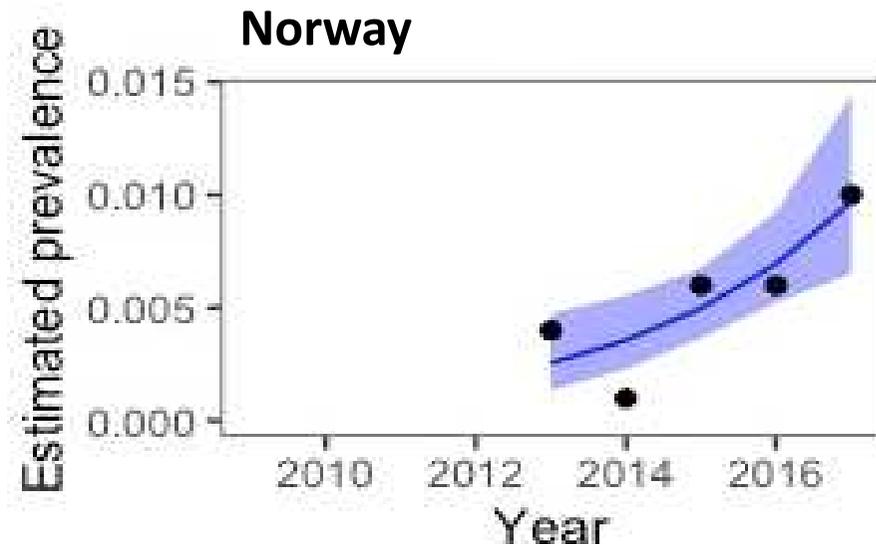
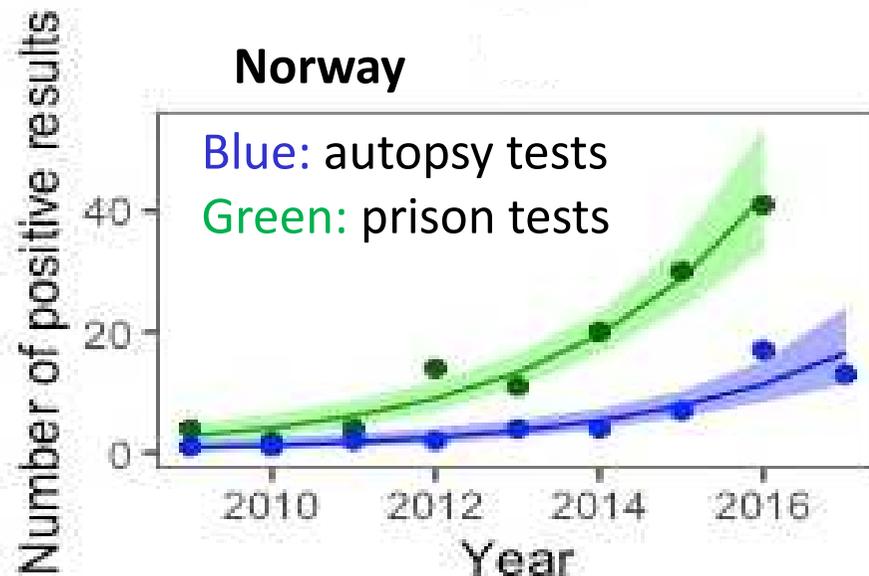
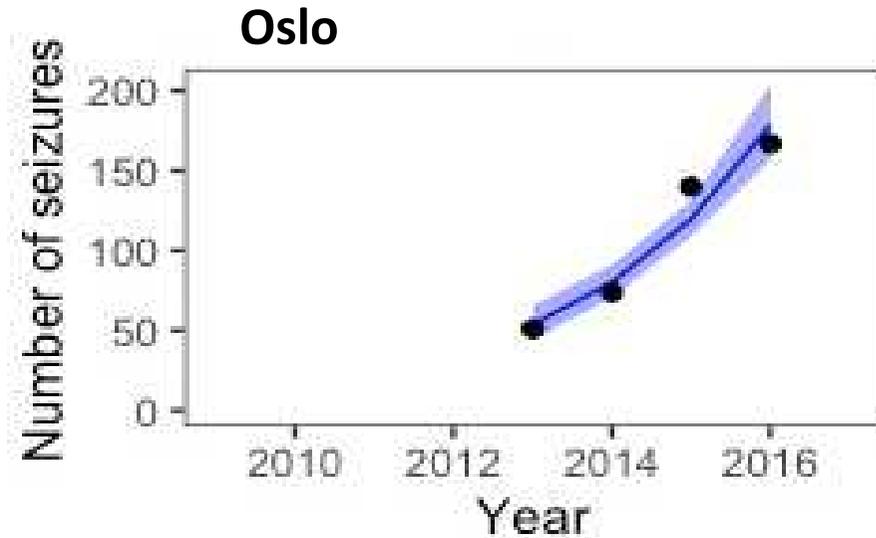
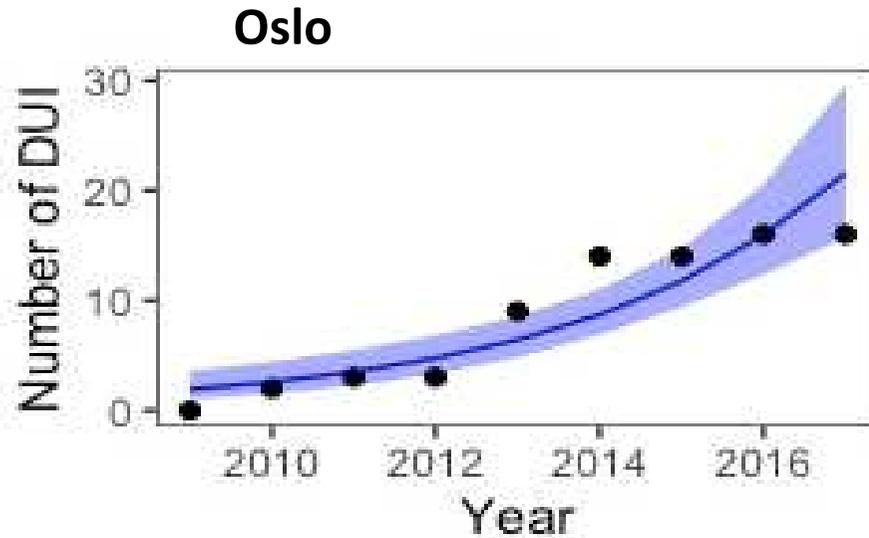
To what extent are these data reliable and useful?

