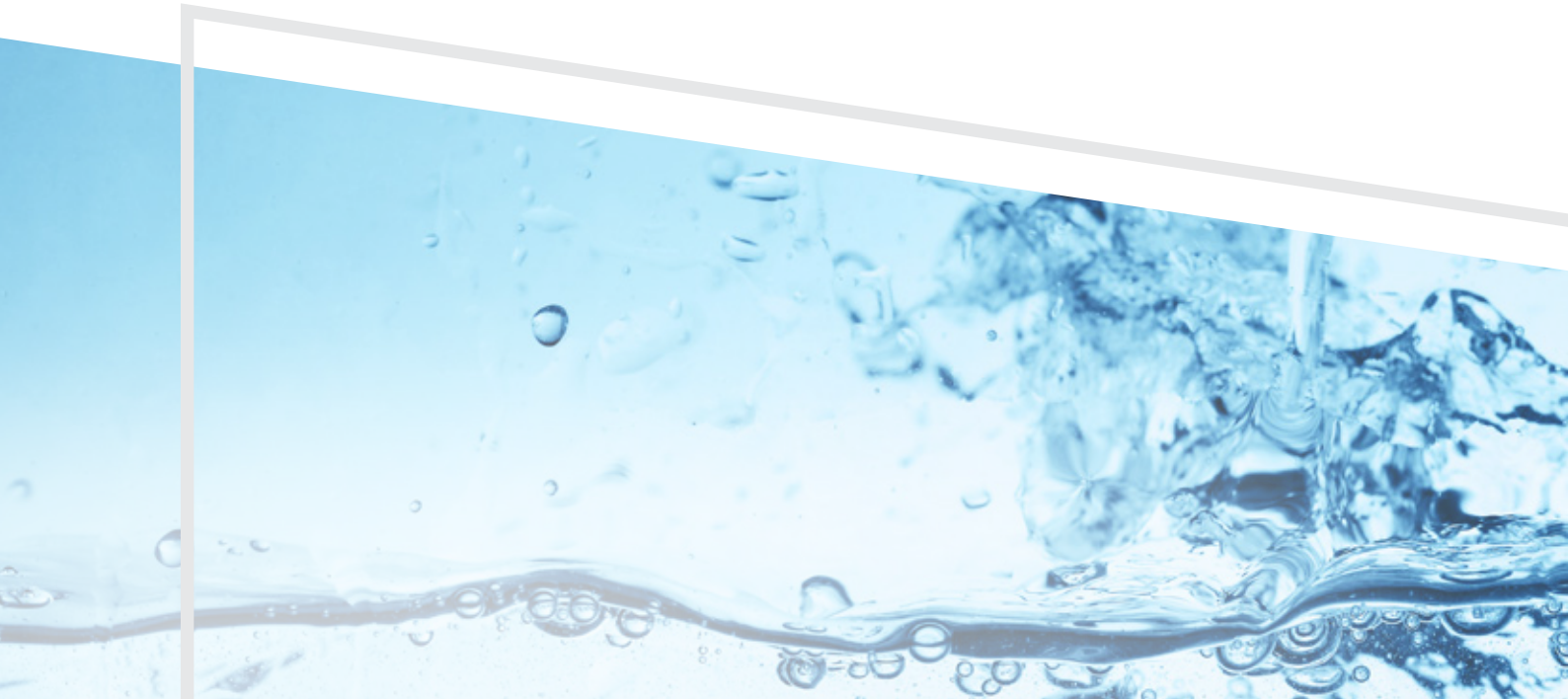
NATIONAL WASTEWATER DRUG MONITORING PROGRAM

REPORT 2, JULY 2017

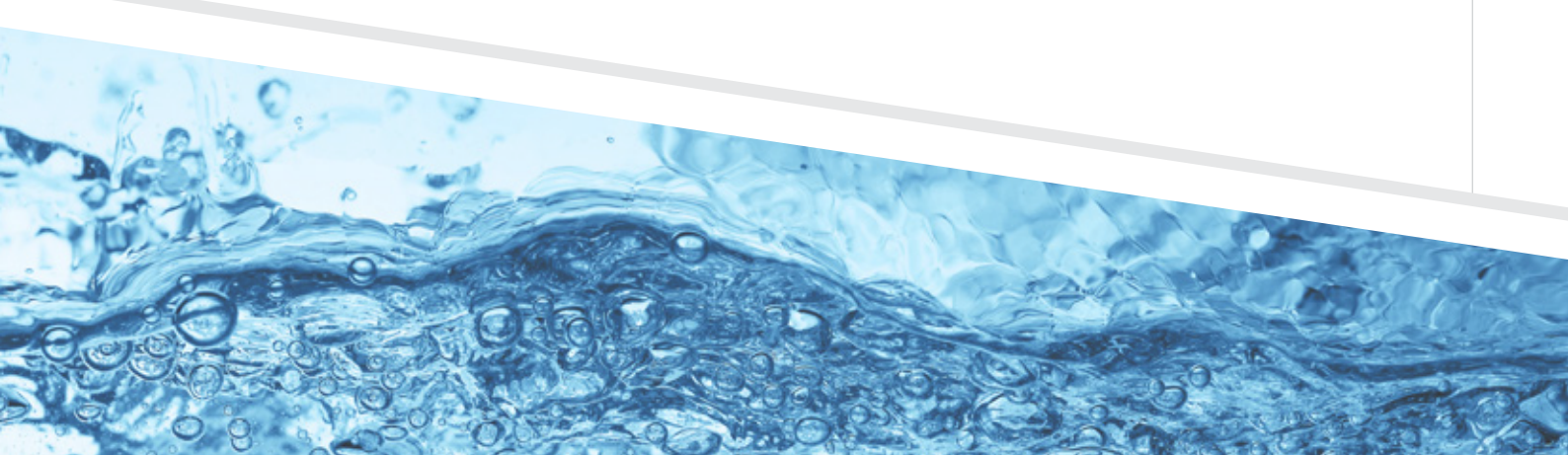
AUSTRALIAN CRIMINAL INTELLIGENCE COMMISSION

THE UNIVERSITY OF QUEENSLAND AUSTRALIA

University of South Australia



CONTENTS



CEO FOREWORD

The Australian Criminal Intelligence Commission has a national responsibility to provide information and intelligence on criminal activity. Much of the harm that Australians suffer at the hands of organised crime is due to the trade in illicit substances and abuse of licit substances at the instigation of serious and organised crime groups who profit from importing, trafficking, manufacturing and selling drugs.

This National Wastewater Drug Monitoring Program report is the second in a series of nine public reports which will detail the findings of the national wastewater program until the end of 2019. This report provides statistically valid datasets of drug use and distribution patterns across a large number of sites in capital cities and regional areas.

The National Wastewater Drug Monitoring Program is intended to provide a national picture of drug use and therefore demand. Regrettably, during the period covered by this report the operators of wastewater facilities in Tasmania and the Northern Territory declined to participate in the collection of samples, and hence there is no analysis of drug trends in those jurisdictions in this report. This is disappointing, as it limits our understanding of trends and emerging issues in those jurisdictions, and the ability to compare current findings with those published in the first report. The Australian Criminal Intelligence Commission will continue engaging with all jurisdictions to secure ongoing participation in sampling for future reports. Participation from all states and territories is vital to informing our understanding of the national picture of drug use and demand.

TRENDS IDENTIFIED DURING THIS REPORTING PERIOD

Although results from different jurisdictions vary, there was a slight but pleasing reduction in the level of methylamphetamine used nationally over the period covered by this report. It is too early to say with any confidence whether this result is part of a longer term trend. Independent reporting points to widespread harm being caused by the methylamphetamine market, so any sustained decline in the level of use nationally would be welcomed. Results from this reporting period continue to identify relatively high levels of methylamphetamine use in regional areas in a number of jurisdictions, which is problematic and poses significant challenges due to the relative scarcity of resources that can be employed locally to respond.

Methylamphetamine remains by far the most used illicit drug of those tested in the National Wastewater Drug Monitoring Program. Reduced licit and illicit use of the pharmaceutical opioids oxycodone and fentanyl was identified during the period covered by this report. However, the level of use still allows considerable scope for diversion to the illicit market. The Australian Criminal Intelligence Commission continues to monitor trends in relation to pharmaceutical opioids and to collaborate with the public and private sectors to develop a national response.

No significant changes were identified in the cocaine or MDMA markets nationally. Use of these substances continues to lag behind the use of methylamphetamine and pharmaceutical opioids by some margin. The use of tobacco increased nationally and in most jurisdictions during the period covered by this report.

EVOLUTION OF THE PROGRAM

As I noted when the first National Wastewater Drug Monitoring Program report was released, wastewater analysis provides a measure of one important aspect of national health—the demand for a range of licit and illicit drugs. An understanding of this behaviour allows governments to effectively direct resources to priority areas, and also to monitor the progress of demand and supply reduction strategies. Against this background, it has been pleasing to note that a number of state and local government entities have approached the Australian Criminal Intelligence Commission for advice on drug trends in their particular area when planning responses. The Australian Criminal Intelligence Commission willingly works with agencies in these circumstances to ensure they have reliable contemporary data against which to judge the success of particular initiatives.

In future reports the Australian Criminal Intelligence Commission will test for the use of heroin and 3,4-methylenedioxyamphetamine (MDA). This reporting involves a natural evolution of the existing National Wastewater Drug Monitoring Program and we are grateful to our partners at the University of Queensland and University of South Australia for extending the existing program in this manner.

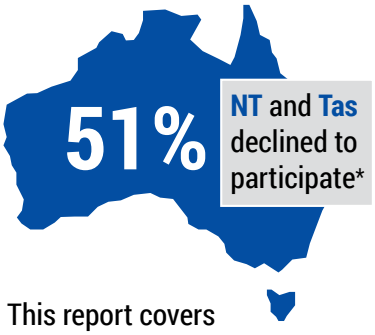
The baseline assessment of national drug consumption established by the first report of the National Wastewater Drug Monitoring Program has been complemented by the findings of this report and of other contemporary datasets. For example, findings from the Drug Use Monitoring in Australia program indicate that in 2015–16 the self-reported use of methylamphetamine overtook that of cannabis. For the first time, methylamphetamine became the most commonly reported illicit drug used by police detainees in the 12 months preceding interview. The proportion of detainees testing positive for methylamphetamine also increased in 2015–16 and was higher than the proportion testing positive for any other drug. The Australian Criminal Intelligence Commission remains committed to capturing and integrating additional datasets with our wastewater data to build a comprehensive and increasingly detailed picture of national drug consumption.

I would like to thank the Minister for Justice for contributing the funding which made this initiative possible, and to acknowledge the Australian Criminal Intelligence Commission officers who contributed to the project. I am grateful for the valuable support and specialist expertise of Jochen Mueller, Wayne Hall, Sharon Grant, Ben Tscharke, Rachel Mackie and Jake O'Brien of the University of Queensland, and Jason White, Cobus Gerber, Richard Bade and Maulik Ghetia from the University of South Australia who undertook the data collection and analysis which underpins this report.

Chris Dawson APM
Chief Executive Officer
Australian Criminal Intelligence Commission

SNAPSHOT

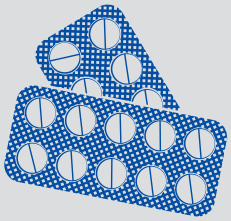
Methylamphetamine remains the **highest consumed** illicit drug tested across **all regions** in Australia, though nationally there was a **slight reduction**.



NT and **Tas** declined to participate*

This report covers approximately **51 per cent** of Australia's population—about **12.6 million Australians.**

Compared with methylamphetamine, **consumption** of **other stimulants** was generally **much lower**.



Oxycodone and **fentanyl consumption** (licit and illicit) across all jurisdictions continues at **concerning levels**.

Consumption levels for tested **new psychoactive substances** confirm this remains a **niche market**.

Alcohol and tobacco remain **highest consumed substances** in all states and territories.

*Operators of wastewater facilities in Tasmania and the Northern Territory declined to participate in the collection of samples during the period covered by this report.

METHYLAMPHETAMINE CONSUMPTION

Highest levels in **SA** and **WA**.

Capital city consumption exceeded regional sites.

COCAINE CONSUMPTION

While capital city **NSW** levels **dominated** the national landscape, **ACT, Vic** and regional **Qld** sites showed **higher levels** compared to other states.

Consumption in capital city locations was on average **almost double** that of regional sites.

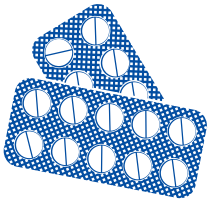
MDMA CONSUMPTION

Consumption in **ACT increased significantly** in Dec 2016, before **reducing** to a relatively **low level** in Feb 2017.

CONSUMPTION OF OTHER SUBSTANCES

Tobacco levels in Qld and WA are the highest across the nation.

SA and **ACT** capital city sites showed **higher than average oxycodone** levels.



NSW, **SA** and **Qld** regional sites had **higher than average fentanyl** levels.

INTRODUCTION

This is the second in a series of nine National Wastewater Drug Monitoring Program reports to be publicly launched by the Australian Criminal Intelligence Commission. This program aims to deliver on the recommendations of the National Ice Taskforce's final report. It is the first program to provide leading-edge, coordinated national research and intelligence on illicit and licit drugs, with a specific focus on methylamphetamine and 12 other substances.

In 2016, the Australian Criminal Intelligence Commission received $3.6 million in funding under the Proceeds of Crime Act to deliver the National Wastewater Drug Monitoring Program over three years. The program provides a measure, rather than an estimate, of the use of a number of illicit drugs, as well as licit drugs including nicotine, alcohol and some pharmaceuticals. It gives us valuable insight into the trends and emerging issues of drug consumption across Australia.

The findings presented in the nine reports will give law enforcement, policy, regulatory and health agencies additional and more objective data on the use of methylamphetamine and other drugs. This data creates opportunities to shape the response to both the demand and the supply side of the illicit drug market, particularly in high-use areas.

IMPLEMENTATION

The Australian Criminal Intelligence Commission has contracted the University of Queensland and through it the University of South Australia to deliver the program. Relationships have been built between the universities and the operators of wastewater facilities across Australia to permit the collection and analysis of samples.

The contract provides that for the first 12 months the wastewater analysis will measure the presence[1] of the following substances:

- methylamphetamine
- amphetamine
- cocaine
- 3,4-methylenedioxymethamphetamine (MDMA)
- 3,4-methylenedioxyamphetamine (MDA)
- JWH-018
- JWH-073
- mephedrone
- methylone
- oxycodone
- fentanyl
- tobacco
- alcohol.

1 The contract recognises that threshold levels are substance dependent and will vary accordingly. Refer to the report for further information on detection levels, and whether it was possible to measure all substances.

The first five substances are widely recognised illicit stimulants. The next four substances are also illicit and are described as new psychoactive substances (NPS). JWH-018 and JWH-073 are synthetic cannabinoids, while mephedrone and methylone are synthetic stimulants. Oxycodone and fentanyl are pharmaceuticals with therapeutic application, but are also diverted to the illicit market.

Both contracted universities will monitor wastewater at sites across Australia until the end of 2019. The capital city sites cover all state and territory capital cities, with the remaining sites covering regional cities and towns. The capital city sites will be monitored for the duration of the trial, while the remaining sites will be re-assessed periodically during the course of the program.

Sites were selected to permit the Australian Criminal Intelligence Commission to provide data on major population areas, sites of actual or potential concern from a drug use perspective, and sites where the local authorities have established relationships with the two universities. During the period covered by this second report, entities operating wastewater treatment facilities in Tasmania and the Northern Territory declined to participate in the National Wastewater Drug Monitoring Program, reducing the number of sites monitored for this report.

