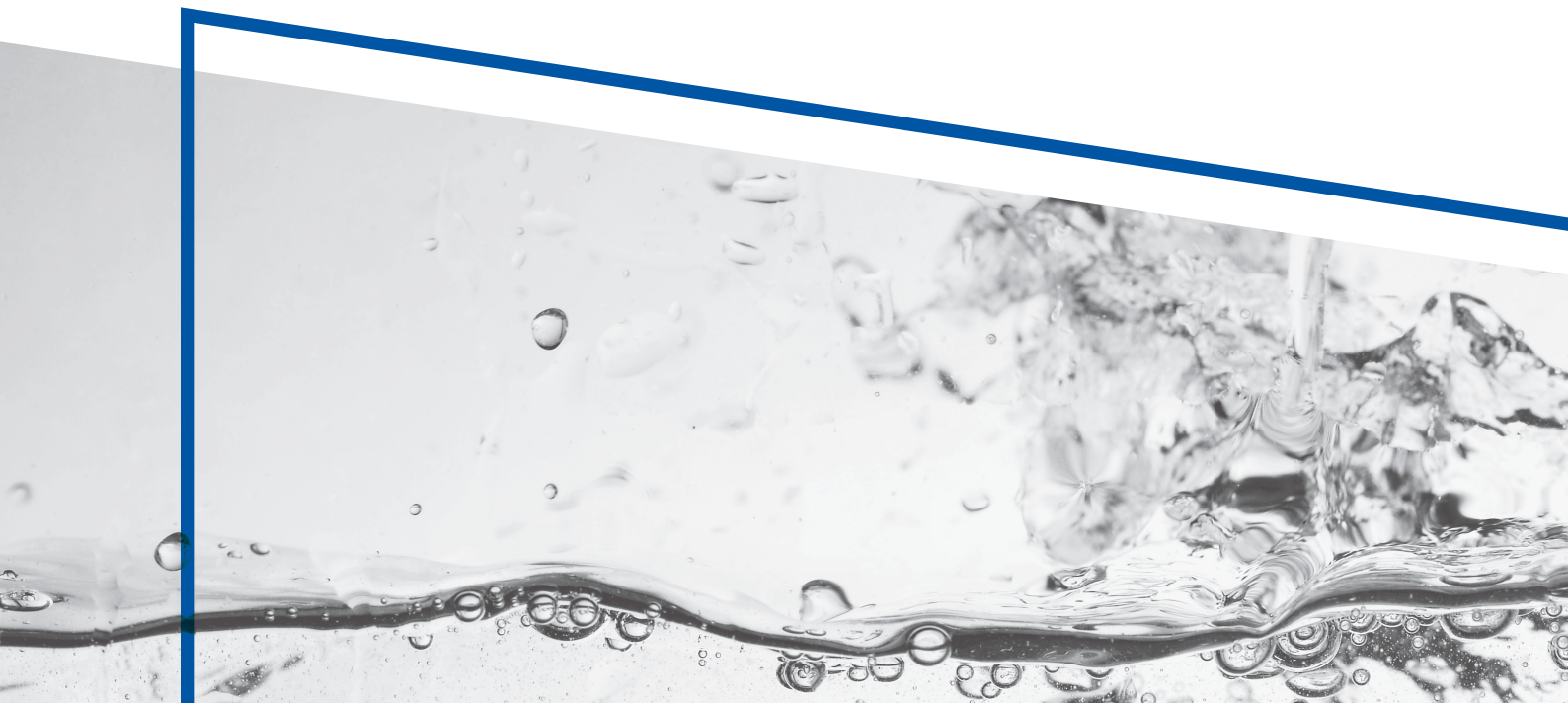
NATIONAL WASTEWATER DRUG MONITORING PROGRAM