- Data are based on just **7 consecutive days of sampling**
- Few locations with large populations have collected wastewater data over a long term period, allowing:
 - **Representativeness** of 7 days of sampling of one year to be assessed
 - Potentially more robust **comparisons of trend data** with other indicators

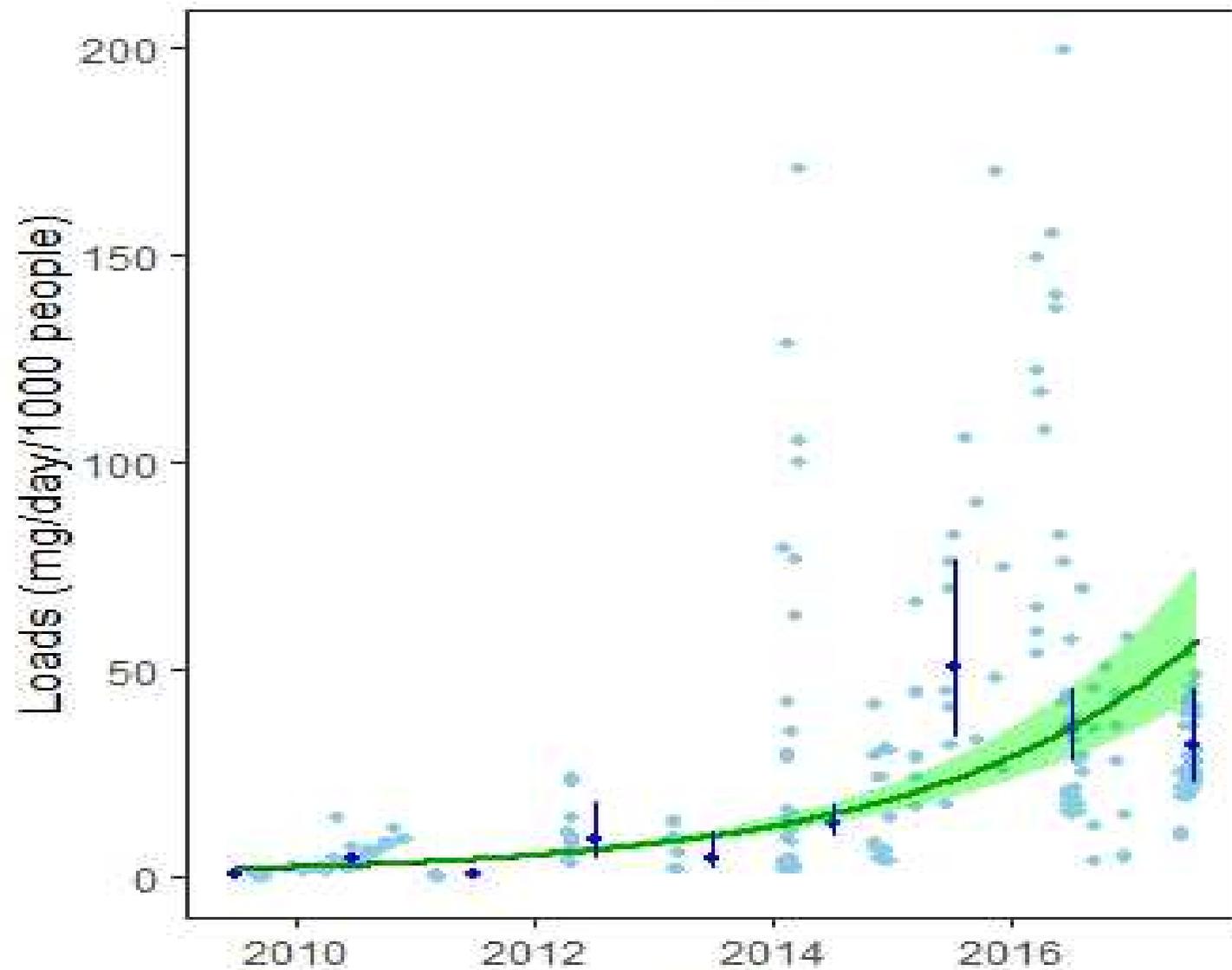
Methods

- Analysed **long-term** wastewater data from 3 locations:
 - 1) Oslo, Norway, 2009-2017. n = 246
 - 2) South-East Queensland, Australia, 2009-2017. n = 598.
 - 3) Eindhoven, Netherlands, 2012-2017. n = 187
- Compared trends with other epidemiological indicators of stimulant use
- Compared estimates based on 7 days vs estimates based on all available data