The breakdown by jurisdiction for the second report is as follows:

The Australian Criminal Intelligence Commission will continue engaging with all jurisdictions to secure ongoing participation in sampling for future reports. Participation from all states and territories is vital to informing our understanding of the national picture of drug use and demand. In the event that one or more jurisdictions decide not to participate in the national program in the future, the Australian Criminal Intelligence Commission will identify replacement sites from participating jurisdictions to ensure that the largest possible segment of the national population is sampled. Accordingly, the location of sites within and between jurisdictions may change over the three years of the contract.

The Australian Criminal Intelligence Commission is also reviewing the appropriateness of the selected substances with its partners, stakeholders and the universities. To this end, from the third report of the National Wastewater Drug Monitoring Program, heroin will be included in the list of drugs for which the samples are tested. The universities have also devised a method to distinguish between the MDA that exists in wastewater as a metabolite derived from MDMA consumption and the metabolites that derive from the consumption of MDA itself. This method will allow a distinction to be made between MDMA and MDA consumption in future reports.

REPORTING

National Wastewater Drug Monitoring Program reports will be published as comprehensive public reports three times a year, as per the program contract. In accordance with current wastewater analysis conventions, the terms of the contract, and to protect the integrity of the program, the exact locations of wastewater treatment plants will not be publicly released by the Australian Criminal Intelligence Commission.

To maintain the confidentiality of the participating sites, each site was allocated a unique code so that results could be de-identified. However, trends in particular jurisdictions are still able to be identified. The public reports will incorporate a discussion of trends in drug use where distinct trends are seen—for example, between regional areas and capital cities, or between jurisdictions and nationally—and will include comparisons with testing from previous years where that data is available. Once each year, the report will include an assessment of where Australian consumption for some substances sits in comparison with international trends.[2]

Stakeholders in law enforcement, health and other relevant policy agencies will be given classified reports which identify actual sampling locations in order to inform appropriate responses.

2 The data is only updated annually because, although Australian data is updated every four months, the comparable international data is only collated and updated annually.

EXPLOITATION OF THE NATIONAL WASTEWATER DRUG MONITORING PROGRAM DATA

The Australian Criminal Intelligence Commission intends that the findings of the National Wastewater Drug Monitoring Program analysis will be fundamental to the development of government policy and decision making, as the reports will provide a regular, timely, unambiguous and detailed measure of the level of demand for the listed commodities in the Australian population, complementing other drug datasets published in Australia. The second National Wastewater Drug Monitoring Program report measures drug use by approximately 51 per cent of the Australian population.[3] It is hoped that wastewater data will be used to assess and validate other available data sources to obtain a more comprehensive and accurate understanding of drug markets nationally and in the respective jurisdictions.

Findings from the first report of the National Wastewater Drug Monitoring Program have already been used by agencies from two jurisdictions to shape local responses to the methylamphetamine threat, and a local government entity from a third jurisdiction is using the data as part of its planning processes—evidence that the program is providing meaningful and actionable intelligence to inform Australia's response to drug supply and demand.

Making the National Wastewater Drug Monitoring Program data available to the public and to public agencies will enrich understanding and inform the national conversation on trends in the demand for drugs. Because the collection and analysis protocols are similar, it will also be possible to compare domestic drug use with levels of use internationally, which may stimulate further discussions on alternative responses to the threat posed by drug use.

The Australian Criminal Intelligence Commission is also considering methods of using National Wastewater Drug Monitoring Program data as a measure of the effectiveness of supply and demand reduction initiatives in selected locations around the country. The Australian Criminal Intelligence Commission is working to ensure the broadest possible range of stakeholders are engaged throughout the life of the program, consulting with stakeholders through existing drug forums and direct discussions with agencies. Since the release of the first public report in March 2017, the Australian Criminal Intelligence Commission has delivered a series of presentations to forums in Australia and New Zealand concerning the National Wastewater Drug Monitoring Program's capability and the significant potential it offers for enhanced collaboration.

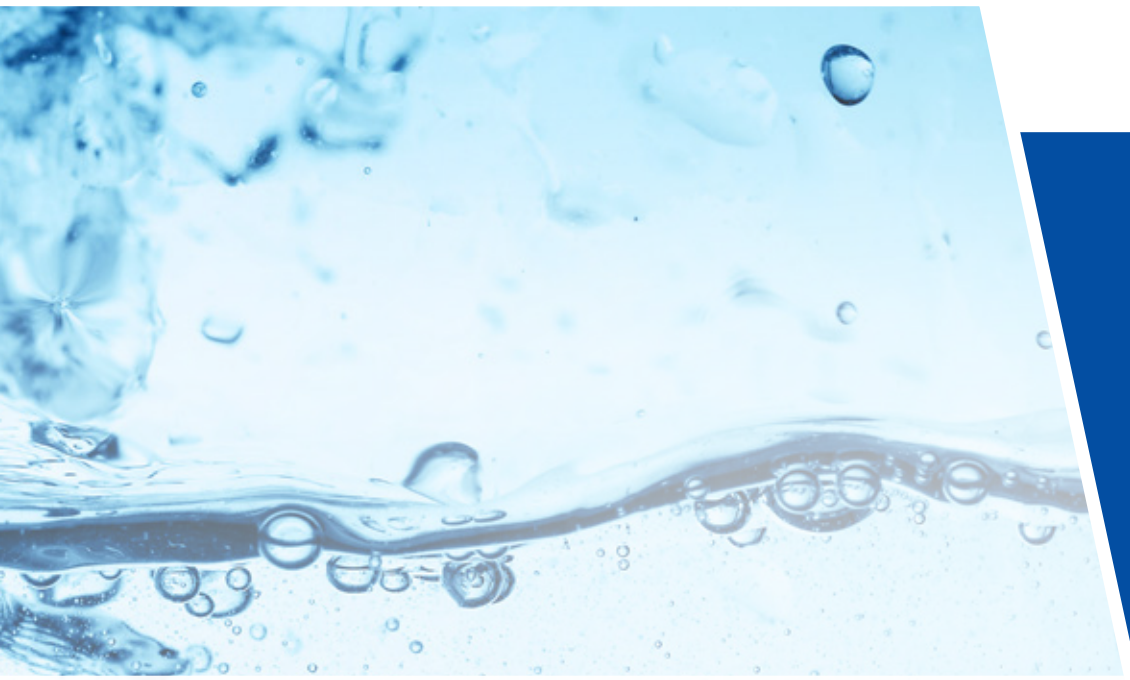
The National Wastewater Drug Monitoring Program is based on a well-established and internationally recognised methodology which has been applied to varying extents by many other nations. In the Australian context, wastewater has been identified as offering an important, unified and consistent guiding tool in developing holistic drug responses. To this end, the scope of the sampling will generate data which will help governments at both a state and national level to formulate appropriate responses.

3 This estimate is based on the Australian Bureau of Statistics estimate of the Australian population as at 31 December 2016 and catchment data supplied by the operators of the wastewater facilities and service providers for December 2016.

RESULTS FROM THE INITIAL COLLECTION

Building on the baseline assessment of national drug consumption provided by the first public report, the second report of the National Wastewater Drug Monitoring Program contains data on drug use patterns across states, territories and the nation. It provides data on capital city and regional drug use and, where possible, comparisons with previous levels of use in sites across Australia. This and future reports will contribute further data to identify trends, changes in patterns of use and emerging issues—building a comprehensive and increasingly detailed picture of national drug consumption.

Reported results reflect per capita use in all locations and are expressed in terms of both the number of doses and the weight or volume per capita of the respective substances, to facilitate comparison between substances.

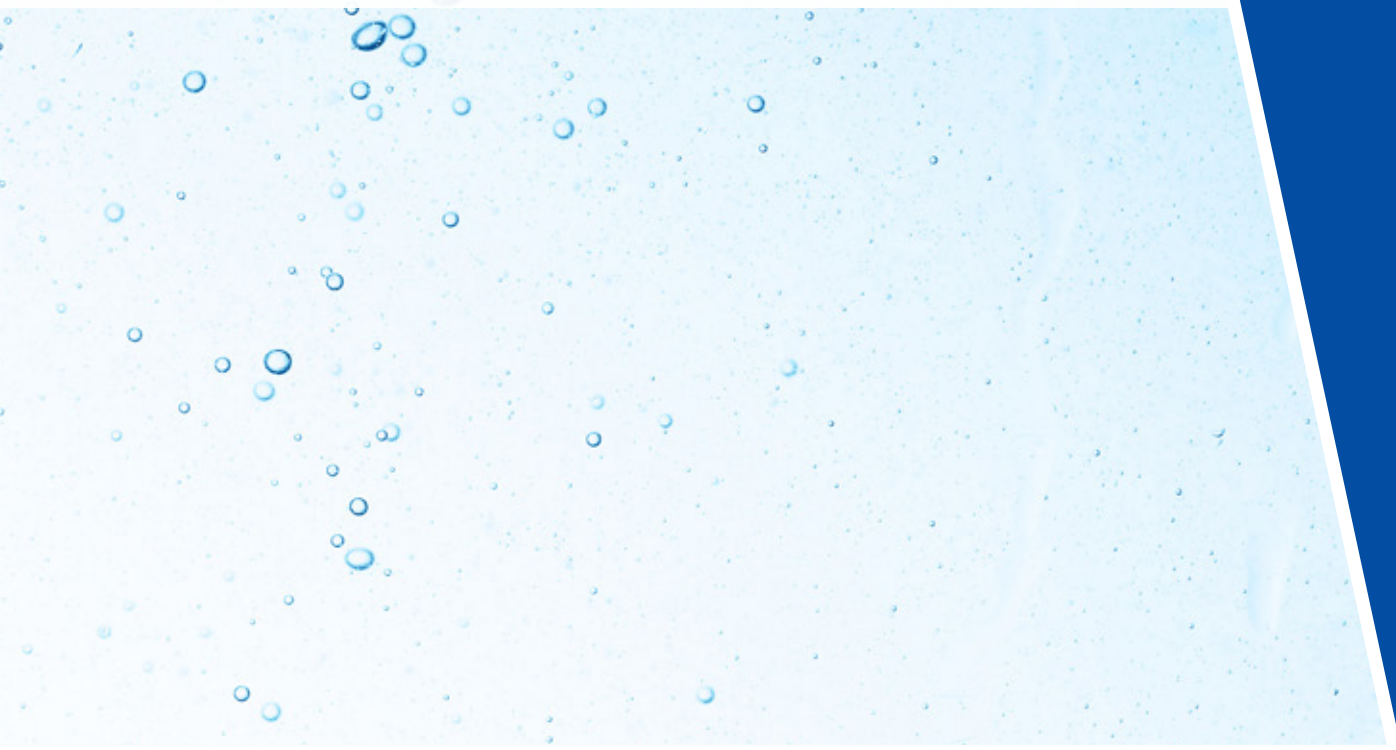


RESEARCH FINDINGS

Prepared for the Australian Criminal Intelligence Commission by:

The University of Queensland
(B Tscharke, R Mackie, J O'Brien, S Grant, J Mueller)

University of South Australia
(R Bade, M Ghetia, C Gerber, J White)



LIST OF ABBREVIATIONS

ABS	Australian Bureau of Statistics
ACIC	Australian Criminal Intelligence Commission
ACT	Australian Capital Territory
LC-MS/MS	liquid chromatography tandem mass spectrometry
LOD	limit of detection
LOR	limit of reporting
MDA	3,4-methylenedioxyamphetamine
MDMA	3,4-methylenedioxymethylamphetamine
NSW	New South Wales
NT	Northern Territory
NWDMP	National Wastewater Drug Monitoring Program
QA/QC	quality assurance and quality control
QLD	Queensland
SA	South Australia
TAS	Tasmania
VIC	Victoria
WA	Western Australia
WWTP	wastewater treatment plant

TERMINOLOGY

Methylamphetamine is also commonly known as methamphetamine. In this report, consistent with the preferences of the Australian Criminal Intelligence Commission, methylamphetamine is used.

MDMA is commonly known as ecstasy.

Alcohol consumption in this report refers to ethanol consumption but the more general term 'alcohol' is used throughout.

1: EXECUTIVE SUMMARY

Wastewater analysis has become the standard for measuring population-scale use of a range of different chemical compounds. The underlying concepts involved in wastewater analysis were demonstrated in the first national Australian report which was released in March 2017. Estimates of drug usage in a population were back-calculated from measured concentrations of drug metabolites (excreted into the sewer system after consumption) in wastewater samples. Spatial and temporal trends in drug use have now been included using this approach for several sites across Australia. The National Wastewater Drug Monitoring Program (NWDMP) of the Australian Criminal Intelligence Commission (ACIC) aims to expand the monitoring of substances of concern to all regions of Australia. The study focuses on 13 licit and illicit drugs, including tobacco, alcohol, methylamphetamine, cocaine and MDMA (ecstasy). Trends in estimated drug consumption will be established over the three-year project. Wastewater treatment plants (WWTPs) located across capital cities and regional Australia, covering all states and territories, have been invited to participate in this program.

For this second report, wastewater samples were collected during weeks of October and December 2016, as well as February 2017. A total of 15 WWTPs in capital cities and a further 22 regional sites participated in the project for the December 2016 period, covering a population of more than 12.6 million Australians. Data from this report equates to coverage of approximately 58%, 30%, 54% and 52% of Australia's population for the August, October, December and February periods, respectively. A total of 777 individual daily samples have been assessed since the beginning of the program, with results of 448 samples from October to February reported for the first time here. Unlike the first reporting period which covered 51 sites in census week (August 2016), sites in the Northern Territory and Tasmania declined to provide subsequent samples, while an ongoing sampling regime was not in place to collect New South Wales and Queensland samples in October 2016. Nevertheless, the collected samples provide relatively comprehensive, Australia-wide baseline data against which subsequent data can continue to be compared to ascertain both spatial and temporal trends. Twenty-four-hour composite wastewater samples were collected using time-proportional or flow-proportional autosamplers at the influent of each WWTP by plant operators. Samples were collected for up to seven consecutive days. Concentrations of drug metabolites were determined in the wastewater using liquid chromatography-tandem mass spectrometry (LC-MS/MS) analytical methods. Drug consumption estimates for each catchment population were calculated from these measured concentrations using flow volumes and estimates of the catchment population size provided by the treatment plants, together with excretion and dose data derived from the scientific literature. To maintain treatment plant confidentiality, each site was allocated a unique code and site names are not included in this report.

Estimated drug usage across the 37 sites (December 2016) was highly variable, both between drugs and between sites. However, when the amount of drug measured in wastewater was normalised for population size and average dose consumed, alcohol and tobacco were consistently the highest consumed drugs in all states and territories. Estimated consumption of tobacco was generally highest in Queensland and Western Australia and some sites in regional New South Wales and Victoria. Alcohol consumption across the nation was similar for the most part. Amongst the illicit drugs, methylamphetamine consumption was the highest across all regions of Australia. This trend was consistent for both capital cities and regional sites and on average, regional and capital city Australia showed comparable levels of usage. The highest methylamphetamine levels were seen at Western Australian and South Australian sites (capital city and regional), as well as some regional sites in Queensland. Comparing the latest findings of drug use with previous data for sites in Queensland and South Australia, current methylamphetamine levels have shown a decline since historical highs in October 2016.

Amphetamine is a metabolite of methylamphetamine and measured amphetamine concentrations across the sites were consistent with the observed levels being primarily related to methylamphetamine metabolism rather than sourced from direct consumption.

Compared to methylamphetamine, estimated usage of other stimulants was generally much lower, although no consistent pattern (profile) of usage for these other drugs could be observed between states and territories. Cocaine usage in Australia is mostly centred in New South Wales across several capital city and regional sites. At sites elsewhere around the country usage was low in comparison. MDMA usage was similarly low across most sites with a few site-specific exceptions.

