PREVALENCE OF RECREATIONAL DRUGS AND NEW PSYCHOACTIVE SUBSTANCES IN A COHORT OF PATIENTS PRESENTING TO AN URBAN EMERGENCY DEPARTMENT (ED) WITH SUSPECTED ACUTE RECREATIONAL DRUG TOXICITY
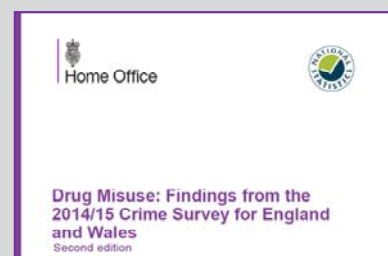
Michelle Wood[1], Rachelle Abouchedid[2], David M Wood[2], Nayan S Mistry[1], John RH Archer[2], James Ho[2] and Paul I Dargan[2]

[1]Health Sciences Organisation, Waters Corporation, Wilmslow (UK); [2]Guys and St Thomas' NHS Foundation Trust, Clinical Toxicology, London (UK)

Waters
THE SCIENCE OF WHAT'S POSSIBLE.®

Guy's and St Thomas' NHS NHS Foundation Trust

INTRODUCTION

- The Crime Survey for England and Wales (CSEW) is published by the Office for National Statistics and includes measurement of the extent, and trends, in illicit drug use amongst adults aged 16-59 years.

- Key findings from the 2014/15 report indicated that around 8.6% of adults had taken an illicit drug in the last year[1].

- The figure for young adults (16-24 years) over the same period, was more than double at ~19.4%.

- The survey also revealed that around 1 in 40 of young adults took a new psychoactive substance (NPS) in the last year and that NPS drug use was also more common amongst individuals who frequent pubs and nightclubs.

- Recreational drugs and NPS are common reasons for presentation to the ED with acute toxicity however, there is limited data on the actual drugs responsible for the presentations and self-reported drug use may be unreliable.

- **STUDY AIM: To assess the drugs present in a cohort of patients with suspected acute recreational drug/NPS toxicity.**

Home Office

Drug Misuse: Findings from the 2014/15 Crime Survey for England and Wales
Second edition

SAMPLES

Surplus plasma samples (from bloods collected as part of routine clinical care) were anonymised and sent to the laboratory for analysis.

A total of 191 samples were collected over a period of 6 months (Jan—July 2015).

Samples were prepared by liquid:liquid extraction at basic pH. Five microlitres was analysed by UPLC-TOF-MS[E]

METHOD

Screening system:

UNIFI® Forensic Toxicology Screening Application Solution (Waters)

The system comprises an ACQUITY UPLC® I-Class and XEVO™ G2-XS QTOF Mass Spectrometer with UNIFI® informatics.

Full scan accurate mass data was acquired using MS[E] mode which involves simultaneous collection of data under two energy conditions: the low energy (function 1) provides the accurate mass of the precursor ion while the elevated energy (function 2) leads to the generation of specific accurate mass fragment ions for additional confirmatory purposes.

UNIFI® data processing:

Routine processing involves simultaneous targeted and semi-targeted analysis. Discovery tools are also available for non-targeted analysis.

Targeted analysis: Comparison to UNIFI® toxicology library data (RT and diagnostic fragments) for >1300 characterised drugs and metabolites.

Semi-targeted analysis: Uses a molfile to screen for drugs where reference material (and therefore RT and diagnostic fragment data) was unavailable at the time of analysis. This technique screens for precursor mass and uses in-silico fragmentation techniques to yield theoretical fragment ions for additional confirmation through comparison with high energy data. Molfiles are available for >1500 substances, including ~200 emerging drug substances (advisory from early-warning organisations[2]).

Non-targeted analysis (Discovery): Automated tools to determine elemental composition, search external databases/libraries and uses in-silico techniques to compare high energy fragments.

RESULTS AND DISCUSSION

UPLC-TOF-MS[E] was used for its ability to screen for established, recreational drugs (targeted analysis) as well as NPS (semi- and non-targeted analysis).

One-hundred and sixty samples (84%), screened positive for one or more illicit drug substances. Figure 1 summarises all drug substances detected and also provides a breakdown for the main classes of recreational drug substances and NPS.

The most common illicit drug substance detected was mephedrone and/or its metabolite, which was found in 65 samples (40.6 % of the cases containing illicit drug substances). The most frequently found drug class was the amphetamine class (81%).

More commonly, two or more illicit drug classes were detected within the same sample (55% of the illicit-positive samples). Common combinations were cathinones/amphetamines (27% of the 191 samples analysed); cocaine/opiates (10%); cocaine/amphetamines (9.3%) and cocaine/cathinones (6.9%).