MDMA use in Oslo/Norway: traditional indicators

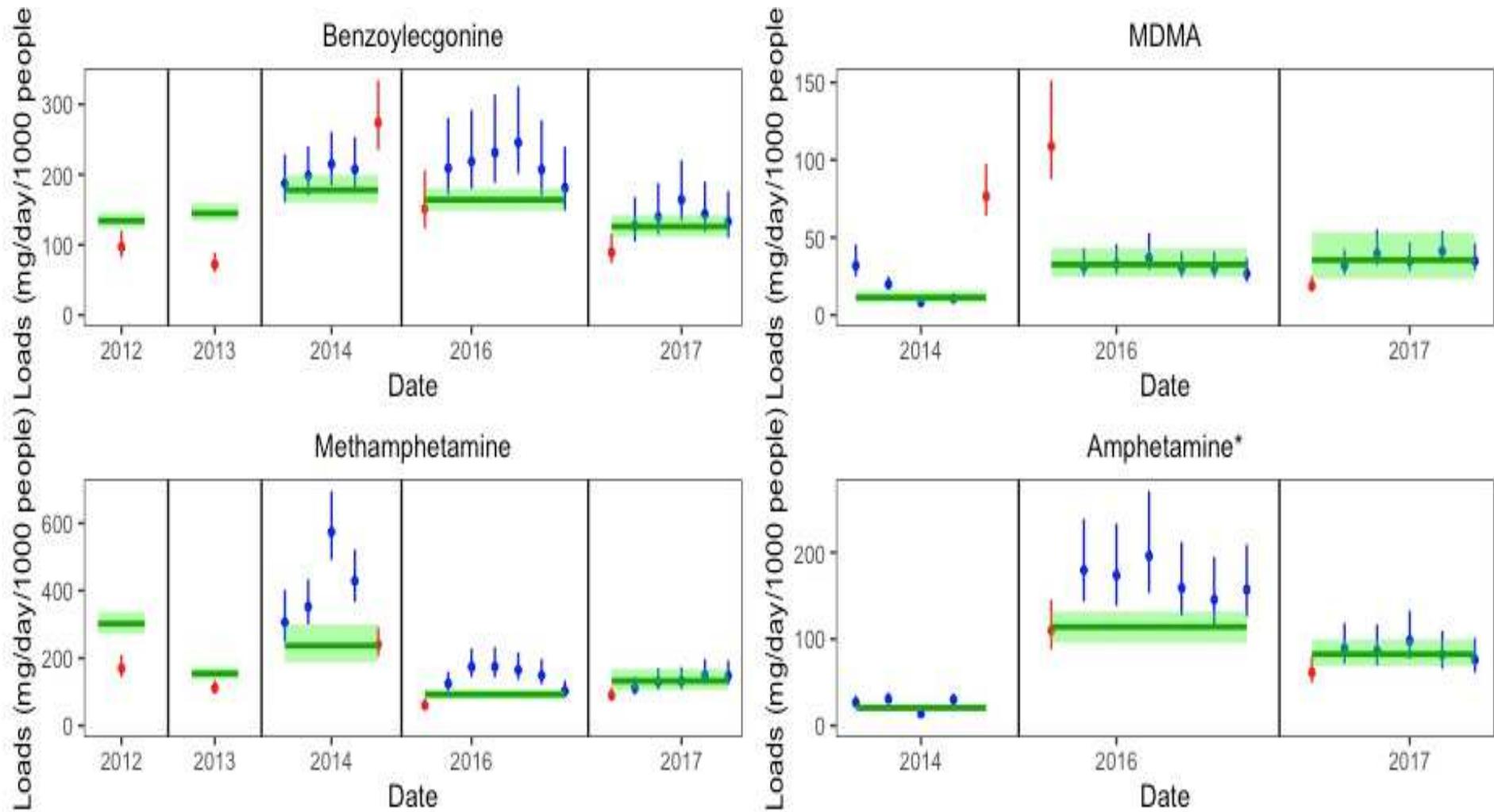