REPORT 12

AUSTRALIAN CRIMINAL INTELLIGENCE COMMISSION

THE UNIVERSITY OF QUEENSLAND AUSTRALIA

University of South Australia



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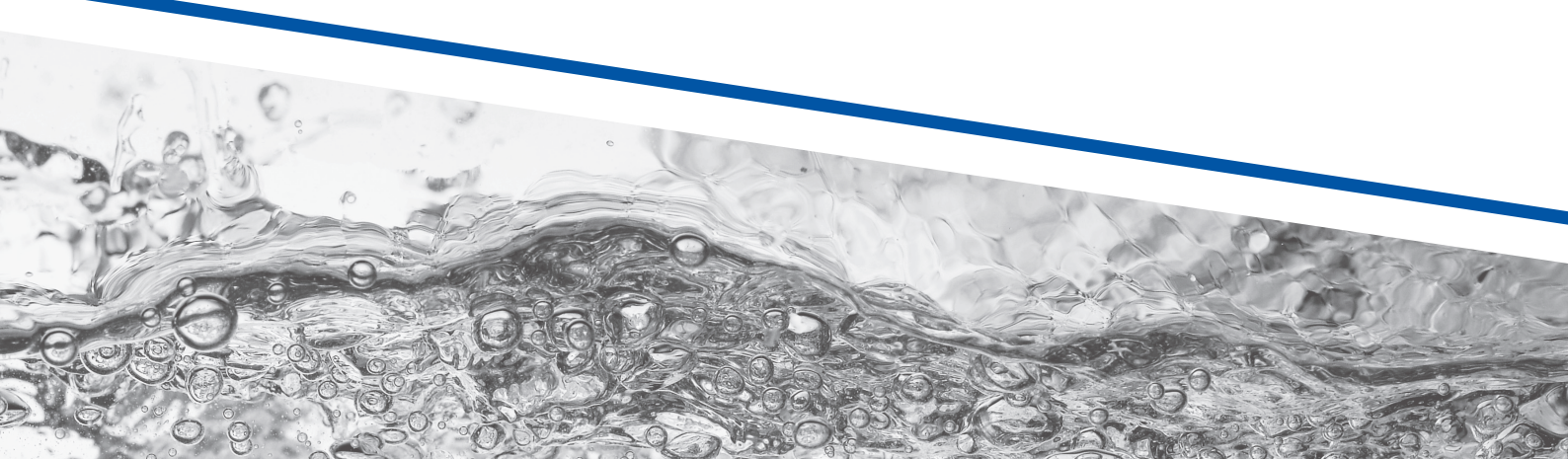


CEO FOREWORD

The Australian Criminal Intelligence Commission (ACIC) is responsible for providing information and intelligence on criminal activity to support Government in creating a safer Australia. Much of the harm that Australians suffer at the hands of organised crime is due to illicit drugs. Serious and organised crime groups profit from the importation, manufacture, trafficking and sale of drugs that cause harm to the community.

The National Wastewater Drug Monitoring Program (the Program) continues to evolve. Work continues to consolidate the ACIC's collaboration with international partners in New Zealand, Asia, North America and Europe. Wastewater analysis assists in understanding drug use within populations, providing a measure of one important aspect of national health—the demand for a range of licit and illicit drugs. Illicit drugs and licit drugs with abuse potential are inherently harmful. Reliable drug consumption data are a key indicator of the level of harm experienced by the community, because logically the level of harm to the community is a function of the quantity of the substance that is consumed. Understanding drug consumption at a population level supports effective allocation of resources to priority areas. It also allows the progress of demand, supply and harm reduction strategies to be monitored. The ACIC is increasingly seeking partnerships to merge wastewater data with other drug data in locations of interest to develop a more granular appreciation of high risk markets.

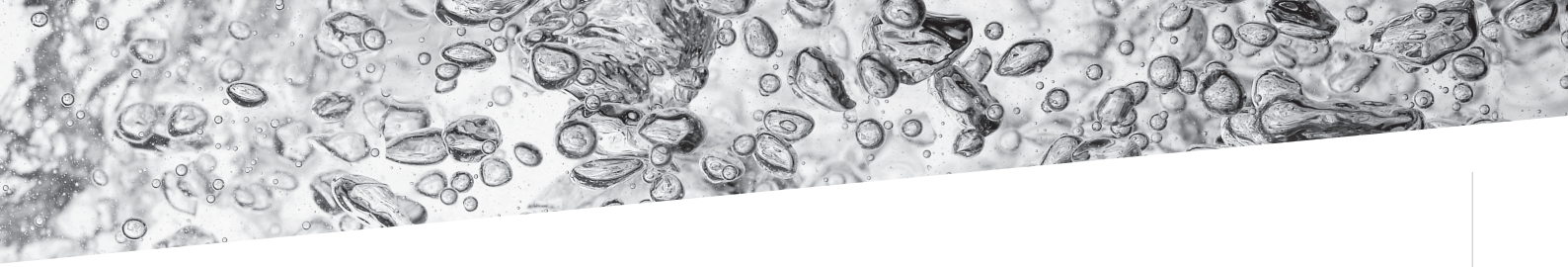
The Program is an Australian Government funded initiative. This report is the third in a series of 12 reports that will be released publicly until early 2024.

THE ONGOING REQUIREMENT TO ASSESS DRUG MARKETS DURING THE COVID-19 PERIOD

During this reporting period, the ACIC continued to provide advice to Government, law enforcement and policy partners on drug trends during the COVID-19 pandemic and the period of related restrictions. Some of this advice was derived from more regular and focused sampling than is routinely undertaken as part of the Program. The regularity of wastewater reporting permits partner agencies to plan with greater confidence at a time of considerable uncertainty.