Oxycodone and fentanyl, which are both pharmaceutical substances with abuse potential through diversion, had elevated consumption levels at several regional sites. It should be noted that it is not possible to distinguish between licit and illicit use of the substances. Regional areas had average oxycodone use well above capital city sites in most jurisdictions. For the other drugs included in this study, methylone and mephedrone, concentrations were generally at or below detection levels at all participating sites, while JWH-018 and JWH-073 were not detected in any samples.

The collection of wastewater samples at regular intervals allowed for the temporal comparison of consumption data. While small overall changes were evident at both a site and a state or territory level, sufficient data is not yet available to draw meaningful conclusions. Nevertheless, the recent declines in methylamphetamine use in South Australia and Western Australia were clear reversals in longer term trends. A gradual reduction in pharmaceutical opioid use, particularly oxycodone, was also apparent.

2: INTRODUCTION

2.1: PREAMBLE

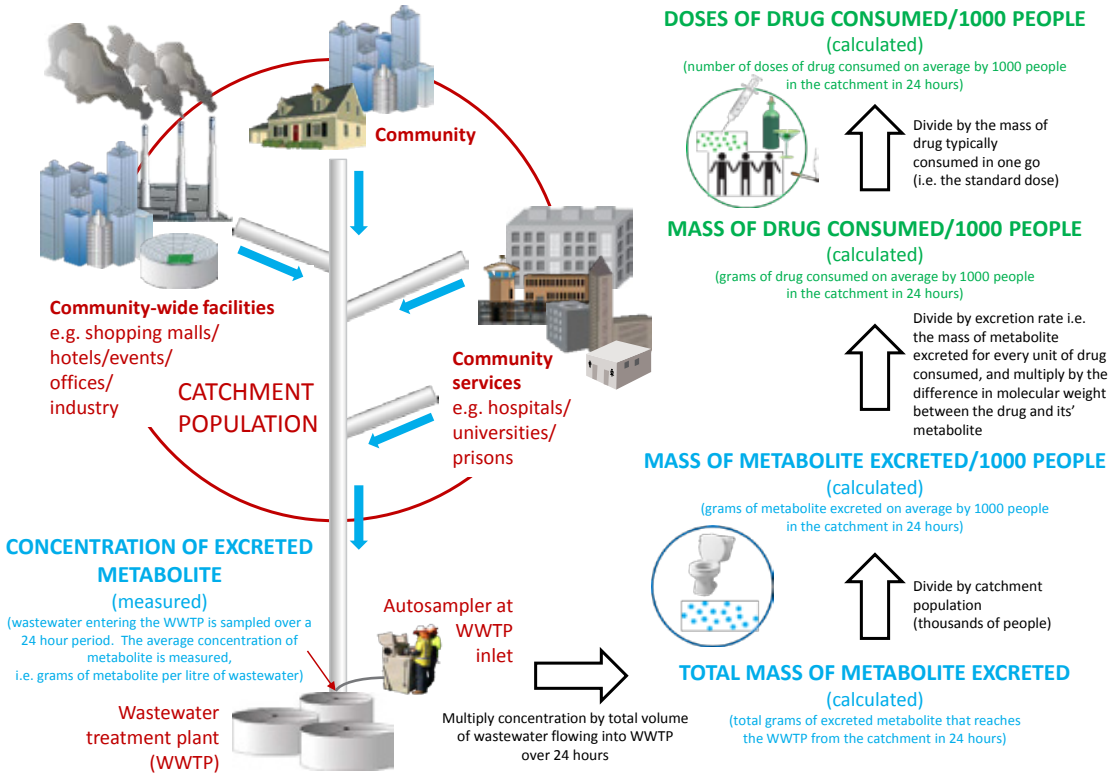
Wastewater analysis is a technique for measuring population-scale consumption of substances. The University of Queensland and University of South Australia have been commissioned to provide drug consumption data to the ACIC for a period of three years, beginning in August 2016. A total of approximately 50 wastewater treatment sites will be assessed, bimonthly in the case of capital city sites and every four months for regional sites. The aim is to acquire data on the population-scale use of substances that cause potential harm, either through addiction, health risks, or criminal and anti-social behaviour. The intention is to establish baseline data of substance use across Australia. This second NWDMP report compares consumption data from the initial August 2016 analysis to data obtained from October and December 2016, and from February 2017. Invitations for inclusion in subsequent NWDMP collections were declined from sites in Tasmania and the Northern Territory. As such, no samples or data for those states have been collected or reported for the October, December or February periods.

Compounds of concern include nicotine from tobacco, ethanol from alcohol intake, pharmaceutical opioids with abuse potential, illicit substances such as methylamphetamine, MDMA and cocaine, as well as a number of new psychoactive substances (NPS) including synthetic cannabinoids. The compounds amphetamine and MDA were measured but not included in the final report. Amphetamine is a by-product of methylamphetamine consumption and also one of its metabolites. MDA is a metabolite of MDMA. These substances will be included in future reports once there is greater certainty regarding the contribution from other drugs as opposed to ingested amphetamine and MDA. The report presents patterns of substance use across Australia, showing differences in levels between capital cities and regional centres within states and territories, and nationally.

3: METHODS

The method underlying wastewater based monitoring of drug use in a given population is based on the principle that any given compound that is consumed (irrespective of whether it is swallowed, inhaled/smoked or injected) will subsequently be excreted (either in the chemical form it is consumed and/or in a chemically modified form that is referred to as a metabolite). The excreted compound or metabolite will eventually arrive in the sewer system. The drugs and their metabolites of interest in this study are given in the first NWDMP report (available at www.acic.gov.au). Collectively, waste products in the sewer system arrive at a wastewater treatment plant where wastewater samples are collected over a defined sampling period. Measuring the amount of target compound in the wastewater stream allows for a back-calculation factor to be applied to determine the amount of drug that was used over the collection period (Figure 1). The method is non-invasive and is done on a population-scale level, so individuals are not targeted and privacy is respected.

Figure 1: Schematic of the population catchment area and methodology employed to convert measured concentration of substances in wastewater to mass loads or doses consumed per day per normalised population.



To obtain an estimate of drug use, representative samples are collected over a given period (typically 24 hours) using autosamplers that collect time or flow proportional samples. Wastewater treatment plant operators provide assistance with collecting the samples from the influent autosampler (where the wastewater enters the treatment plants). Details of the calculation methods are given in the first NWDMP report.

Collected wastewater samples were analysed at the University of South Australia and the University of Queensland laboratories. The steps routinely performed in our laboratories are based on filtration of the samples followed by an enrichment/concentration step where the concentrated sample is injected, or (for chemicals with sufficiently high concentrations) direct injection of samples into the analytical instruments. The instrumental analysis consists of chromatographic separation and subsequent compound specific detection. A summary of the extraction and analytical methods is given in the first NWDMP report.

3.1: PARTICIPATING WASTEWATER TREATMENT PLANTS (WWTPs)

Thirty-seven WWTPs across Australia participated in this study for the December 2016 collection (Figure 2). Of these, 15 sites were located in capital cities and a further 22 were regional sites covering a wide range of catchment population sizes. Sites were selected by the ACIC. The number of participating sites for August, October, December and February is listed in Table 1. A complete list of participating sites, number of samples and relative catchment sizes is listed in Appendix 1. To maintain the confidentiality of the participating sites, all sites were allocated a unique code to de-identify their results. Only site codes are presented in the results sections.

Figure 2: Participating WWTPs in December 2016, showing the split between capital city and regional plants by state and territory. The colours in this figure are used in the remainder of the report to identify results relating to individual states and territories.

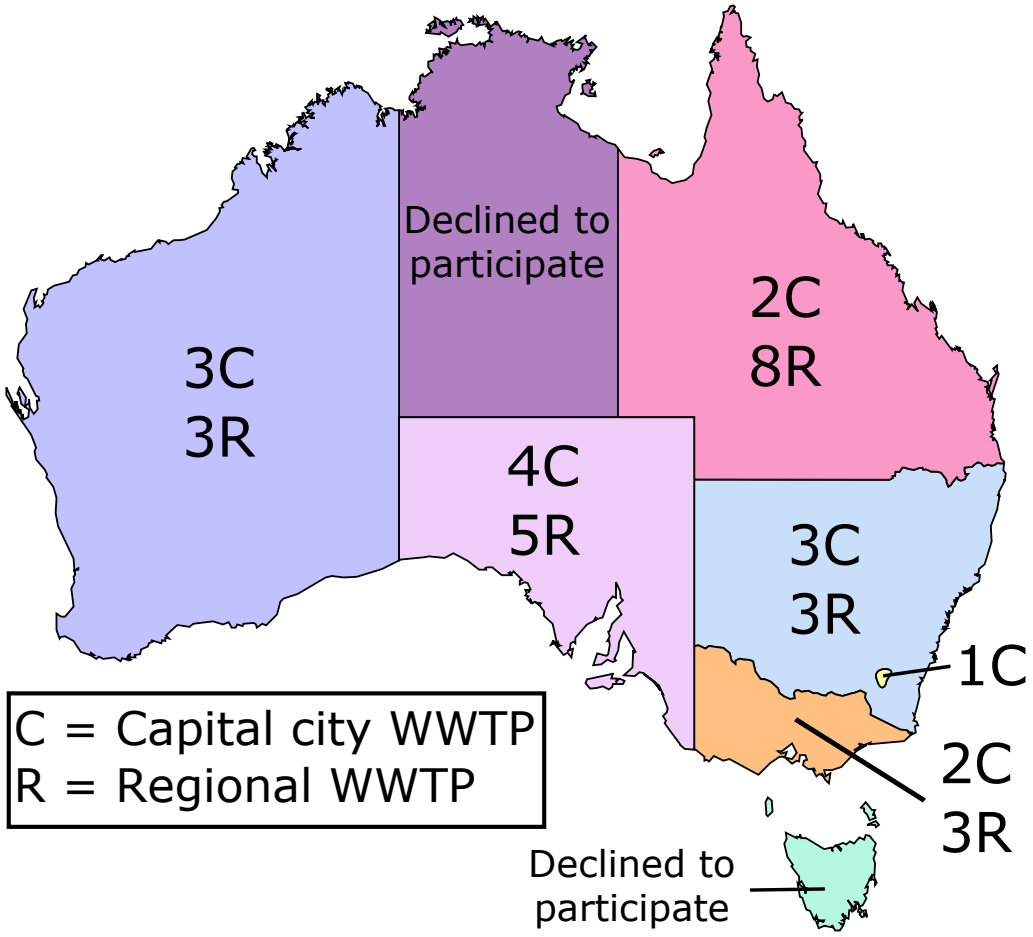


Table 1: Number of Participating WWTPs for the periods covered in this report. Every second collection period aims to collect data from both regional and city sites (Aug and Dec), while the in-between collection periods (Oct and Feb) aim to collect data from city sites only.

	AUG–16		OCT–16		DEC–16		FEB–17	
State/territory	**C**	**R**	**C**	**R**	**C**	**R**	**C**	**R**
ACT	1	-	-	-	1	-	1	-
NSW	5	5	-	-	3	3	3	-
NT	1	1	Declined to participate					
Qld	3	9	-	1	2	8	3	1
SA	4	4	4	-	4	5	4	-
Tas	3	4	Declined to participate					
Vic	2	5	2	-	2	3	2	-
WA	3	1	3	1	3	3	3	3
Total Population (millions)	**12.1**	**2.0**	**6.8**	**0.04**	**11.2**	**1.4**	**11.9**	**0.2**

3.2: SAMPLE COLLECTION AND PREPARATION

Composite samples were collected by treatment plant staff daily on seven consecutive days from Monday to Sunday, or where seven days was not feasible, across as many consecutive days as possible. Samples were stored at 4°C or were frozen prior to transport to Adelaide or Brisbane, respectively. Further details of the sampling protocol and relevant quality controls are included in Irvine et al. (2011), Lai et al. (2011), Lai et al. (2015), Tscharke et al. (2016). All other descriptions of calculations, extractions and analytical methods are outlined in the first NWDMP report.

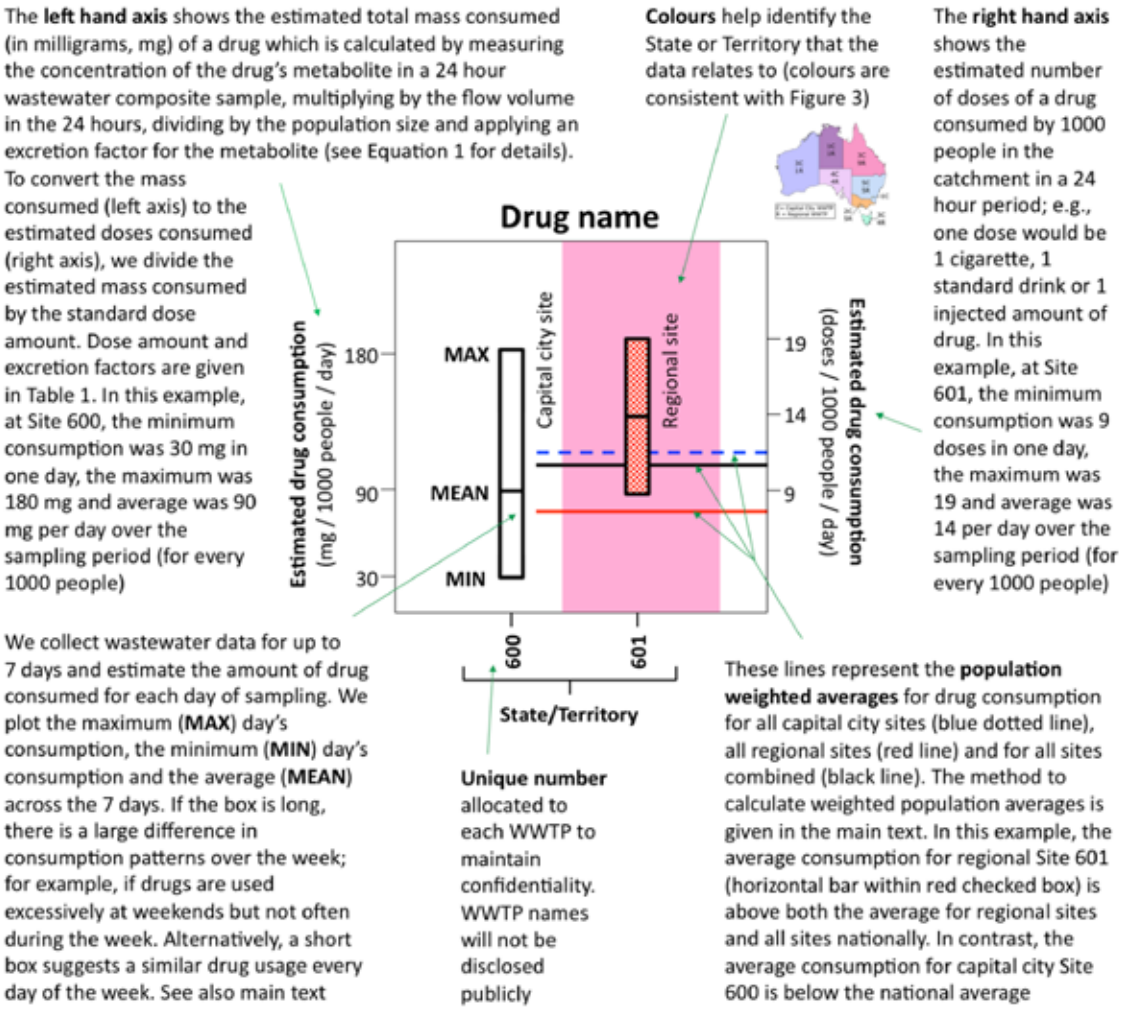
3.3: PRESENTATION OF DATA AND INTERPRETATION OF GRAPHS

Reported averages: All averages for state/territory or Australia-wide drug consumption data are presented throughout this report as population weighted averages. The number of people in the catchment population is used as the weighting for the respective drug consumption data for that population. For example, to calculate the population weighted average of capital city methylamphetamine consumption, the methylamphetamine consumption data for each WWTP was multiplied by the respective population number, all data were then summed and divided by the total population across all capital city sites. Reported average values are therefore not skewed towards usage data from small, non-representative populations.