MDMA in Oslo: wastewater data

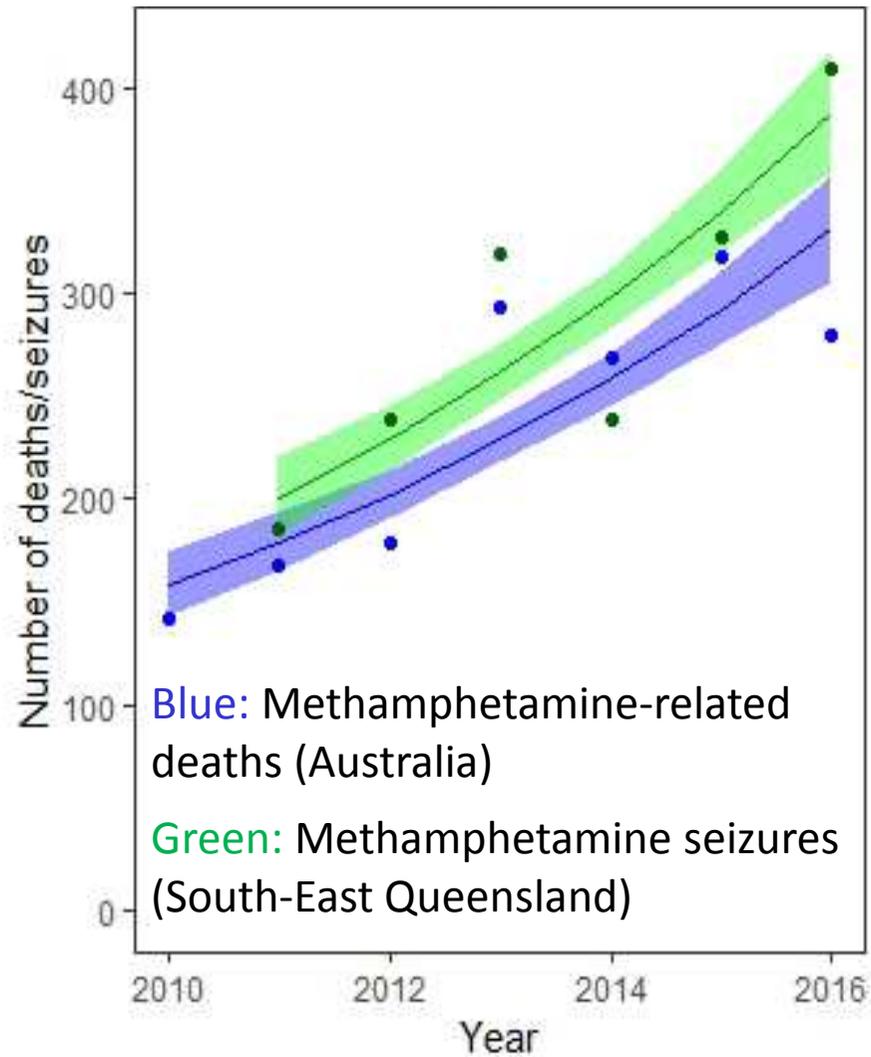
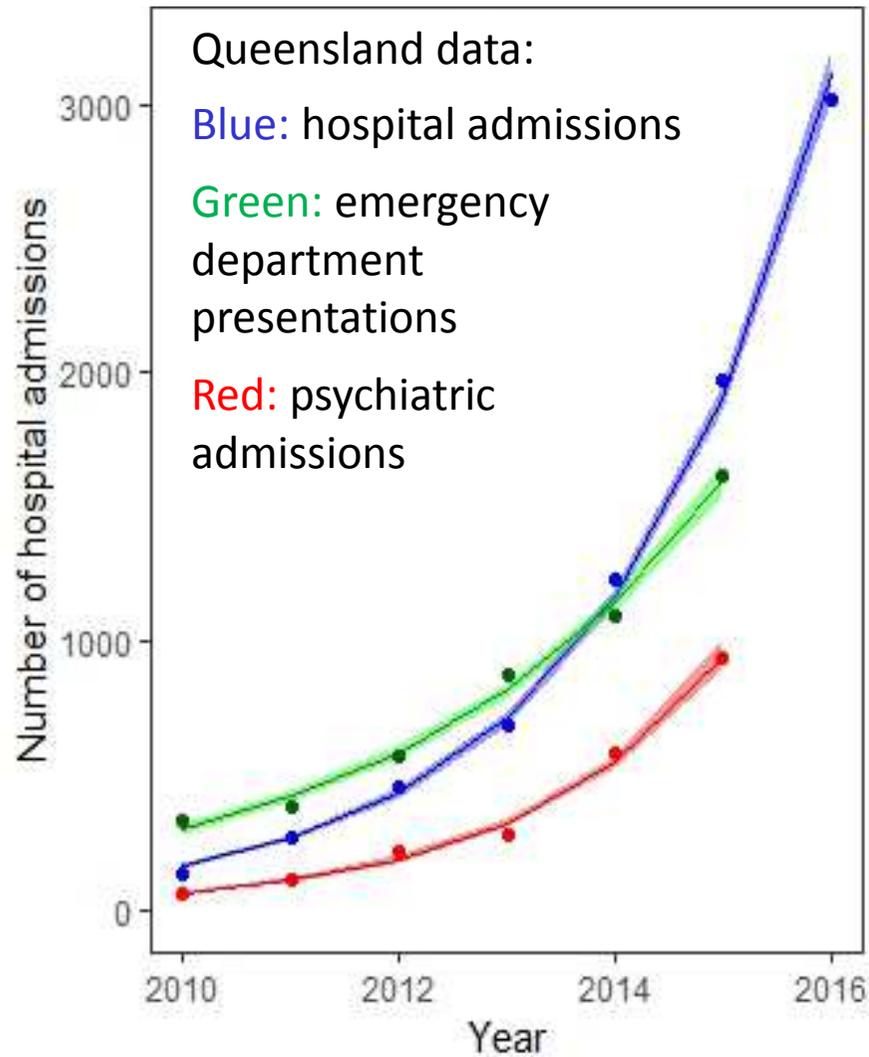