TRENDS IDENTIFIED DURING THIS REPORTING PERIOD

In August 2020, 56 wastewater sites were monitored nationally. Based on 2016 Census data, these sites cover approximately 56 per cent of the Australian population. This reporting period again demonstrated varying consumption levels for different drugs and jurisdictions. For example, in August 2020 average national methylamphetamine consumption decreased to the lowest level recorded by the Program, while average national heroin consumption increased to the highest level recorded by the Program. August 2020 also saw record consumption of cannabis in regional Australia. Interestingly, consumption of both methylamphetamine and cocaine increased in capital cities between August and October 2020.



The measured pharmaceutical opioids also exhibited different trends during this period. National average fentanyl consumption continued to decrease in both capital city and regional areas to record low levels. Conversely, average consumption of oxycodone increased in both the capital cities and regional areas. Per capita consumption of oxycodone in August 2020 in one jurisdiction exceed per capita consumption of methylamphetamine, the first time this has occurred anywhere in Australia.

TRENDS IDENTIFIED DURING THE FOUR YEARS OF THE PROGRAM

Over the four years of the Program, the population-weighted average consumption of all drugs monitored by the Program has fluctuated, but consumption of the four major illicit drugs with available dose data (methylamphetamine, cocaine, MDMA and heroin) has increased substantially. There was record annual consumption of cocaine, MDMA and heroin in Year 4 of the Program, but consumption of methylamphetamine decreased during Year 4 to the second highest level seen by the Program, largely due to the impact of COVID-19 restrictions on supply and demand.

The estimated street value of the above four drugs in Year 4 of the Program was $8.9 billion, down from $11.3 billion in Year 3, largely due to general price reductions for illicit drugs and the decrease in methylamphetamine consumption. That said, methylamphetamine still accounted for 78 per cent of the total estimated value of the four drugs in Year 4.

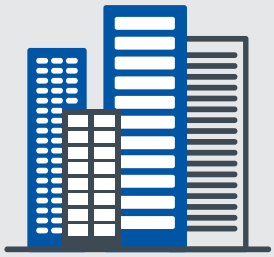
ACKNOWLEDGEMENT

I would like to acknowledge the valuable support and expertise of the Universities of Queensland and South Australia, which undertook the data collection and analysis which underpins this report, and the Australian Criminal Intelligence Commission officers who contributed to the project.

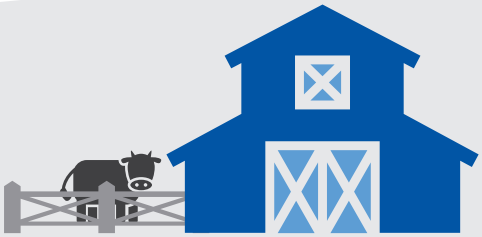
Michael Phelan APM
Chief Executive Officer
Australian Criminal Intelligence Commission

SNAPSHOT

The August 2020 collection covers around **56 per cent** of Australia's population—about **13.2 million Australians.**



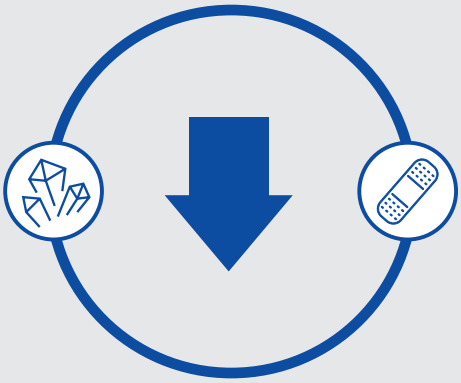
Capital city **cocaine** and **heroin** average consumption exceeded regional consumption.



Regional **nicotine, alcohol, methylamphetamine, MDMA, MDA, oxycodone, fentanyl** and **cannabis** average consumption exceeded capital city consumption.

Of the drugs measured with available dose data, **alcohol** and **nicotine** remain the most consumed, with **methylamphetamine** the most consumed illicit drug.

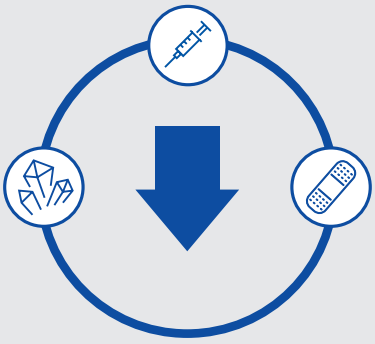
Between April and August 2020, the population-weighted average capital city consumption of:



methylamphetamine and fentanyl **decreased**

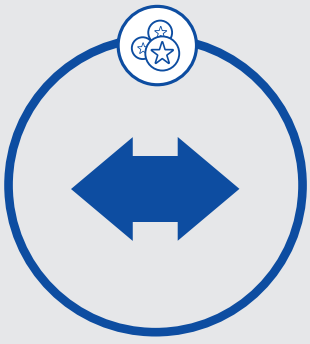
alcohol, nicotine, cocaine, MDMA, heroin, oxycodone and cannabis **increased**