Per capita consumption: The per capita consumption estimates presented in this report are calculated using the total estimated catchment population (which includes children). For example, per capita alcohol consumption has previously been reported by the ABS based on population numbers for people aged 15 and over. The consumption values presented in the current report will be under-estimated compared to those determined for an adult-only population. For consistency, data from other studies included in this report were recalculated where necessary using estimated total population.

Graphical presentation of data: An overview of how the data is presented in the graphs for the individual sites is given in Figure 3. This includes information on interpreting the consumption data presented on the vertical axes in all graphs in this report; in some graphs, the values plotted in the graph can be read as either mass of drug consumed (left axis) or doses of drug consumed (right axis).

Figure 3: Explanation of the graphical representation of data for individual sites. General concepts relevant to all graphs in the report are also outlined (unique site codes, explanation of vertical axes, colour coding).



Instrumental method limits of detection and limits of reporting: Since the wastewater samples contain very low quantities of particular drugs, the limit of detection (LOD) was determined analytically as the lowest concentration of that drug that could be distinguished in the sample (using the methods described in Report 1). A drug may be present at a concentration below the LOD. However, trace quantities may actually be present at undetectable levels. The limit of reporting (LOR) is a concentration (higher than the LOD), above which we have high confidence that the concentration measured on the analytical instrument is accurate. Above the LOD but below the LOR there may be some uncertainty as to the actual concentration. To be conservative (a drug may be present but there is uncertainty as to its concentration) and in line with current practise, for back calculations to estimate per capita consumption, a concentration below the LOD is included at a value of LOD. A concentration above the LOD but below LOR, is included at the midpoint between the LOD and LOR (i.e. (LOD + LOR)/2).

Weekly pattern of drug use: The pattern of drug use over the sampling week for the sites in this report cannot be elucidated from the data included in the current report. We present only maximum, minimum and average (for the individual sites) (Figure 3) and only average (or population weighted average, see above) values for all other graphs. Consistent patterns of drug use in Australia from previous wastewater-based epidemiology studies indicate that some illicit drugs such as cocaine, MDMA, mephedrone and methylone have high variation in weekly consumption rates, with higher consumption on weekends. Other drugs such as methylamphetamine, oxycodone and fentanyl appear to have lower daily variation, suggesting that their consumption is consistent throughout the week (Lai et al., 2015, Tscharke et al., 2016).

4: RESULTS

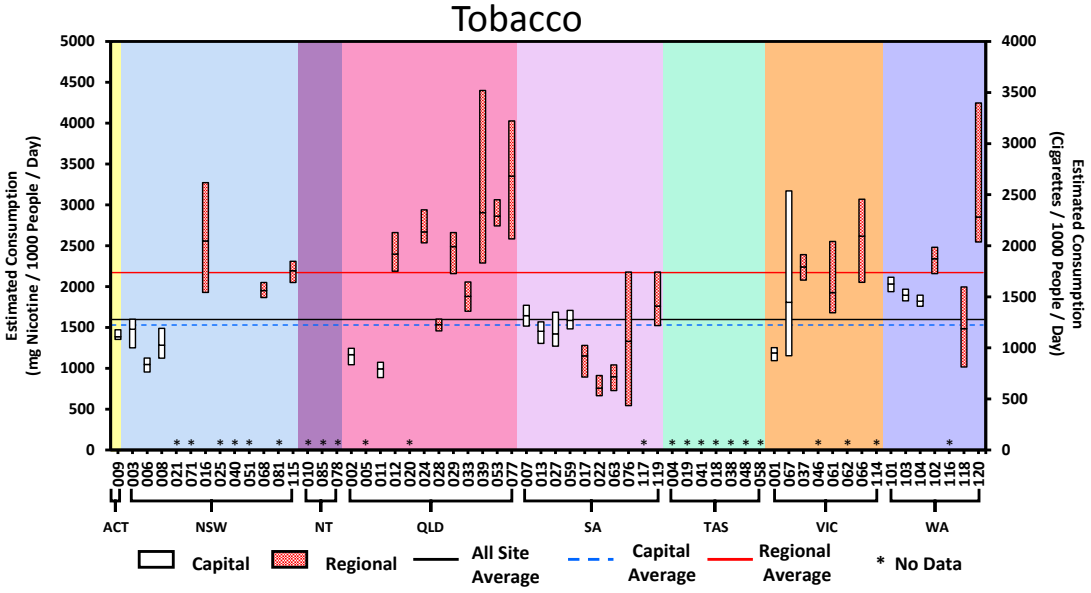
Estimated drug consumption data are presented in several different ways in the following sections to allow comparisons of drug use at the individual site level (Section 4.1), between states and territories (Section 4.2) and within each state and territory (Section 4.3). We recommend exercising caution when comparing results between sites. Although every effort has been made to ensure accuracy, population size and estimated consumption may be affected by inaccuracies in population figures provided by plants or managing agencies. Following release of the 2016 Census data, updated catchment populations will be determined and included in the third and subsequent reports. The uncertainties in individual population estimates have less impact when data are averaged, for example when broader comparisons at the state/territory or international level are undertaken.

4.1: INDIVIDUAL SITE COMPARISON OF DRUG USE IN DECEMBER 2016

4.1.1: TOBACCO AND ALCOHOL

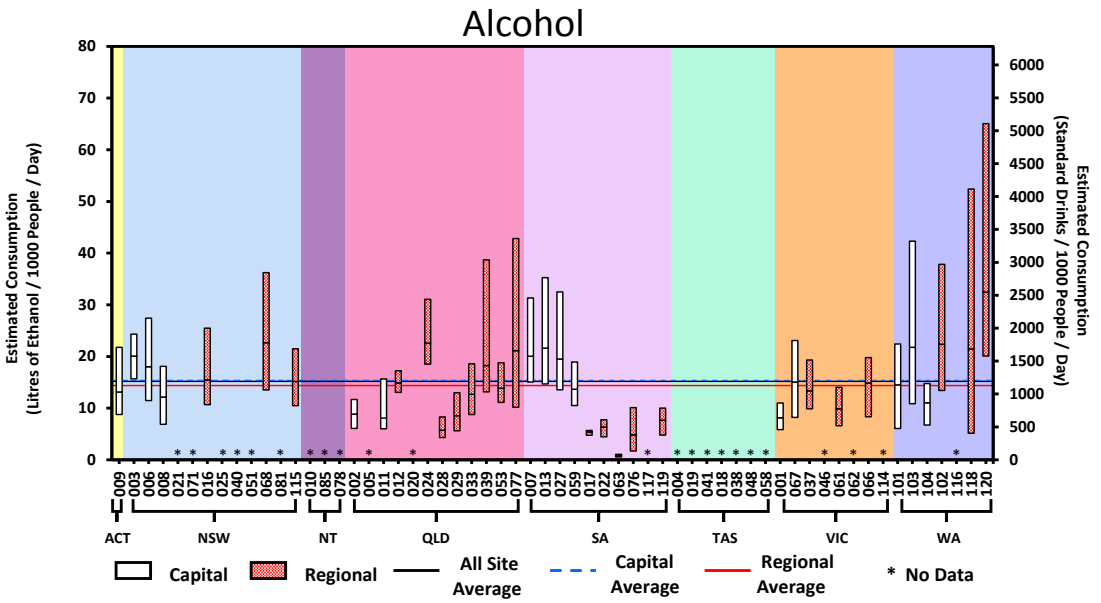
Tobacco consumption was estimated by measuring two nicotine metabolites. The method does not distinguish between nicotine intake from tobacco or electronic cigarettes and nicotine replacement therapies such as patches and gums. Estimated tobacco consumption varied significantly between sites and regions (Figure 4). Regional Queensland and some sites in New South Wales and Western Australia had the highest per capita consumption in Australia. In general, regional sites had higher average consumption levels (red horizontal line, Figure 4) than capital city precincts (dotted blue line, Figure 4). The Northern Territory and Tasmania declined to participate in this collection period. Therefore, data for these regions are unavailable.

Figure 4: Estimated tobacco consumption in mass of nicotine consumed per day (left axis) and number of cigarettes per day (right axis) per thousand people. The number of collection days varied from 4–7.



Alcohol was measured using a specific metabolite of ethanol. The difference between the average capital city and regional centre alcohol consumption was not as pronounced as for tobacco (Figure 5). Some regional sites in Western Australia showed a wide range over the collection week. Alcohol consumption in regional South Australia and parts of Queensland was well below the national average.

Figure 5: Estimated alcohol consumption in volume consumed per day (left axis) and standard drinks per day (right axis) per thousand people. The number of collection days varied from 4–7.



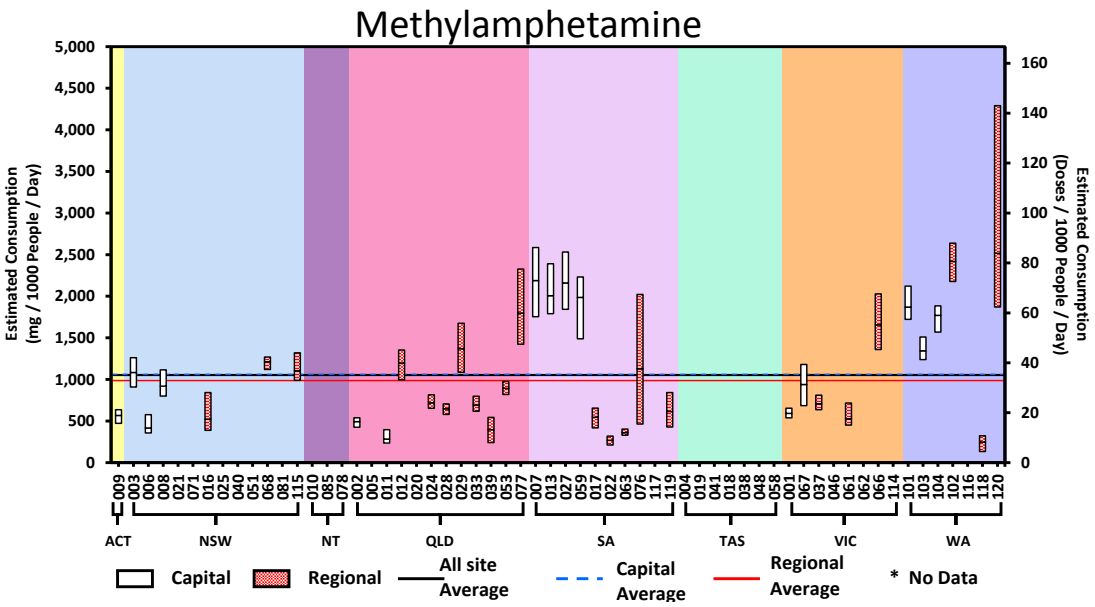
4.1.2: STIMULANTS

The relative estimated consumption levels across the participating sites for three stimulants, methylamphetamine, cocaine and MDMA, are described in more detail below.

4.1.2.1: METHYLAMPHETAMINE

Except for tobacco and alcohol, estimated mass loads of methylamphetamine were high compared to other substances of abuse. The normalised mass loads in South Australia and Western Australia were the highest (Figure 6). A high variability in consumption across the nation was evident. One site (120) in regional Western Australia had the highest level on a single day, although the average weekly total for the site (black horizontal bar) was not substantially different from consumption levels elsewhere in the state (e.g. 102). In contrast, another regional site in Western Australia (Site 118) had very low consumption compared to the national average. Regional and capital city averages were marginally different, with regional consumption being slightly lower for the sites assessed this period.

Figure 6: Estimated methylamphetamine consumption in mass consumed per day (left axis) and doses per day (right axis) per thousand people. The number of collection days varied from 4–7.



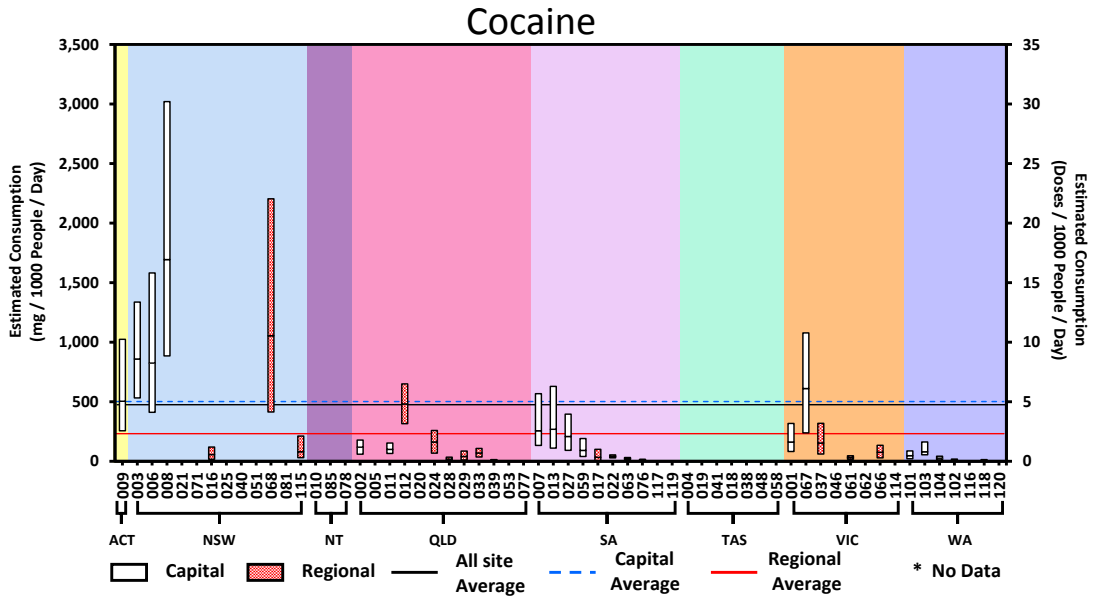
4.1.2.2: AMPHETAMINE

The concentration of amphetamine observed in the August 2016 samples strongly correlated with the methylamphetamine concentrations, with approximately seven times higher methylamphetamine measured than amphetamine ($R^2 = 0.77$) (see Appendix 4 of Report 1) which is consistent with the reported amphetamine excretion range following methylamphetamine consumption (Gracia-Lor et al., 2016). Therefore, we assumed that the levels of amphetamine we measured were predominantly metabolites of methylamphetamine. It is probable that some of the amphetamine measured could be a result of amphetamine ingestion. But, due to the much higher methylamphetamine consumption and excretion profile, this cannot be confirmed by our present data.

4.1.2.3: COCAINE

Cocaine was measured using its specific metabolite, benzoylecgonine. On a national level, capital city areas on average had higher cocaine use than regional centres (Figure 7). However, some regional areas such as Site 68 in New South Wales and Site 12 in Queensland showed use well above the regional average. Most other sites in regional Australia showed very little evidence of cocaine use. Capital city New South Wales consumed cocaine well above the national average, with Site 8 particularly prominent. On average, cocaine consumption in Australia was noticeably lower than methylamphetamine levels.