n = 246
samples

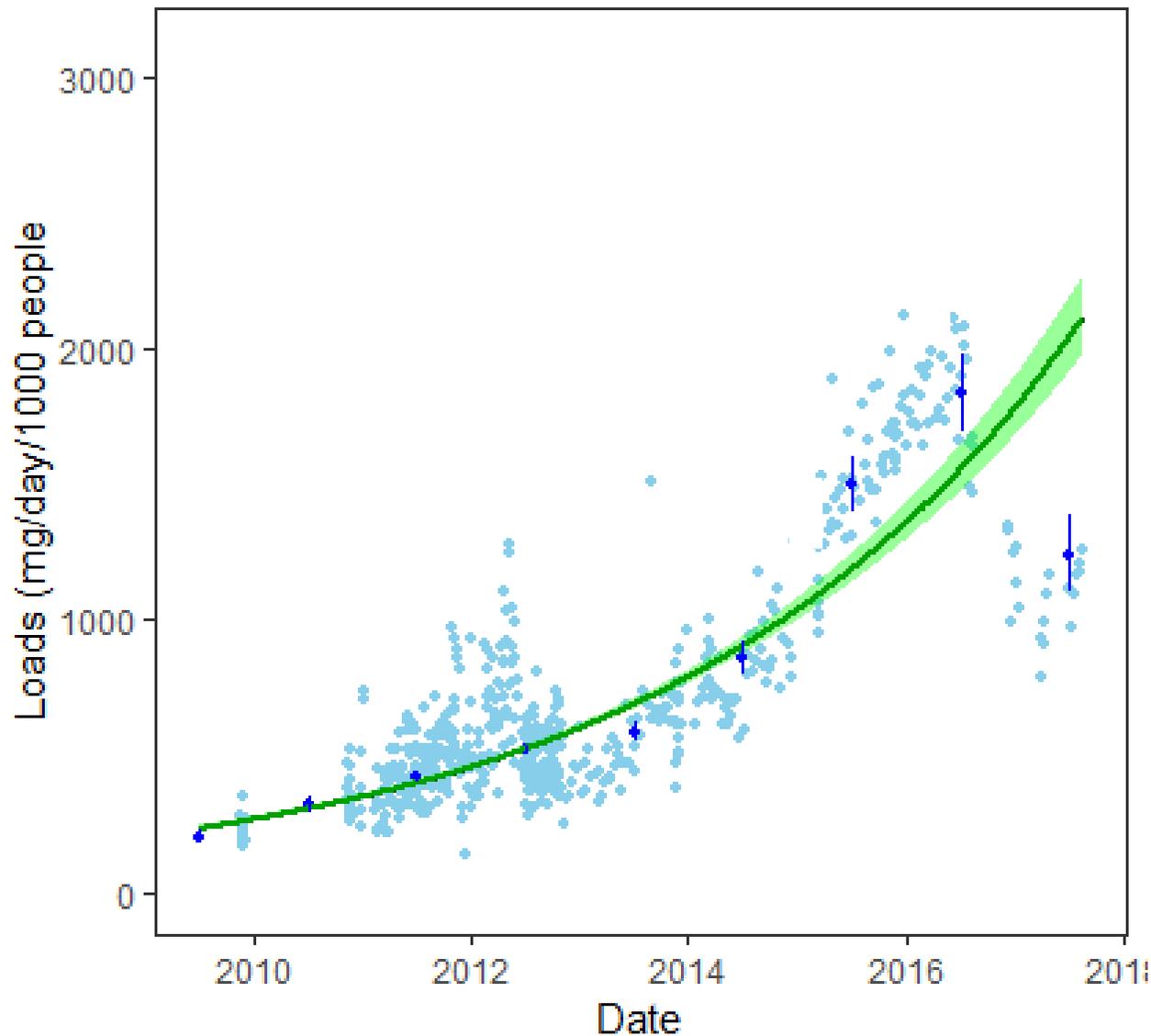
Oslo: is one week of sampling enough?