Between April and August 2020, the population-weighted average regional consumption of:

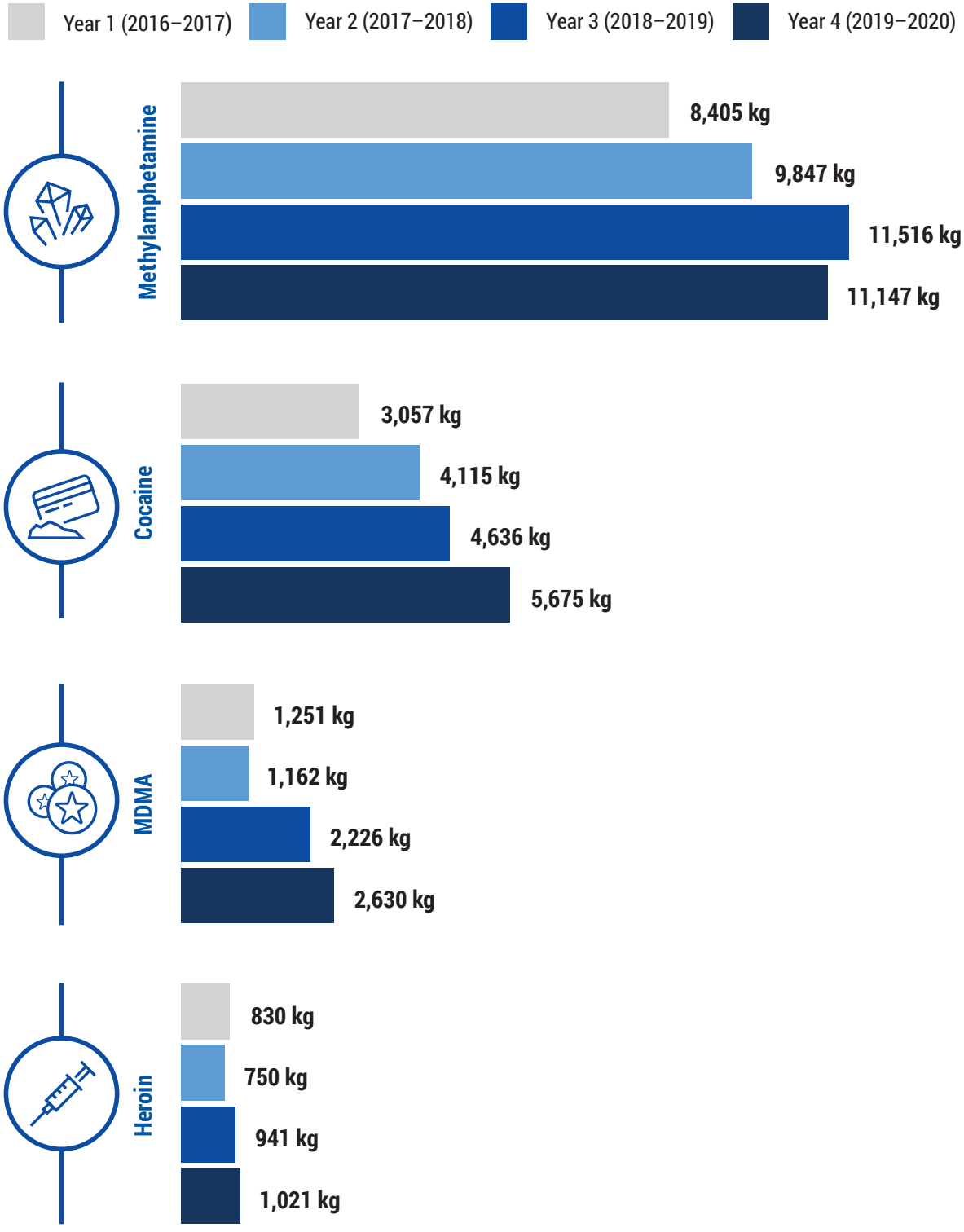


methylamphetamine, heroin and fentanyl **decreased**

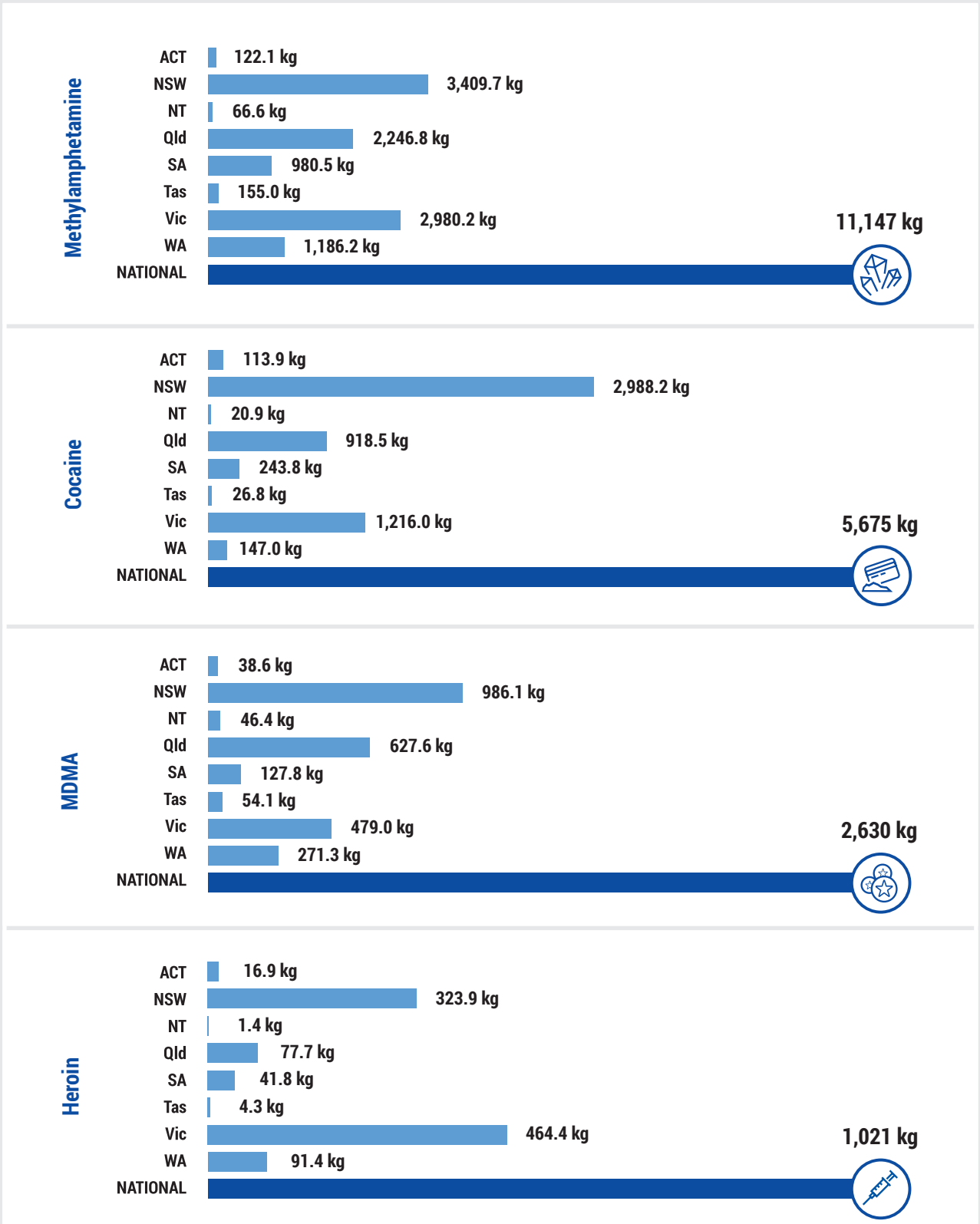
alcohol, nicotine, cocaine, oxycodone and cannabis **increased**



MDMA remained **relatively stable**



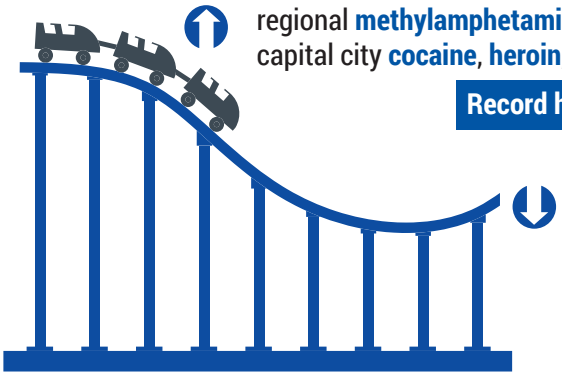
The estimated weight of methylamphetamine, cocaine, MDMA and heroin consumed annually increased from Year 1 to Year 4 of the Program.



Estimated state and territory annual consumption of methylamphetamine, cocaine, MDMA and heroin for Year 4 of the Program.

IMPACT OF COVID-19

During the period of COVID-19 restrictions:



regional **methylamphetamine (April)**, **heroin** and **cannabis**
capital city **cocaine**, **heroin**, **cannabis** and **nicotine**

Record high drug consumption

regional **methylamphetamine (August)** and **fentanyl**
capital city **methylamphetamine**, **oxycodone**, **fentanyl** and **alcohol**

Record low drug consumption

In one jurisdiction in August 2020, average **oxycodone** capital city consumption **exceeded methylamphetamine** consumption for the first time anywhere in Australia since the Program commenced.