References
[1]Home Office for National Statistics (2015) Drug Misuse: Findings from the 2014/15 Crime Survey for England and Wales – second edition. Accessed online (Oct 5, 2016) https://www.gov.uk/government/statistics/drug-misuse-findings-from-the-2014-to-2015-csew
[2]Examples of early-warning organisations: European Monitoring Centre for Drugs and Drug Addiction (EMCDDA); United Nations Office on Drugs and Crime (UNODC); UK Home Office Forensic Early Warning System (FEWS)
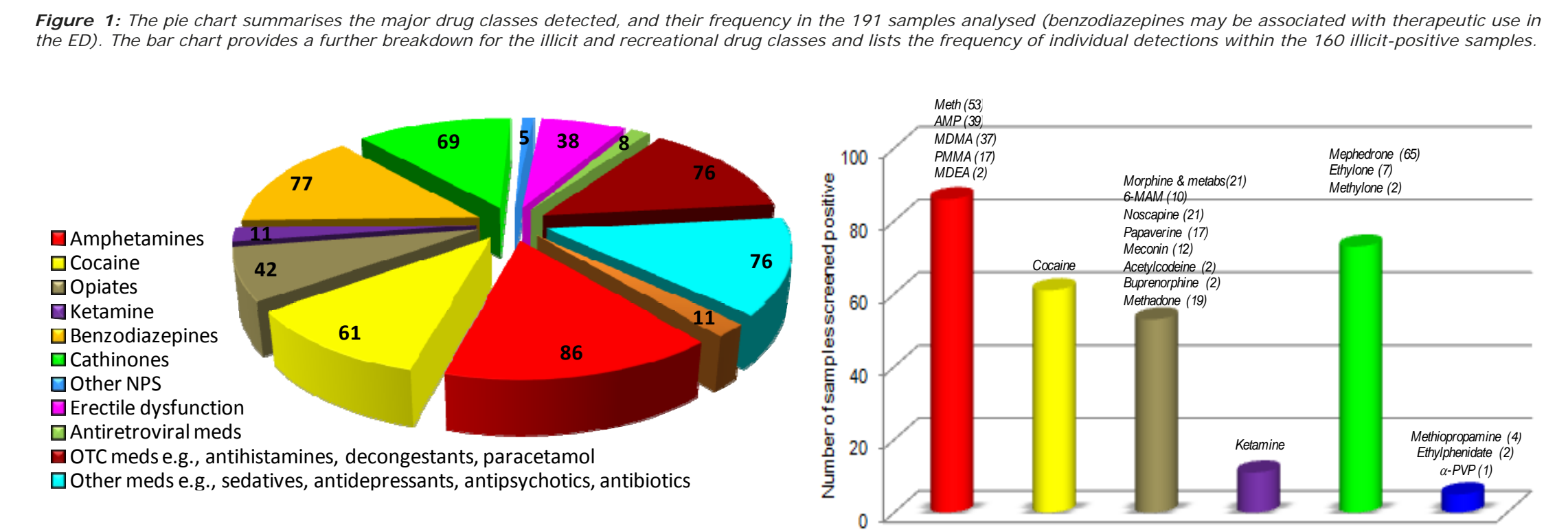
Figure 1: The pie chart summarises the major drug classes detected, and their frequency in the 191 samples analysed (benzodiazepines may be associated with therapeutic use in the ED). The bar chart provides a further breakdown for the illicit and recreational drug classes and lists the frequency of individual detections within the 160 illicit-positive samples.
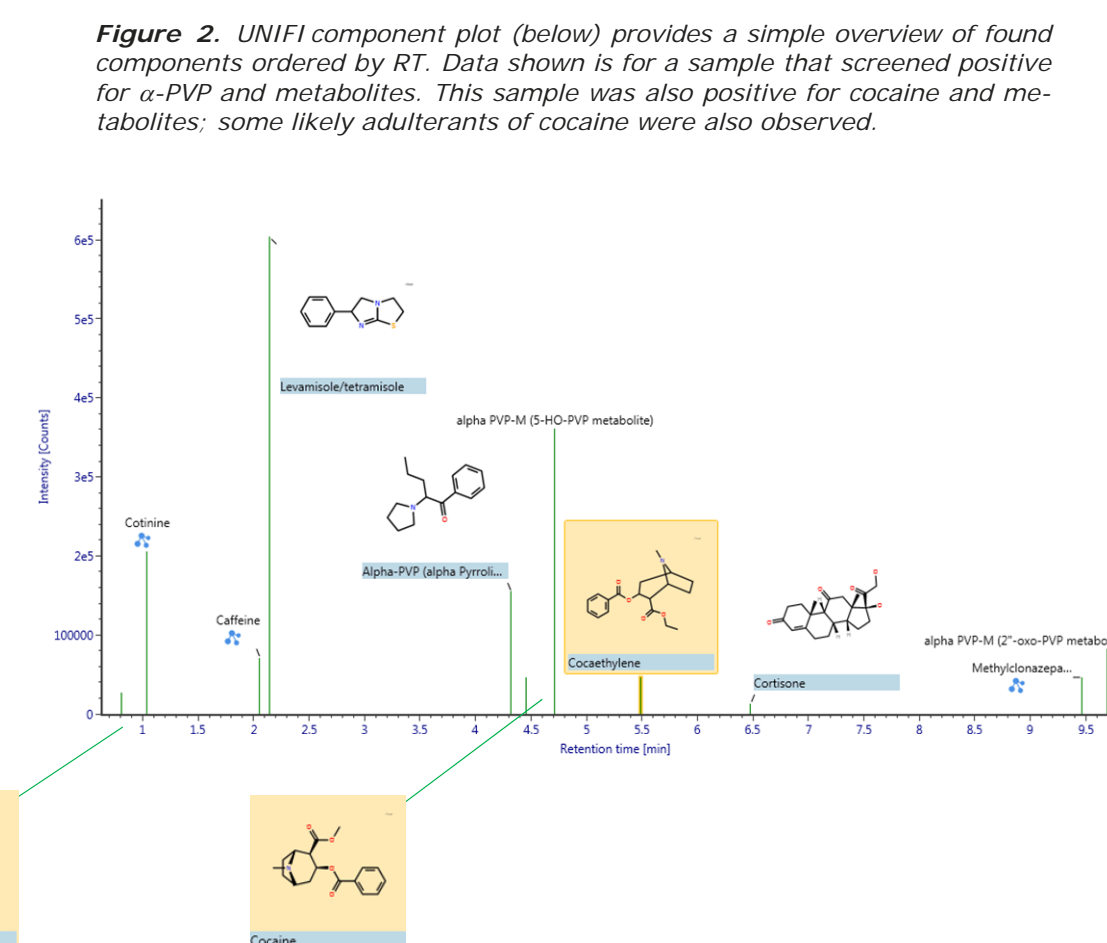
Figure 2. UNIFI component plot (below) provides a simple overview of found components ordered by RT. Data shown is for a sample that screened positive for α-PVP and metabolites. This sample was also positive for cocaine and metabolites; some likely adulterants of cocaine were also observed.