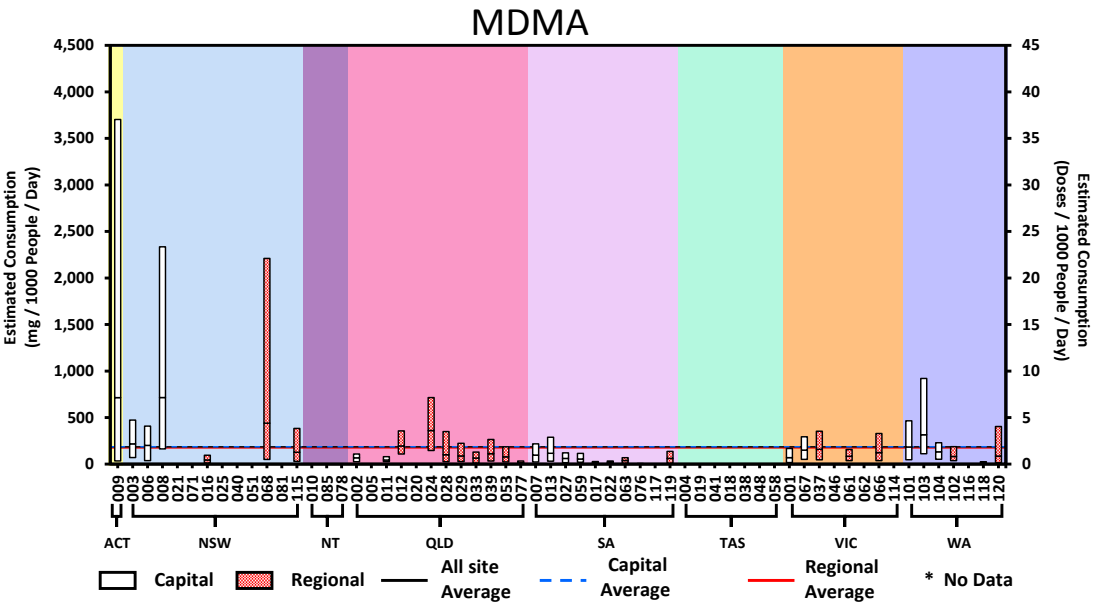
Figure 7: Estimated cocaine consumption in mass consumed per day per thousand people (left axis) and doses per day (right axis). The number of collection days varied from 4–7.



4.1.2.4: MDMA (3,4-METHYLENEDIOXYMETHYLAMPHETAMINE)

In comparison with methylamphetamine, estimated consumption of MDMA was low across the country (Figure 8). Some exceptions were capital city Site 8 in New South Wales and Site 9 in the Australian Capital Territory with large spikes on specific days, and with weekly averages higher than measured for the country overall. A similar observation was made at Site 68 in regional New South Wales. Nationally, the regional and capital city average MDMA consumption were almost identical.

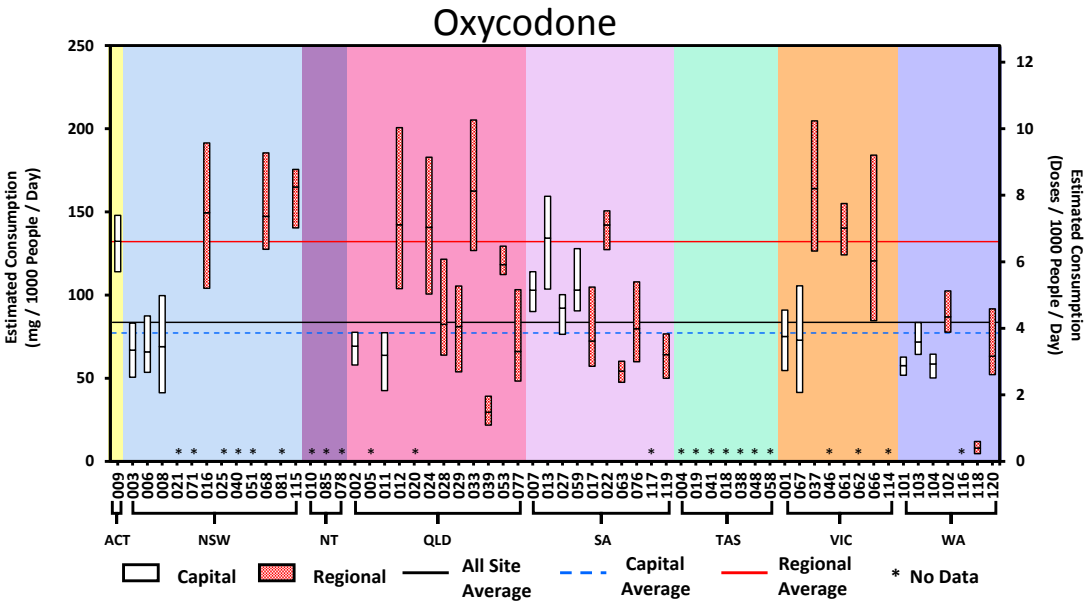
Figure 8: Estimated MDMA consumption in mass consumed per day (left axis) and doses per day (right axis) per thousand people. The number of collection days varied from 4–7.



4.1.3: PHARMACEUTICAL OPIOIDS

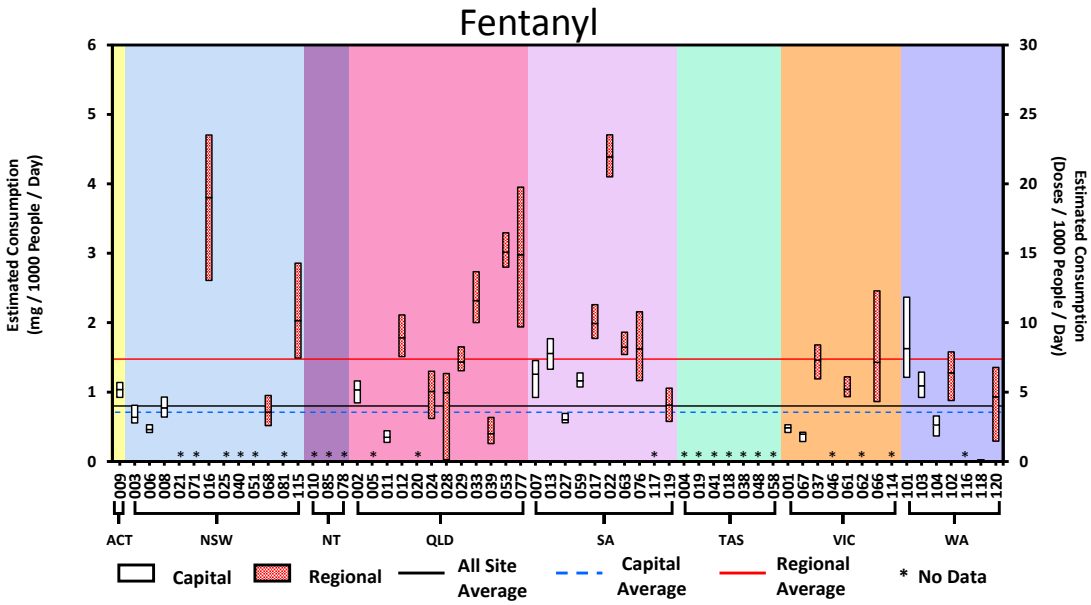
Oxycodone and fentanyl are pharmaceutical substances with abuse potential. The metabolism and excretion of both compounds are well characterised. The major metabolite of each compound was measured to estimate drug consumption. The Australian Capital Territory and South Australia had the highest capital city level of oxycodone (Figure 9). Consumption in regional sites was well above capital city levels, resulting in the average regional consumption being almost double the capital city national average.

Figure 9: Estimated oxycodone consumption in mass consumed per day (left axis) and doses per day (right axis) per thousand people. The number of collection days varied from 4–7.



Similar to oxycodone, fentanyl levels were high in many regional centres, notably parts of New South Wales, Queensland and South Australia (Figure 10). On average, regional consumption was higher than capital city areas. However, large variations were evident when comparing sites across Australia.

Figure 10: Estimated fentanyl consumption in mass consumed per day (left axis) and doses per day (right axis) per thousand people. The number of collection days varied from 4–7.



4.1.4: NEW PSYCHOACTIVE SUBSTANCES

Methylone, mephedrone and two synthetic cannabinoids, JWH-073 and JWH-018, were included in the study. Since limited information is available on the human metabolism and excretion of these drugs, the parent compound was measured. It is probable that a significant proportion of the ingested drug is converted into different metabolites. In this collection, only a few sites showed evidence of methylone and mephedrone use. The measured levels were mostly below the limits of reporting. Sites that showed the presence of the two compounds are qualitatively listed in Table 2 for the December period. No JWH-073 or JWH-018 were detected in any samples.

Table 2. The number and code of sites per state and territory where mephedrone and methylone were detected in December 2016. The total number of daily samples that were assessed in December was 236.

	Number of detections Dec 2016		Sites detected Dec 2016	
State/territory	**Mephedrone**	**Methylone**	**Mephedrone**	**Methylone**
NT	0	0		
ACT	0	7		009
NSW	5	16	068	003, 006, 008, 016, 068, 115
Qld	1	21	012	002, 011, 012, 024, 039
SA	4	4	007, 063	059
Tas	0	0		
Vic	1	7	067	067
WA	0	14		101, 103, 104, 102
Total	**11**	**69**		

Detection methods for measuring the synthetic cannabinoids were also included in this study, but neither compound was detected in any of the samples. MDA had overall low detection frequency using direct injection methods. Being a metabolite of MDMA, it was assumed that most low levels detected originated from MDMA consumption. This will be addressed further in subsequent reports by concentrating the sample using solid phase extraction prior to analysis to improve the sensitivity of the method.

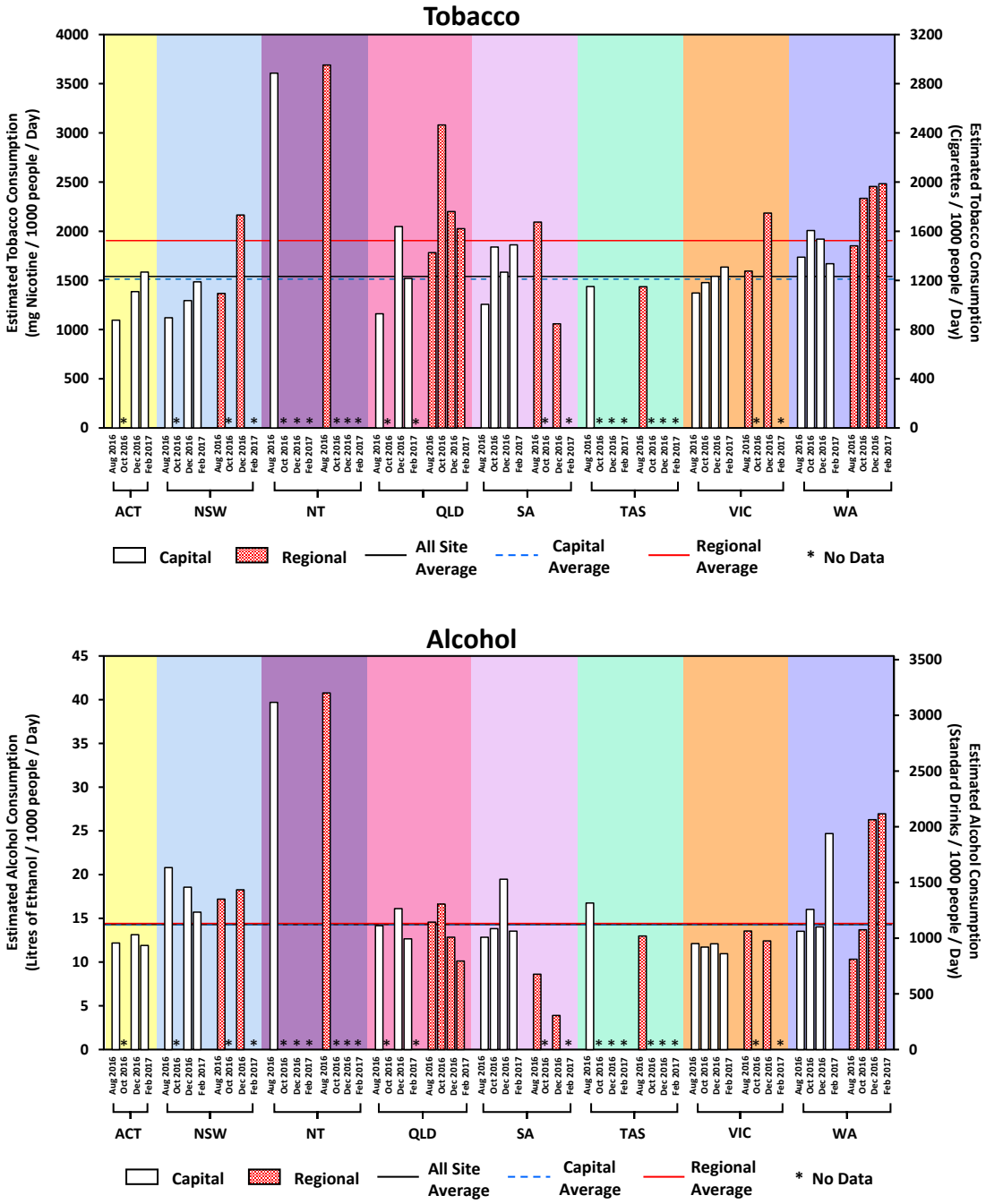
4.2: STATE AND TERRITORY COMPARISON OF DRUG USE

The total level of each drug reported in the preceding August report per state or territory was compared with subsequent collection periods. Capital city sites were monitored over weeks in October, December 2016 and February 2017. Samples from regional sites were collected for up to a week during October and December 2016 and February 2017 in South Australia and Western Australia, and December 2016 in other participating states and territories. Every effort was made to assess the same sites for each period. However, as the individual sites and the number of sites used to generate the population-weighted averages may have changed between periods, comparing between time points should be done with caution. This would be most evident for the regional averages, which had more variation in participation between each period (see Appendix 1 for a comprehensive list of participating sites).

4.2.1: TOBACCO AND ALCOHOL

Average tobacco consumption in samples collected from regional sites were generally higher when compared to the capital cities (Figure 11 (top)). In the Australian Capital Territory and most states, tobacco consumption showed a small increase over the four collection periods. For alcohol, the difference between overall capital city and regional centre consumption within each state or territory was less pronounced (Figure 11 (bottom)). No apparent trend was obvious in terms of changes in consumption over time within each region.