Methamphetamine in SE Queensland / Australia: traditional indicators

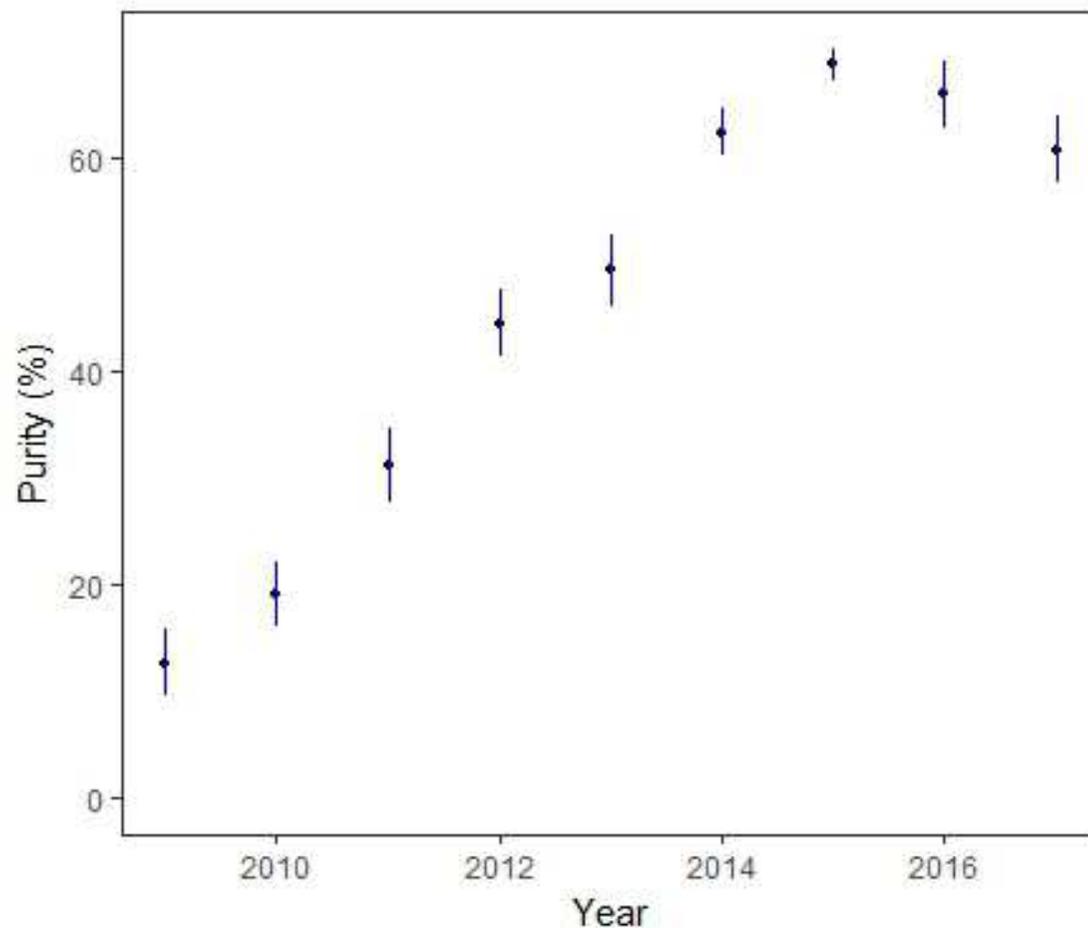


Methamphetamine in SE Queensland: wastewater data