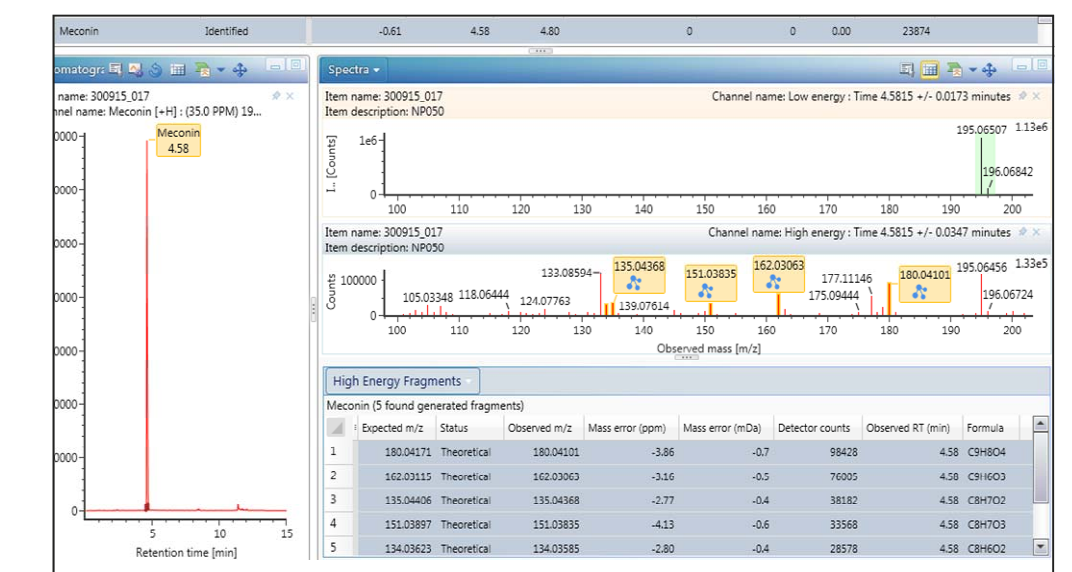
Figure 3. An example of a detection by UNIFI's semi-targeted tools. On detection of a precursor mass, theoretical substructures for meconin were automatically generated by the in-silico fragmentation tool; these ions can then be compared with observed fragment ions in the high energy spectrum. In this example the tentative detection of the precursor at 4.6 min was further supported by 5 theoretical fragments. This sample also screened positive for morphine, (plus codeine, noscapine and papaverine); cocaine (plus benzoylecgonine, ecgonine methyl ester, hydroxycocaine and cocaethylene) and methadone (plus EDDP metabolite).

CONCLUSIONS

- In this study, the amphetamines were the most commonly detected illicit drug class followed by the cathinones.

- Mephedrone was the most commonly-detected substance; the majority were also positive for other recreational drug substances.

- Studies such as this, with broad-based toxicology screening, are important to determine the actual drugs present in individuals presenting to hospitals with acute recreational toxicity and to determine trends in the use of, and toxicity associated with, novel psychoactive substances.