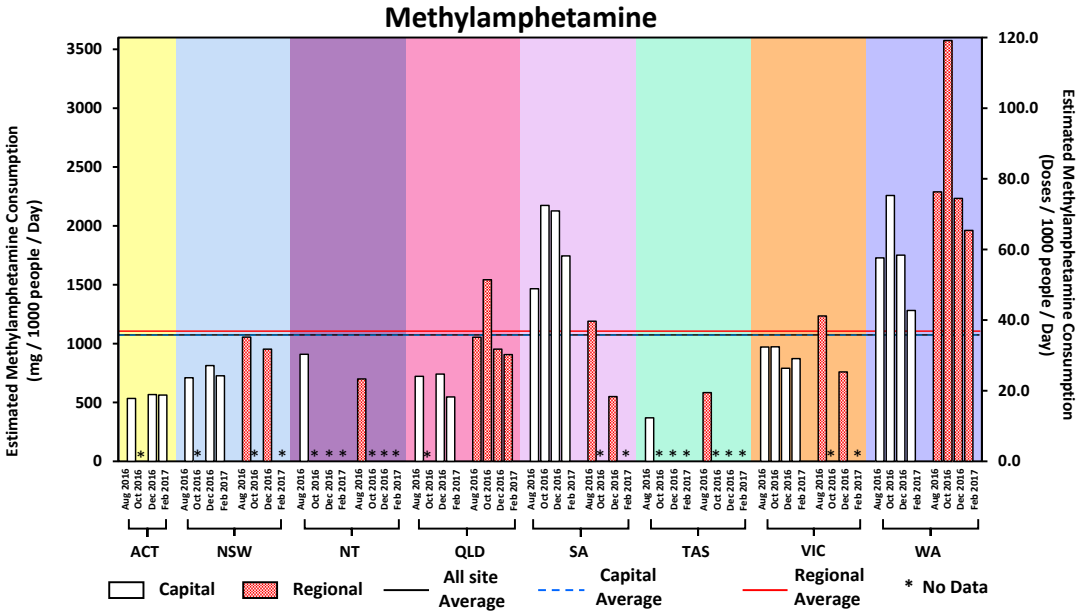
Figure 11: Estimated average consumption of tobacco (top) and alcohol (bottom) for capital city sites and regional sites by state/territory. A standard drink is 10.0 g or 12.5 mL and 1 cigarette contains 1.25 mg of nicotine.



4.2.2: ILLICIT DRUGS

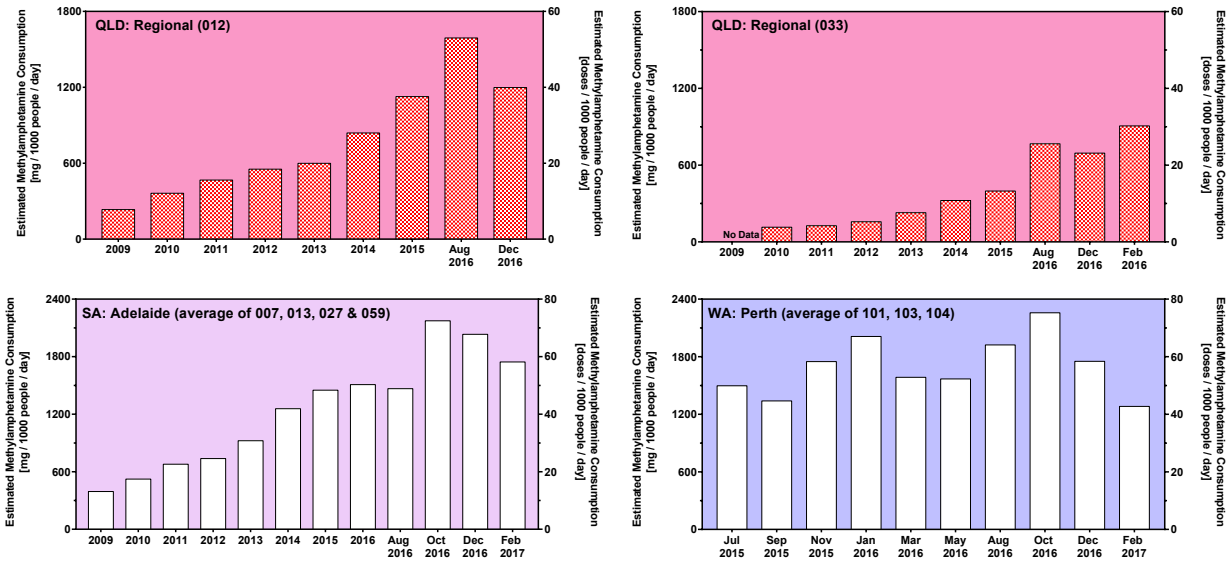
Regional Western Australia had the highest levels of methylamphetamine consumption, while Western Australia and South Australia had the highest levels in capital cities (Figure 12). In both of these states, consumption appeared to peak in October 2016 and has declined since. Queensland shows a similar pattern, albeit less pronounced. Additional data points will be needed to confirm the decline.

Figure 12: Estimated average consumption of methylamphetamine for capital city sites and regional sites by state/territory.



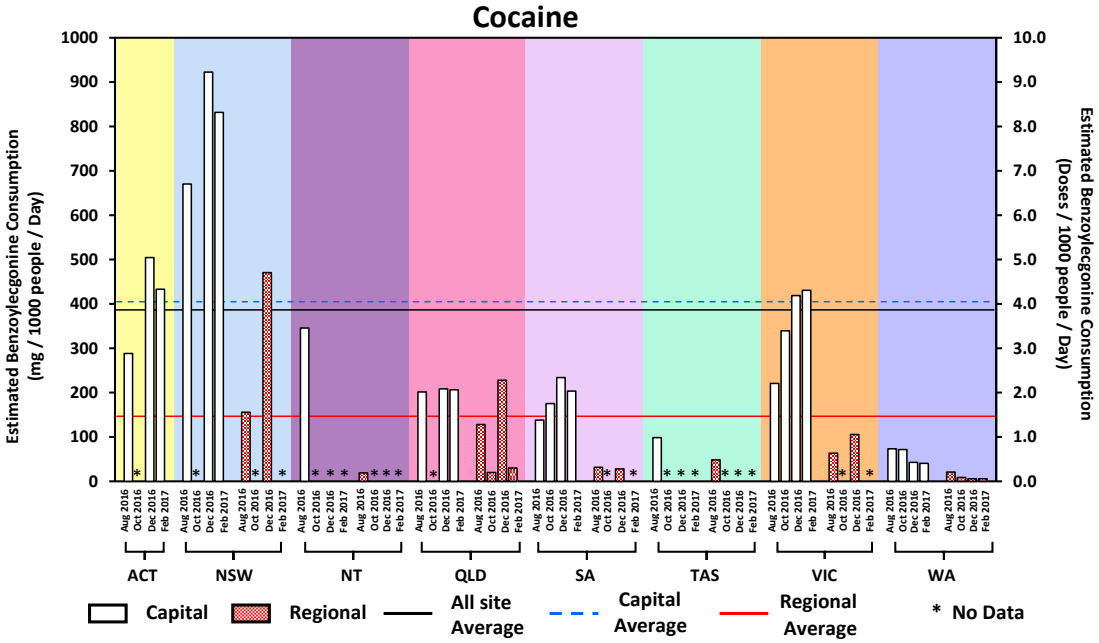
When plotted against historical levels recorded in the three regions, the decline or levelling off in use is a reversal in the long term trend (Figure 13). However, whether the downward change in consumption is temporary or not, remains to be seen.

Figure 13: Change in methylamphetamine consumption for sites with historical data.



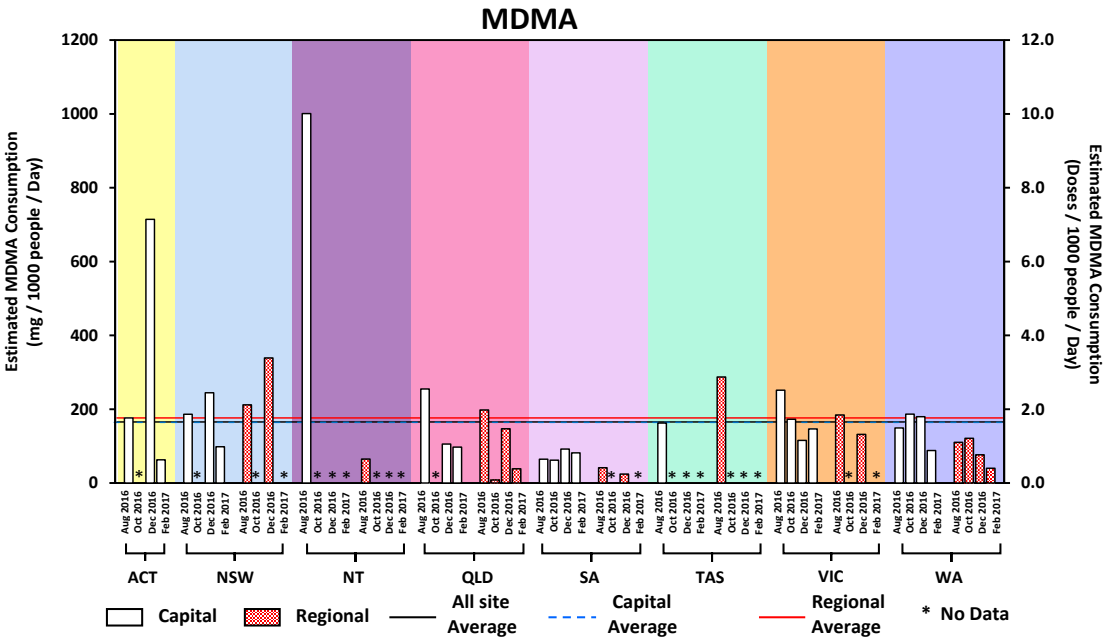
Cocaine consumption in capital city sites in New South Wales continued to dominate the national landscape, though the Australian Capital Territory and Victoria showed increases from August 2016 to February 2017 (Figure 14). Regional consumption was noticeably lower than in capital cities in every state and territory, except Queensland. Cocaine consumption in Western Australia remained well below the national average.

Figure 14: Estimated average consumption of cocaine for capital city sites and regional sites by state/territory.



In regions with representative sampling data, no consistent trends in MDMA use were evident. MDMA use in the Australian Capital Territory increased dramatically in December 2016, almost reaching the high levels recorded in the Northern Territory in August 2016 (Figure 15). In contrast, MDMA use in regional Western Australia and all sites across South Australia was well below the national averages. Moreover, decreasing use over time was observed in Queensland, Victoria and Western Australia. No further samples were provided from the Northern Territory capital city site to put the high August result into context.

Figure 15: Estimated average consumption of MDMA for capital city sites and regional sites by state/territory.



4.2.3: OPIOIDS

In terms of pharmaceutical opioids, the average oxycodone and fentanyl use was higher in regional areas of a number of states (Figure 16). Levels in regional areas were generally lower than in the previous reporting period. However, with only two time points in most instances, this decline should not be considered significant as population movements or short term behavioural changes will dramatically affect the results in small catchments. In addition, the variation in participating rural sites (and hence the sampled populations) may also have an effect on the observed trend of the population-weighted averages.

Figure 16: Estimated average consumption of oxycodone and fentanyl for capital city sites and regional sites by state/territory.

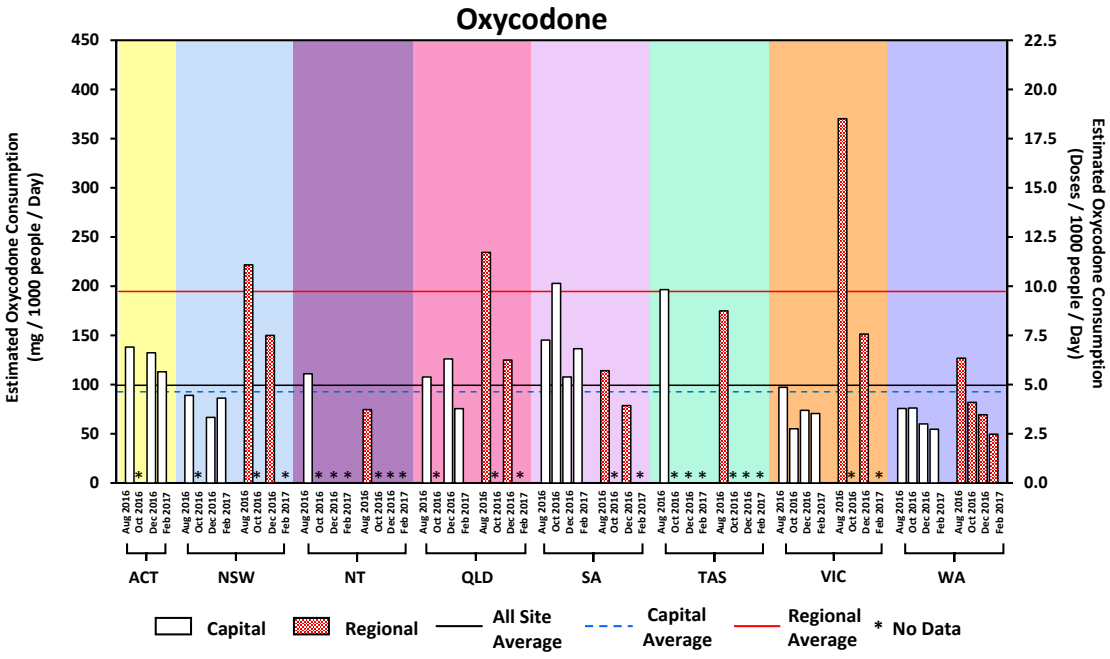
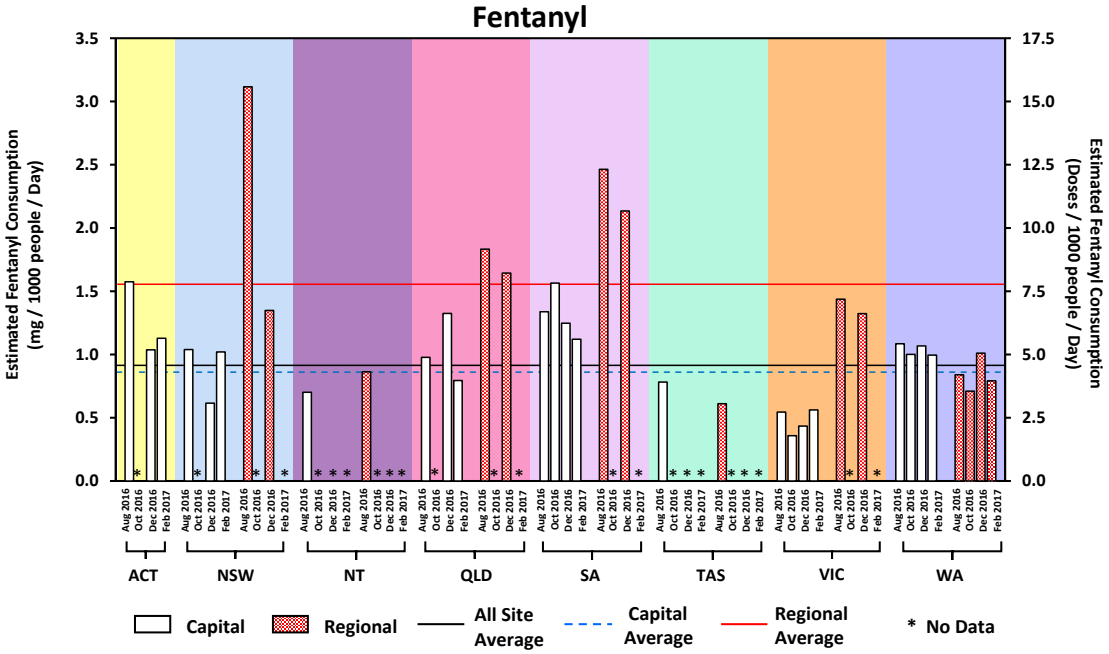


Figure 16 (continued): Estimated average consumption of oxycodone and fentanyl for capital city sites and regional sites by state/territory.