Consumption in some regional drug markets, such as those for **cannabis**, **cocaine**, **oxycodone**, **nicotine** and **alcohol**, increased from April to August 2020. Also, capital city consumption of **methylamphetamine**, **cocaine** and **oxycodone** increased from August to October 2020.

INTRODUCTION

This is the twelfth in a series of National Wastewater Drug Monitoring Program reports to be publicly released by the Australian Criminal Intelligence Commission, and the third of twelve reports to be delivered under new budgetary arrangements that will see reports delivered until early 2024. The Program provides a measure, rather than an estimate, of the consumption 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 in drug consumption across Australia and can identify new sources of threat.

The twelfth report presents data on Australia's drug consumption for 13 substances and includes data for August (capital city and regional sites) and October 2020 (capital city sites). Longitudinal data captured by the Program increases our understanding of drug use nationally, in specific locations and over time. As with Report 11, wastewater analysis provides us with unique insight into the impact of COVID-19 and related restrictions, as those restrictions were lifted or reintroduced across Australia during 2020. Findings presented in the reports provide law enforcement, policy, regulatory and health agencies with additional, objective data on the use of methylamphetamine and other drugs. These data create opportunities to shape the response to the demand and supply sides of illicit drug markets, particularly in high-use areas, and inform harm reduction strategies. They permit priorities to be set and modified in a manner that is consistent with constantly evolving drug markets and broader world circumstances.

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.

In this report, wastewater analysis from the National Wastewater Drug Monitoring Program measured the presence[1] of the following substances:

- methylamphetamine
- amphetamine
- cocaine
- 3,4-methylenedioxymethylamphetamine (MDMA)
- 3,4-methylenedioxyamphetamine (MDA)
- heroin
- cannabis
- mephedrone
- methylone
- oxycodone
- fentanyl
- nicotine
- alcohol.

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

The Australian Criminal Intelligence Commission continues to review the appropriateness of monitored substances with its partners, stakeholders and the universities. As part of this process, the Program will be incorporating analysis of ketamine consumption from Report 13, replacing mephedrone and methylone, which will be reported on separately as part of broader coverage of emerging stimulants where they appear in wastewater.

Both contracted universities monitor wastewater across Australia, covering all state and territory capital cities and a range of regional cities and towns. In August 2020, 56 wastewater treatment plants participated nationally.[2] 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 treatment plant operators have established relationships with the two universities.

The breakdown of sites by jurisdiction for August 2020 is as follows:

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 states and territories decide(s) not to participate in the national program in the future, the Australian Criminal Intelligence Commission will identify replacement sites from participating states and territories to ensure that the largest possible segment of the national population is sampled. Accordingly, the location of sites within and between states and territories may change over the life of the Program.

2 Sampling also occurred in October 2020 in capital city sites, with 20 participating wastewater sites nationally, covering approximately 48 per cent of the Australian population.

REPORTING

National Wastewater Drug Monitoring Program reports are completed three times a year and made public. 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 sampled are not publicly released by the Australian Criminal Intelligence Commission. Stakeholders in law enforcement, health and other relevant policy agencies are provided with classified information identifying actual sampling locations to inform appropriate responses.

Reported results reflect per capita use in all locations and, with the exception of MDA and cannabis (for which reliable dose figures are not available), are expressed in terms of both the number of doses and the weight or volume consumed per capita of the respective substances, to facilitate comparison between substances.

EXPLOITATION OF THE NATIONAL WASTEWATER DRUG MONITORING PROGRAM DATA

The National Wastewater Drug Monitoring Program is based on a well-established and internationally recognised methodology. The Australian Criminal Intelligence Commission considers that National Wastewater Drug Monitoring Program data provide an important basis for the development of empirically informed government and private sector policy and decision making. The reports provide regular, timely, unambiguous and detailed measures of the level of demand for the listed substances in the Australian population, complementing other drug datasets published in Australia. The twelfth National Wastewater Drug Monitoring Program report measures the drug use of approximately 56 per cent of the Australian population.[3]

Wastewater data are also particularly useful for identifying differences in levels of drug consumption in capital city and regional areas of Australia. The data reinforce the different dynamics that apply to both capital city and regional markets and also illustrate drug preference variation that exists both within and between states and territories. Understanding these preferences is important in the development and delivery of national responses and in tailoring responses to suit the specific needs of individual jurisdictions. The number and diversity of regional sites that participate in the Program permits confident assessments to be made of drug trends outside of the capital cities and facilitates local responses to the different circumstances that apply in each location. This is important because it permits wastewater data to complement a number of other sources of drug data in Australia which have very limited regional coverage, or are confined to capital cities.