n = 598
samples

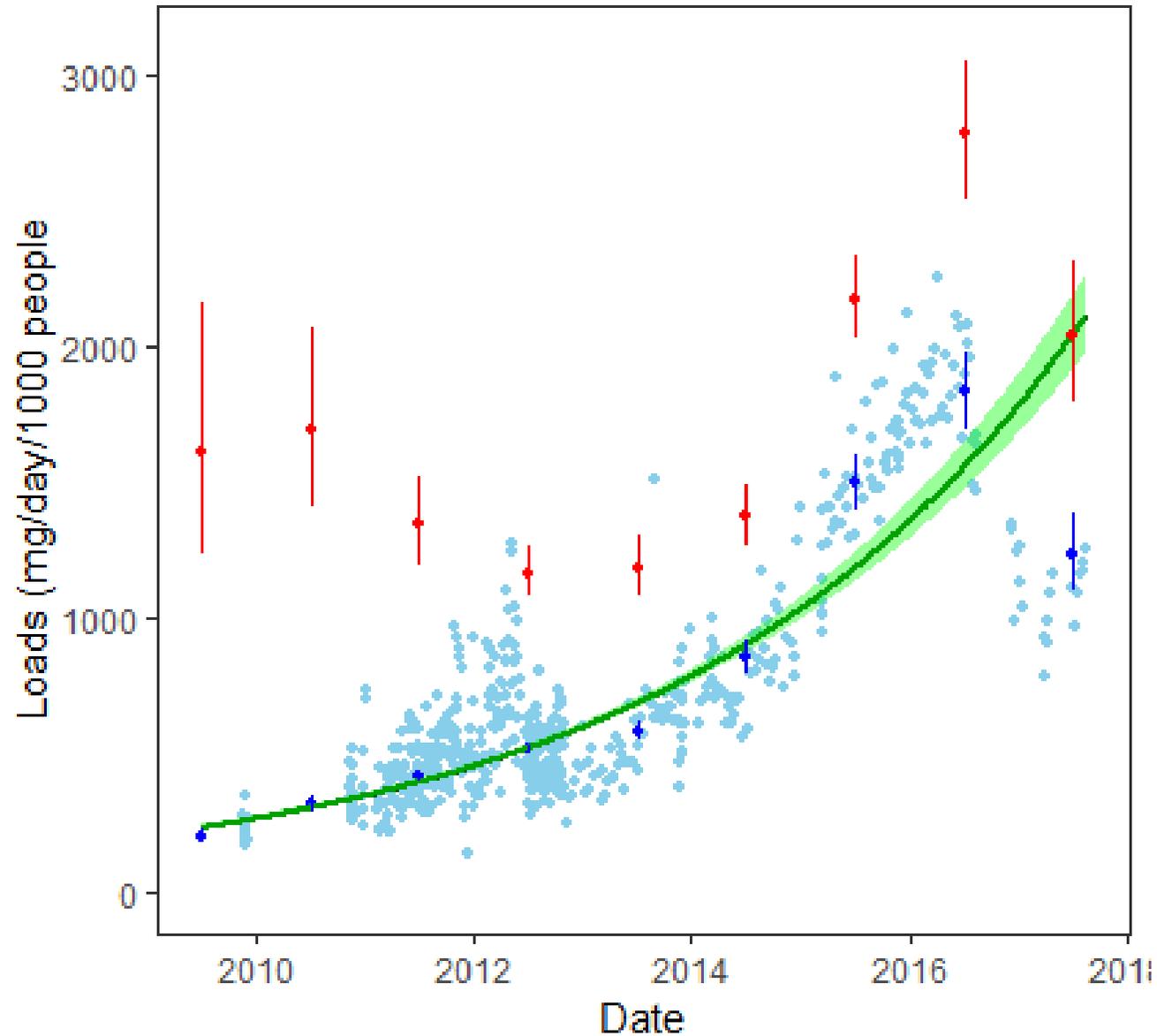
Purity of seized methamphetamine in SE Queensland



Data from: Bruno R et al. 2018. Sci Total Environ.