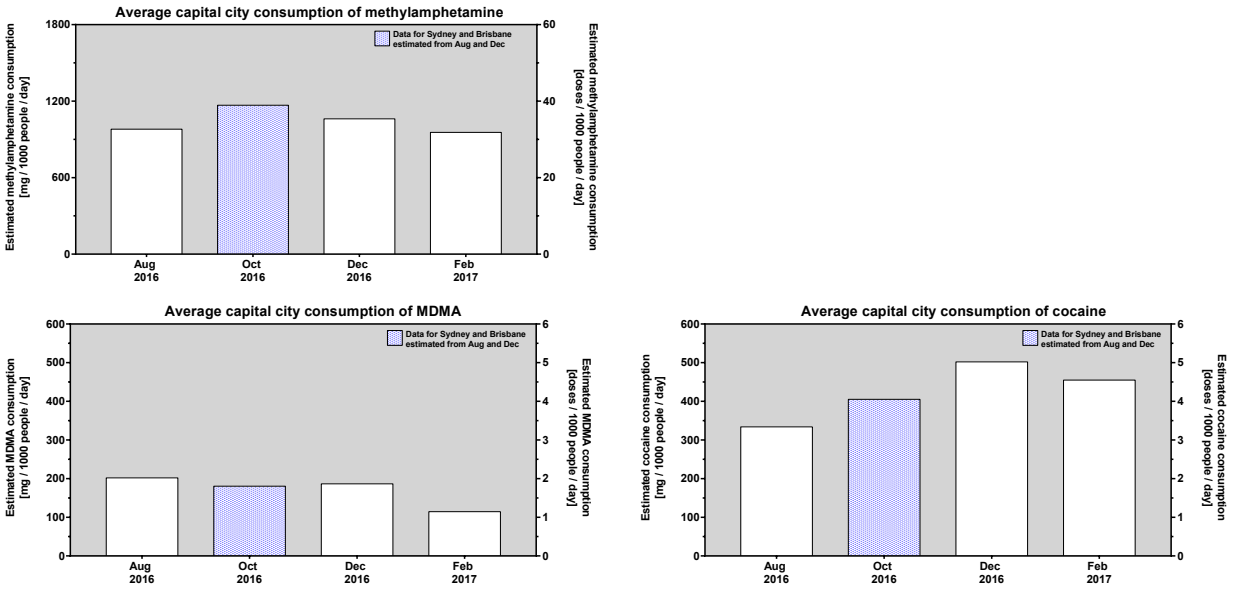
The August 2016 fentanyl result for the regional Western Australian site (102) was affected by a processing error. This has been corrected in the current report, showing that fentanyl use in the region has remained largely steady since that time.

For the NPS, some drugs such as the cannabinoids were not detected at all. Excretion rates for methylone and mephedrone are not yet fully understood and therefore conversion factors for the purposes of the set of figures above could not be applied. Nevertheless, when these compounds were detected, they were at very low levels compared to substances included in Figure 16 (December mephedrone and methylone results are shown in Table 2).

4.2.4: CAPITAL CITY AVERAGES

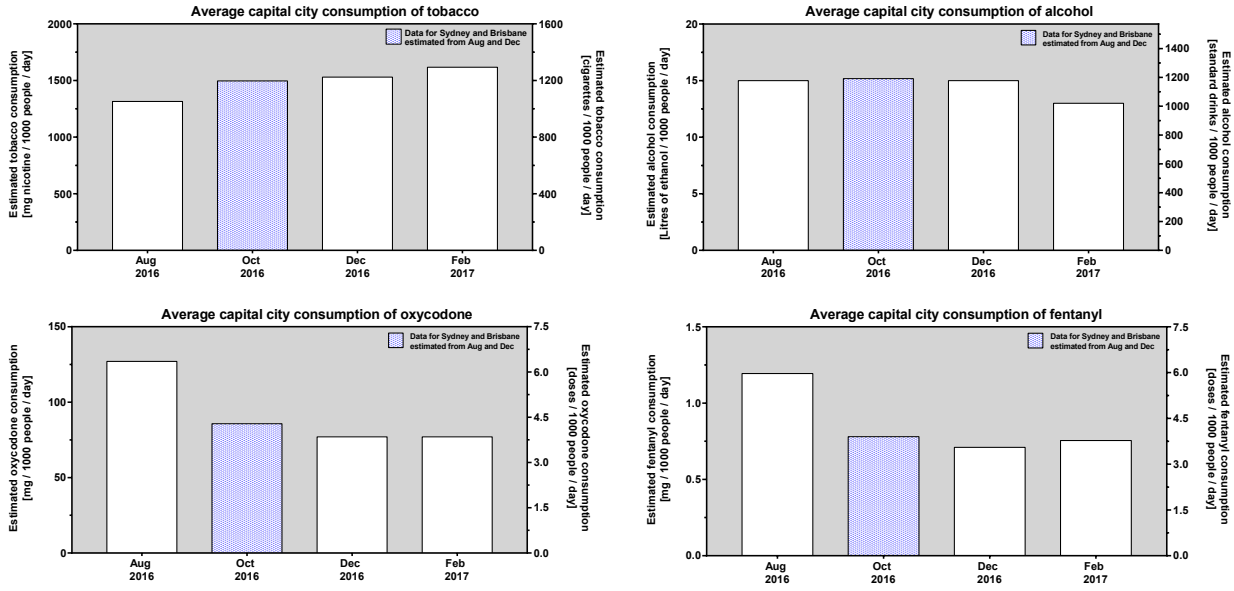
In order to determine representative population trends for the collective catchments included in the report over the four time periods, the averaged capital city site populations were expressed as the total capital average consumption of illicit stimulants (Figure 17). One complication with this type of analysis is that fewer sites were sampled after August 2016, so the contributing population was smaller after this date and some approximations had to be made to account for the absence of some densely populated regions (e.g. October 2016 for capital city New South Wales, and Queensland). For the total population included in the report, methylamphetamine appeared to peak in October 2016, showing a steady decline in the next two collection periods. However, further results are necessary before significance can be attributed to the change. MDMA showed very little change, while cocaine levels rose from a very low base.

Figure 17: The population-weighted average of all capital city sites for methylamphetamine, MDMA and cocaine. As Queensland and New South Wales capital city sites were not sampled in October 2016, their average consumption in August and December 2016 was used to provide the October estimate.



In terms of legal substances with abuse potential, tobacco consumption as measured by two nicotine metabolites showed a small increase over the reporting periods (Figure 18). In contrast, the two pharmaceutical opioids included in the study showed an overall decline since August 2016. In the case of alcohol, marginal changes were evident.

Figure 18: The population-weighted average of all capital city sites for tobacco, alcohol, oxycodone and fentanyl. As Queensland and New South Wales capital city sites were not sampled in October 2016, their average consumption in August and December 2016 was used to provide the October estimate.



4.3: DRUG PROFILE FOR EACH STATE AND TERRITORY

To compare usage of drugs of different types within the same region (for example, within a state or territory), drug consumption was reported as the number of doses consumed. When the amount of drug measured in wastewater was normalised for population size and average dose consumed (conversion factors are listed in the first NWDMP report), alcohol and tobacco remained consistently the highest consumed drugs in all states and territories. For example, the national average consumption of alcohol and tobacco per 1,000 people per day were 1,300 cigarettes per 1,000 people (Figure 4) or 1,200 standard drinks per day (Figure 5), whereas for methylamphetamine, the national average consumption was closer to 35 doses per 1,000 people per day (Figure 6).

Amongst the illicit drugs and opioids, methylamphetamine consumption was the highest across all regions of Australia (Figure 19). This trend was consistent for both capital cities and regional sites. Based on the consumption profiles of the other drugs detected in this study (cocaine, MDMA, oxycodone and fentanyl), no other consistent patterns of usage within the different states and territories were observed; for example, in capital city New South Wales, regional South Australia and regional Western Australia, the second highest drug consumed was fentanyl, but oxycodone in regional Queensland and Victoria.

Figure 19: Profile of average drug consumption by state or territory. Consumption is shown as the number of doses per 1,000 people per day to allow comparison of drugs of different types within the same region (state or territory).

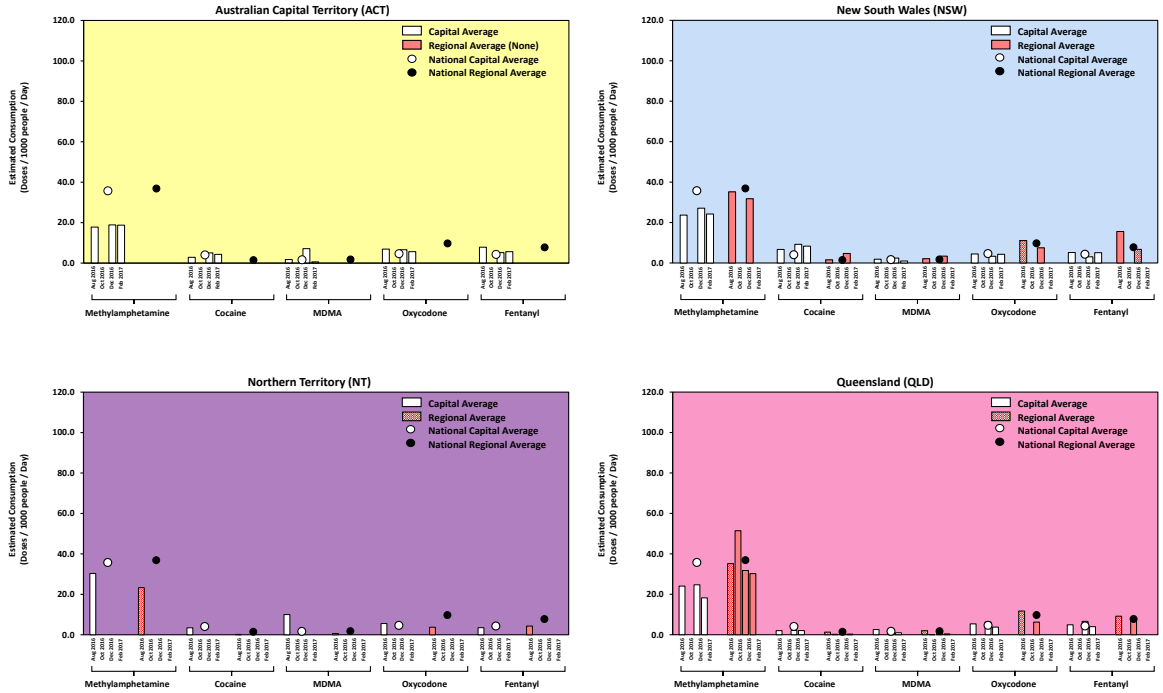
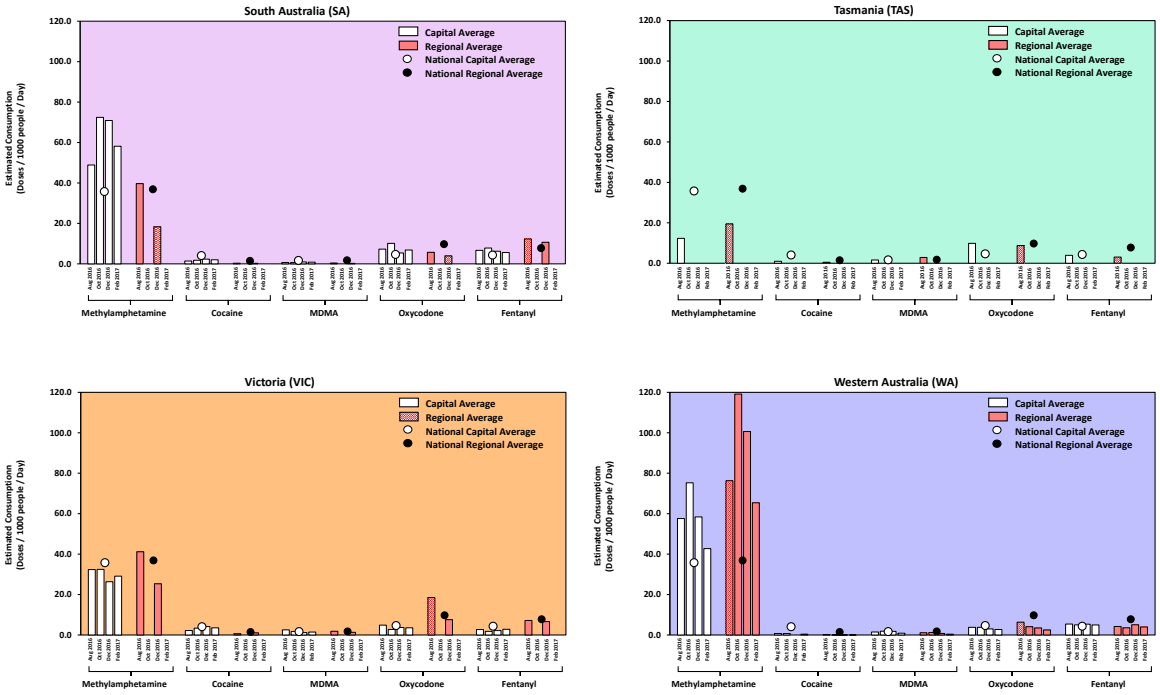


Figure 20: Profile of average drug consumption by state or territory. Consumption is shown as the number of doses per 1,000 people per day to allow comparison of drugs of different types within the same region (state or territory).



5: ACKNOWLEDGEMENTS

The project team sincerely thanks the numerous WWTP operators involved in sample collection and WWTP management agencies for providing flow volumes and other site information. The cooperation of the plants and management agencies is critical to the ongoing success of this project.

The University of South Australia would like to thank our funding partners, the Drug and Alcohol Services South Australia, for their permission to use historical and current data from South Australia as well as Western Australia Police for permission to use data from Western Australia. We would also like to acknowledge the efforts of other team members at the University of South Australia, including Lynn Nguyen for assistance with logistics and analytical methods.

The University of Queensland thanks Geoff Eaglesham for his contributions to the analytical work for this study. We also thank the members of the Emerging Environmental Health Risks research group at the Queensland Alliance for Environmental Health Sciences (QAEHS; incorporating the former Entox) for assistance with preparing and shipping over 1,000 sampling bottles to the various plants, and those members, past and present, who helped establish this field at the university.

We also would like to acknowledge the wider wastewater-based epidemiology field which includes addiction specialists, analytical chemists, environmental engineers, forensic scientists, pharmacologists, policy advisers and sewer engineers for their ongoing contributions to knowledge, willingness to share both methodology and data, critical review and for advancing wastewater analysis research.

The symbols/images used in Figure 1 in the report were provided courtesy of the Integration and Application Network, University of Maryland, Center for Environmental Science (ian.umces.edu/symbols/).