Wastewater data are used with other available data sources to develop a comprehensive and accurate understanding of drug markets nationally and in the states and territories. Wastewater analysis data collected by the National Wastewater Drug Monitoring Program has been used to estimate the street value of methylamphetamine, cocaine, MDMA and heroin consumed annually in Australia; to explore the relationship between drug consumption and different types of crime; and to assess the impact of law enforcement and health initiatives aimed at reducing drug supply and demand.

The Australian Criminal Intelligence Commission engages with academic institutions, industry and public sector agencies to identify further data applications. Opportunities identified include informing responses in high risk areas; measuring drug use in specific local areas; estimating the size of discrete illicit markets; and exploring options for monitoring the effectiveness of existing demand, supply and harm reduction initiatives.

3 The August 2020 population estimate is based on the Australian Bureau of Statistics 2016 Census data and catchment data supplied by the operators of the wastewater facilities and service providers.

Advantages of the National Wastewater Drug Monitoring Program are that the data are collected on an ongoing basis, are reported regularly, and the Program is sufficiently flexible to allow for focusing collection activity in different geographic locations and at more regular intervals in response to identified need.

A FOUR YEAR RETROSPECTIVE

With the passage of four years, sufficient data has now been collected to permit a range of stakeholders to commence longitudinal analysis of consumption trends. The data is also being used by third parties for a range of applications that were not anticipated at the commencement of the Program.

The data has proven itself to be amenable to analysis from a variety of perspectives. A summary of some of this analysis is provided below.

CAPITAL CITY V REGIONAL COMPARISON

Consumption of most drugs was higher per capita in regional sites, with the exception of cocaine and heroin.

While the population-weighted average consumption of all drugs monitored by the Program fluctuated, when comparing data collected for capital city sites and regional sites between August 2016 and August 2020 some patterns can be identified (see Table 1):

Table 1. Changes in the estimated population-weighted average consumption of drugs monitored by the National Wastewater Drug Monitoring Program.

	August 2016 and August 2017		August 2017 and August 2018		August 2018 and August 2019		August 2019 and August 2020		August 2016 and August 2020	
	Capital City	Regional	Capital City	Regional	Capital City	Regional	Capital City	Regional	Capital City	Regional
Alcohol	↓	↓	↑	↑	↓	↓	↓	↑	↓	→
Nicotine	↑	↑	↑	→	↓	↓	↑	↑	↑	↑
Methylamphetamine	↑	↓	↑	↑	↑	↑	↓	↓	↓	↓
Cocaine	↑	↑	↑	↑	↓	↑	↑	↑	↑	↑
MDMA	↓	↓	↑	↑	↑	↑	↑	↓	→	↑
Oxycodone	↓	↓	↑	↑	→	↑	↓	↓	↓	↓
Fentanyl	↓	↑	↑	↑	↓	↓	↓	↓	↓	↓
Heroin[a]	—	—	↓	↓	↑	↑	↑	↑	—	—
Cannabis[b]	—	—	—	—	↓	↓	↑	↑	—	—

Key: ↓ Decrease → Relatively stable ↑ Increase

[a] Heroin data is available from August 2017.

[b] Cannabis data is available from August 2018.

When comparing data for August 2016 and August 2020, the population-weighted average consumption of nicotine and cocaine increased in both capital city and regional sites, while the consumption of oxycodone and fentanyl decreased. Of note, the population-weighted average consumption of methylamphetamine decreased in both capital city and regional sites, reversing an increasing trend in methylamphetamine consumption recorded during the first three years of the Program. It is most likely that this decrease was due to COVID-19 restrictions on methylamphetamine supply, but additional data collection will confirm if this is the case.

The population-weighted average consumption of alcohol decreased in capital city sites and remained relatively stable in regional sites. Conversely, the population-weighted average of MDMA remained relatively stable in capital city sites and increased in regional sites.

DRUG CONSUMPTION TRENDS

The data shows that, while consumption has fluctuated over the four year period (see Table 2), some patterns are emerging. At a national level, the Program is more likely to measure record highs in drug consumption during the month of December (35 per cent of all record highs), while record low consumption is more likely to occur in April (40 per cent of record lows).