and the Queensland Health Forensic Chemistry Laboratory

Purity-adjusted wastewater data



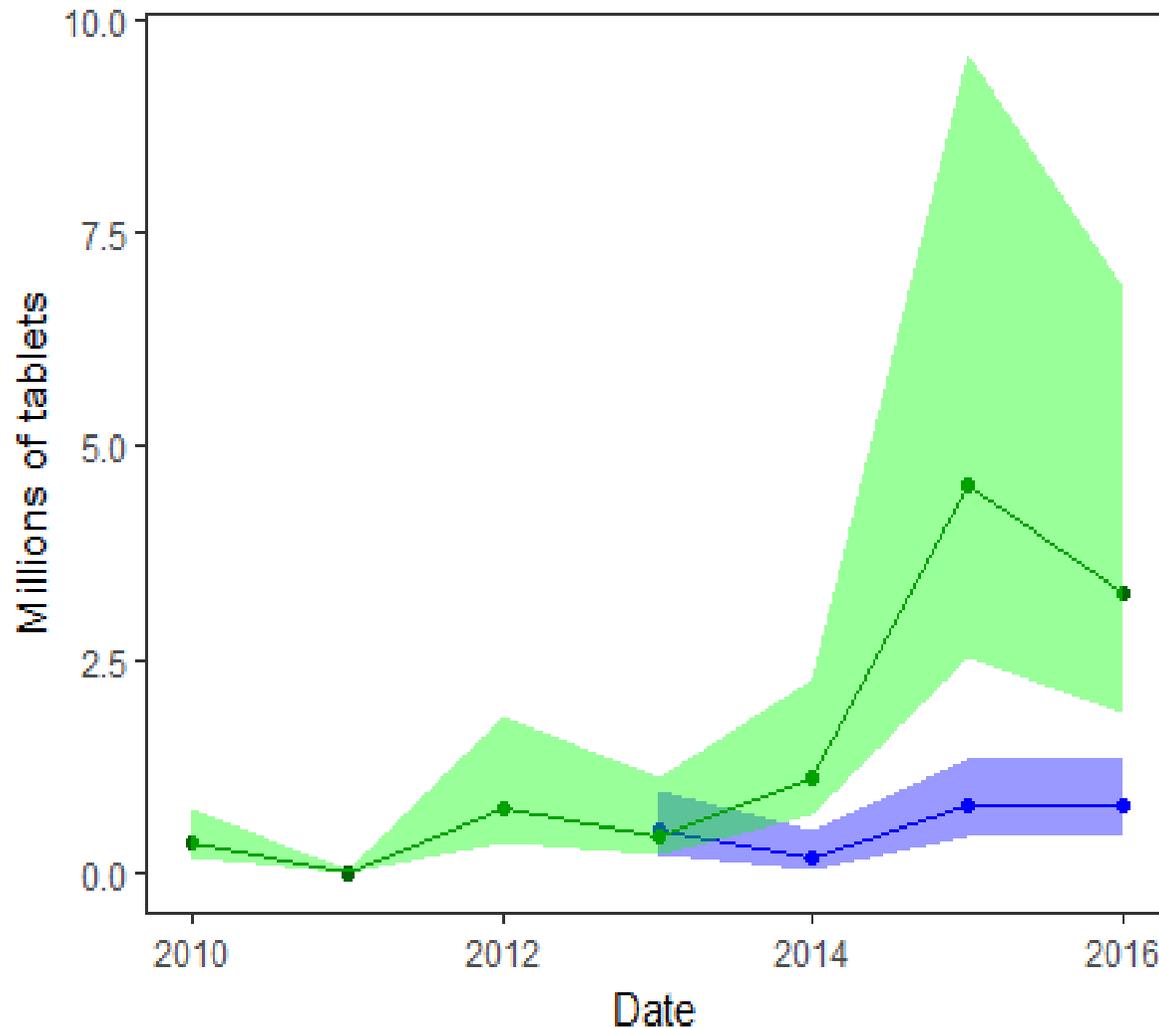
Another potential use for wastewater data?

- ‘Sizing the market’: e.g. how many millions of MDMA tablets consumed in each country/in Europe, each year?
 - EMCDDA report 2016: estimated this through extrapolation from General Population Survey data. This requires data/assumptions about:
 - Prevalence
 - Proportion of users in each frequency of use group
 - Average amount consumed in each frequency group
- Recognised as a likely *under-estimate* of market size

Estimating market size from wastewater data

- Data/assumptions required about:
 - Excretion profiles (what proportion of a dose is excreted as this metabolite?)
 - Purity of drugs consumed
 - Relationship between population sampled and total population of interest
- Likely to generally *over-estimate* total market size
- 2 approaches taken together could provide lower and upper bounds for plausible market size?

Exploratory analysis: 'Sizing the MDMA market', Norway



Blue: GPS
(lower bound?)

Green: Wastewater
(upper bound?)

Limits likely too wide to be of much use - but much **potential for improving this approach**

Conclusions / Discussion

- Long-term trends of stimulants/metabolites in wastewater were *broadly* consistent with trends in other indicators
- But all wastewater data sets exhibited a **large amount of day-to-day variation**
- **7 days of sampling per year may not be sufficient for valid inference**
- Important to interpret wastewater data (and other indicators) alongside purity data
- Potential role of wastewater data in sizing drug markets – particularly if modelled *together* with GPS data in a Bayesian model
- More details in: **Goulding *et al.* A comparison of trends in wastewater-based data and traditional epidemiological indicators of stimulant consumption in three locations. *Addiction*. *In press***