6: REFERENCES

Gracia-Lor, E., E. Zuccato and S. Castiglioni (2016). Refining correction factors for back-calculation of illicit drug use. Sci Total Environ **573**: 1648-1659. DOI: 10.1016/j.scitotenv.2016.09.179

Irvine, R.J., C. Kostakis, P.D. Felgate, E.J. Jaehne, C. Chen and J.M. White (2011). Population drug use in Australia: a wastewater analysis. Forensic Sci Int **210**(1-3): 69-73. DOI: 10.1016/j.forsciint.2011.01.037

Lai, F.Y., S. Anuj, R. Bruno, S. Carter, C. Gartner, W. Hall, K.P. Kirkbride, J.F. Mueller, J.W. O'Brien, J. Prichard, P.K. Thai and C. Ort (2015). Systematic and Day-to-Day Effects of Chemical-Derived Population Estimates on Wastewater-Based Drug Epidemiology. Environ Sci Technol **49**(2): 999-1008. DOI: 10.1021/es503474d

Lai, F.Y., C. Ort, C. Gartner, S. Carter, J. Prichard, P. Kirkbride, R. Bruno, W. Hall, G. Eaglesham and J.F. Mueller (2011). Refining the estimation of illicit drug consumptions from wastewater analysis: Co-analysis of prescription pharmaceuticals and uncertainty assessment. Water Research **45**(15): 4437-4448. DOI: 10.1016/j.watres.2011.05.042

Tscharke, B.J., C. Chen, J.P. Gerber and J.M. White (2016). Temporal trends in drug use in Adelaide, South Australia by wastewater analysis. Sci Total Environ **565**: 384-391. DOI: 10.1016/j.scitotenv.2016.04.183

7: APPENDICES

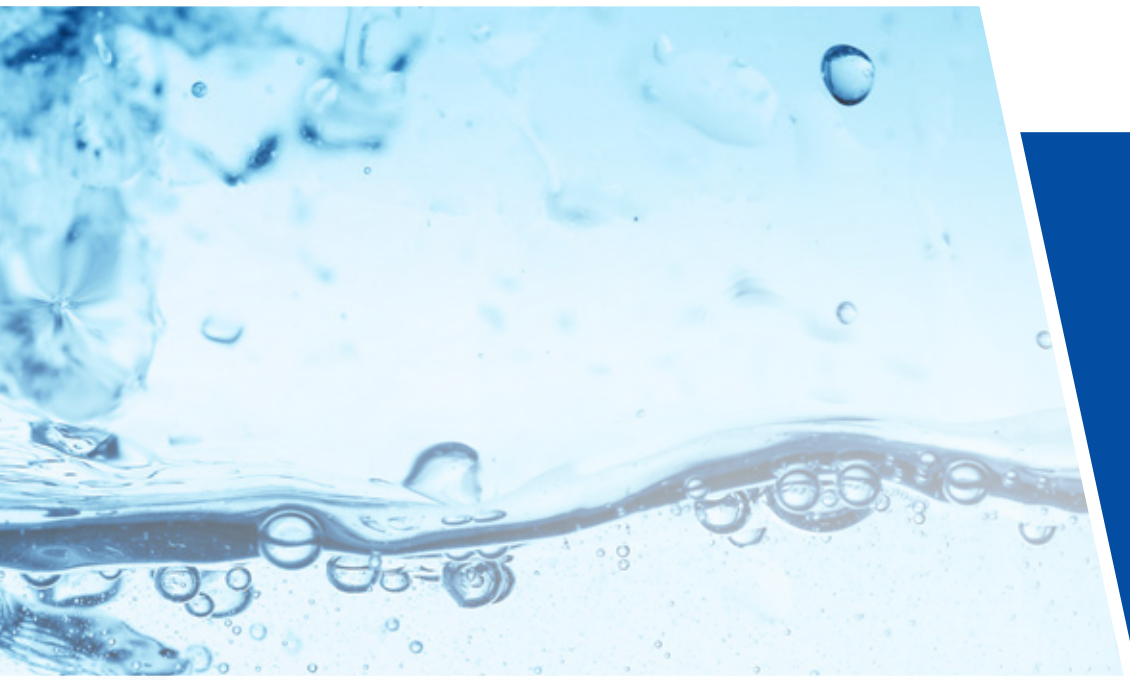
APPENDIX 1: FURTHER INFORMATION ON WWTPS

Table A1: Sampling details of each wastewater treatment plant.

	Capital/ Regional	Samples Aug 16	Samples Oct 16	Samples Dec 16	Samples Feb 17	Population Category
ACT: 009	Capital	7	-	7	7	>150,000
NSW: 003	Capital	7	-	7	4	>150,000
NSW: 006	Capital	7	-	7	7	>150,000
NSW: 008	Capital	6	-	7	7	>150,000
NSW: 021	Capital	7	-	-	-	30,000 to 150,000
NSW: 071	Capital	7	-	-	-	>150,000
NSW: 016	Regional	5	-	7	-	30,000 to 150,000
NSW: 025	Regional	7	-	-	-	>150,000
NSW: 040	Regional	7	-	-	-	<30,000
NSW: 051	Regional	7	-	-	-	<30,000
NSW: 068	Regional	1	-	4	-	>150,000
NSW: 115	Regional	-	-	7	-	30,000 to 150,000
NT: 010	Capital	7	Declined to participate			30,000 to 150,000
NT: 078	Regional	7				<30,000
QLD: 002	Capital	7	-	6	6	>150,000
QLD: 005	Capital	7	-	-	7	>150,000
QLD: 011	Capital	7	-	7	6	>150,000
QLD: 012	Regional	5	-	7	-	>150,000
QLD: 020	Regional	7	-	-	-	<30,000
QLD: 024	Regional	7	-	7	-	30,000 to 150,000
QLD: 028	Regional	7	-	7	-	30,000 to 150,000
QLD: 029	Regional	7	-	7	-	30,000 to 150,000
QLD: 033	Regional	7	-	7	7	30,000 to 150,000
QLD: 039	Regional	7	-	7	-	<30,000
QLD: 053	Regional	7	-	3	-	<30,000
QLD: 077	Regional	7	7	7	-	<30,000
SA: 007	Capital	5	7	7	7	>150,000
SA: 013	Capital	5	7	7	7	>150,000
SA: 027	Capital	5	7	7	7	30,000 to 150,000
SA: 059	Capital	5	7	7	7	30,000 to 150,000
SA: 017	Regional	5	-	4	-	<30,000
SA: 022	Regional	5	-	4	-	<30,000
SA: 063	Regional	5	-	4	-	<30,000
SA: 076	Regional	5	-	4	-	<30,000
SA: 119	Regional	-	-	4	-	<30,000

Table A1 (continued): Sampling details of each wastewater treatment plant.

	Capital/ Regional	Samples Aug 16	Samples Oct 16	Samples Dec 16	Samples Feb 17	Population Category
TAS: 004	Capital	7	Declined to participate			30,000 to 150,000
TAS: 019	Capital	7				30,000 to 150,000
TAS: 041	Capital	7				30,000 to 150,000
TAS: 018	Regional	7				30,000 to 150,000
TAS: 038	Regional	7				<30,000
TAS: 048	Regional	7				<30,000
TAS: 058	Regional	7				<30,000
VIC: 001	Capital	7	7	7	7	>150,000
VIC: 067	Capital	7	7	7	7	>150,000
VIC: 037	Regional	7	-	7	-	>150,000
VIC: 046	Regional	7	-	-	-	30,000 to 150,000
VIC: 061	Regional	7	-	7	-	30,000 to 150,000
VIC: 062	Regional	7	-	-	-	30,000 to 150,000
VIC: 066	Regional	6	-	7	-	30,000 to 150,000
WA: 101	Capital	7	7	7	7	>150,000
WA: 103	Capital	7	7	7	7	>150,000
WA: 104	Capital	7	7	7	7	>150,000
WA: 102	Regional	7	7	7	7	30,000 to 150,000
WA: 118	Regional	-	-	7	7	30,000 to 150,000
WA: 120	Regional	-	-	7	7	<30,000
Total number of samples		**329**	**77**	**236**	**135**	



CONCLUSIONS

CONCLUSIONS

For the second report of the National Wastewater Drug Monitoring Program, wastewater analysis was conducted between October 2016 and February 2017. Findings show that alcohol and tobacco consumption remained the highest of the substances tested in all states and territories. Methylamphetamine consumption was the next highest of the substances tested, indicating that demand for the drug remains strong. However, there was a small decrease in methylamphetamine use nationally, although results differed across jurisdictions.

Use of the pharmaceutical opioids oxycodone and fentanyl remained significant, particularly in regional areas. However, on a national level, the overall use declined this reporting period. Results for the four new psychoactive substances again supported the assessment that this is a niche market which remains small in comparison with traditional illicit drug markets.

METHYLAMPHETAMINE

In all jurisdictions, methylamphetamine consumption far exceeded the consumption of other illicit stimulants and both licit and illicit consumption of oxycodone and fentanyl.[4] Methylamphetamine consumption in capital city locations marginally exceeded consumption in regional locations, with consumption highest in South Australia and Western Australia, although consumption in both states fell after October 2016.

The long-term trend identified in wastewater analysis in Queensland and South Australia since 2009–10 has shown a consistent pattern of methylamphetamine consumption exceeding the consumption of other illicit stimulants. Data from 2010 is available in two regional Queensland sites. This data shows that in those locations methylamphetamine consumption increased every year until October 2016, after which the level of consumption decreased at one site. Similar data is also available for four capital city sites in South Australia, and results from these sites show a continuous increase in methylamphetamine consumption until August 2016, after which the level of consumption decreased. Available data from capital city sites in Perth shows that since 2013 methylamphetamine consumption has been relatively constant in the respective catchment areas but has decreased since October 2016. Average national capital city consumption of methylamphetamine showed little change between August 2016 and February 2017.

The above results are consistent with other publicly available data reported by the Australian Criminal Intelligence Commission. For example, during 2015–16 both the number of seizures and weight of amphetamine-type stimulants (ATS) (excluding MDMA) detected at the Australian border were the second highest on record. The number of ATS (excluding MDMA) detections decreased 13.3 per cent from 2014–15 to 2015–16, with the weight detected decreasing by 23.4 per cent. It is worth noting that 64.2 per cent of ATS (excluding MDMA) detections during 2015–16 were of crystalline methylamphetamine, commonly referred to as ice or crystal meth, confirming that this remains the dominant form of the drug in Australia. In 2015–16, the number of national ATS seizures increased by 19.1 per cent to a record 39,014 seizures, although the weight seized nationally decreased 27.0 per cent—the second highest weight on record. National ATS arrests increased 34.3 per cent in 2015–16, to a record 47,625.

4 Throughout this report, all comparisons of the consumption of different drugs are based on doses rather than the weight of the respective substances.

Results from the Drug Use Monitoring in Australia program[5] indicate that in 2015–16 the self-reported use of methylamphetamine by police detainees overtook that of cannabis. For the first time, methylamphetamine became the most commonly reported illicit drug used by detainees in the 12 months preceding interview. The self-reported use of methylamphetamine by detainees increased from 50.4 per cent in 2014–15 to 59.7 per cent in 2015–16. The proportion of detainees testing positive for methylamphetamine increased from 38.7 per cent in 2014–15 to 49.0 per cent in 2015–16, and continues to be higher than the proportion testing positive for MDMA, heroin, cocaine, benzodiazepines and opiates (excluding heroin). In 2015–16, the proportion testing positive for methylamphetamine was also higher than the proportion testing positive for cannabis.

The overall picture for methylamphetamine is one of ongoing and strong demand. While the National Wastewater Drug Monitoring Program has shown signs that consumption may have peaked in late 2016, it is too early to say with any certainty if this recent reduction in consumption is the start of a longer term trend.

AMPHETAMINE

Amphetamine is a metabolite of methylamphetamine consumption. Although it is recognised that some forms of amphetamine (such as amphetamine and dexamphetamine) are used for both licit and illicit purposes, amphetamine results have not been reported separately in this report, as the major source of amphetamine detected in the wastewater was methylamphetamine consumption.

COCAINE

Nationally, cocaine consumption in capital city locations was on average almost double the level of cocaine consumption in regional locations. Cocaine use remained highest in New South Wales, mainly in the capital city locations. However, there was also tangible consumption in the Australian Capital Territory, in a regional location in Queensland and in Victoria this reporting period. Average national capital city consumption of cocaine increased between August 2016 and February 2017, albeit from a low base.

Other publicly available data reported by the Australian Criminal Intelligence Commission indicates that both the number and weight of cocaine detections at the Australian border increased, with a record 2,777 border detections in 2015–16. National seizures also increased, with a record 3,951 cocaine seizures during that period.

Results from the Drug Use Monitoring in Australia (DUMA) program indicate that cocaine continues to be one of the least commonly detected drugs among detainees. However, the proportion of detainees testing positive for cocaine via urinalysis[6] increased from 0.8 per cent in 2014–15 to 0.9 per cent in 2015–16. Self-reported recent use[7] of cocaine also increased from 14.2 per cent in 2014–15 to 16.0 per cent in 2015–16.

5 The DUMA program examines drug use and offending patterns among police detainees and comprises an interviewer-assisted self-report survey and the voluntary provision of a urine sample which is subjected to analysis to detect licit and illicit drug use. Detainees can participate in the survey without providing a urine sample. Cases with missing data are excluded from the relevant analysis.
6 Cocaine and its metabolite can be detected in urine for 24 to 36 hours after administration.
7 Recent use in the DUMA program refers to self-reported use in the 12 months prior to arrest.

3,4-METHYLENEDIOXYMETHAMPHETAMINE (MDMA)

Average national MDMA consumption was almost identical across capital city and regional locations. MDMA consumption in the Australian Capital Territory increased significantly in December 2016, before reducing to a relatively low level in February 2017. Consumption of MDMA across the rest of the country was unremarkable, with the average national capital city consumption of MDMA almost halving between August 2016 and February 2017.

The subdued picture of the domestic MDMA market that emerges from these results is consistent with other publicly available data reported by the Australian Criminal Intelligence Commission. For example, the number and weight of MDMA detections at the Australian border decreased in 2015–16. The number of national MDMA seizures increased by 10.1 per cent in 2015–16 to 5,967, while the weight of MDMA seized decreased by 28.7 per cent. The number of national MDMA arrests increased by 24.1 per cent to 6,272.

Additionally, results from the DUMA program indicate that the proportion of detainees testing positive to MDMA via urinalysis increased from 1.3 per cent in 2014–15 to 1.9 per cent in 2015–16. Over the last decade the proportion of detainees testing positive to MDMA has remained low (under 2.9 per cent). Self-reported recent use of MDMA[8] increased from 14.7 per cent in 2014–15 to 16.2 per cent in 2015–16.

3,4-METHYLENEDIOXYAMPHETAMINE (MDA)

MDA is a metabolite of MDMA. Although it is recognised that there is an illicit market for MDA in Australia, MDA results have not been reported separately in this report, as the major source of MDA detected in the wastewater was MDMA consumption and there is no data on the size of the illicit MDA market.

JWH-018 AND JWH-073

Methods for measuring the synthetic cannabinoids JWH-018 and JWH-073 were also included but failed to detect the compounds in sites across Australia.

MEPHEDRONE

Mephedrone was detected 11 times at a total of five sites across New South Wales, Queensland, South Australia and Victoria, but the quantity of the substance was mostly below the level at which it could reliably be quantified.

METHYLONE

Methylone was detected 69 times at a total of 18 sites in all states and territories except South Australia and Victoria, but the quantity of the substance was mostly below the level at which it could reliably be quantified.

8 The self-report question includes use of ecstasy/MDMA in the 12 months prior to arrest.

OXYCODONE

Oxycodone was detected in all jurisdictions, with the consumption of oxycodone, which may be licit or illicit, exceeding the use of cocaine and MDMA in all jurisdictions. Nationally, consumption in regional locations was on average almost double the capital city consumption. South Australia and the Australian Capital Territory had the highest oxycodone consumption in capital city locations, while regional consumption in parts of New South Wales, Queensland and Victoria was above the national average. Average national capital city consumption of oxycodone reduced significantly between August 2016 and February 2017.

FENTANYL

The consumption of fentanyl, which may be licit or illicit, exceeded the use of cocaine and MDMA in all jurisdictions this reporting period. Fentanyl consumption in regional locations exceeded consumption in capital city locations in all jurisdictions except Western Australia. Consumption was high in many regional centres, particularly in New South Wales, Queensland and South Australia. Consumption of fentanyl reduced generally during the period covered by this report, with average national capital city consumption also reducing significantly between August 2016 and February 2017.

TOBACCO

In most jurisdictions and in capital city locations, tobacco consumption increased slightly from August 2016 to February 2017. Average national tobacco consumption in regional locations exceeded consumption in capital city locations—a trend which also extended to most jurisdictions.

ALCOHOL

There was no significant trend in alcohol consumption nationally this reporting period. Average national alcohol consumption was slightly higher in capital city locations than regional locations, though alcohol consumption in regional South Australia and parts of Queensland was well below the national average.

NEXT REPORT

The third report of the National Wastewater Drug Monitoring Program will be publicly released in November 2017.