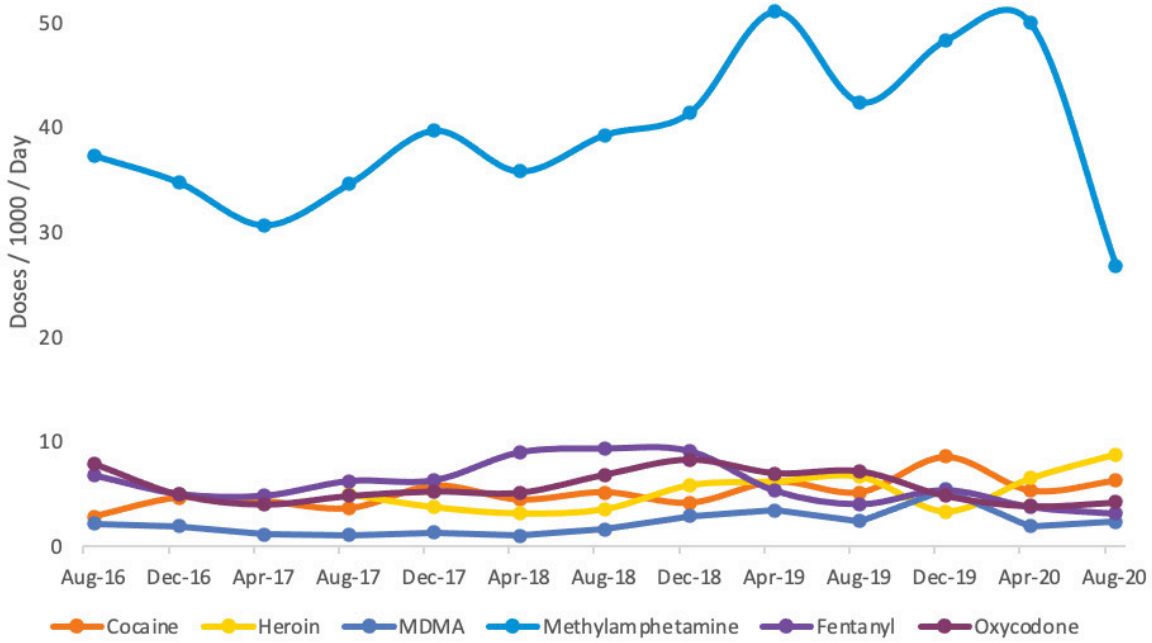
A similar pattern is observed in regional sites, with December accounting for 40 per cent of all record highs and April accounting for 50 per cent of record lows. A slight variation was observed for capital city sites, where record highs were equally likely to occur in the months of June and December (with each month accounting for 30 per cent), while record lows were equally likely to occur in the months of April and October (each accounting for 30 per cent).

Table 2. Months and years when the highest and lowest drug consumption were recorded by the National Wastewater Drug Monitoring Program.

	Highest drug consumption		Lowest drug consumption	
	Capital City	Regional	Capital City	Regional
Alcohol	February 2018	December 2019	April 2020	April 2017
Nicotine	June 2020	December 2019	October 2018	August 2016
Methylamphetamine	December 2019	April 2020	August 2020	August 2020
Cocaine	June 2020	December 2019	August 2016	August 2016
MDMA	December 2019	December 2019	April 2018	April 2017
MDA	December 2016	August 2017	October 2020	April 2019
Oxycodone	February 2019	August 2016	April 2020	April 2017
Fentanyl	August 2018	April 2018	October 2020	August 2020
Heroin	August 2020	April 2020	February 2019	December 2019
Cannabis	June 2020	August 2020	February 2020	April 2019

Despite methylamphetamine consumption decreasing to the lowest levels recorded by the Program in August 2020, the data shows that of the illicit drugs with available dose data, methylamphetamine remains the most consumed drug by a large margin. Interestingly, however, the COVID restrictions appear not to have had a tangible adverse national impact on the major drug markets other than methylamphetamine and fentanyl between April and August 2020 (see below).

National average drug consumption of methylamphetamine, cocaine, MDMA, oxycodone, fentanyl and heroin:



ESTIMATED NATIONAL CONSUMPTION BY WEIGHT

The Australian Criminal Intelligence Commission used wastewater data collected between August 2016 and August 2020 (Years 1 to 4 of the Program) to estimate the weight of methylamphetamine, MDMA, cocaine and heroin consumed annually. These estimates are conservative and enable the identification of long-term trends in drug consumption in addition to providing drug to drug comparisons.

When comparing data from Year 1 and Year 4 of the Program, the estimated national consumption of methylamphetamine, cocaine, MDMA and heroin increased (see Table 3). While the estimated consumption of methylamphetamine decreased from Year 3 to Year 4 of the Program, methylamphetamine continues to be the most consumed illicit drug in Australia for which dose data is available, accounting for approximately 54 per cent of the combined estimated consumption of these four drugs. Notably, consumption of cocaine, MDMA and heroin increased to record high levels in Year 4 of the Program, evidencing the resilience of the respective drug markets and serious and organised crime groups.

Table 3. Estimated annual methylamphetamine, cocaine, MDMA and heroin consumption, as total weight consumed nationally, Year 1 to Year 4 of the National Wastewater Drug Monitoring Program.

Drug	Estimated consumption (kilograms per annum)				% Change
	Year 1	Year 2	Year 3	Year 4	Year 1 to Year 4
Methylamphetamine	8,405	9,847	11,516	11,147	↑ 32.6
Cocaine	3,057	4,115	4,636	5,675	↑ 85.6
MDMA	1,251	1,162	2,226	2,630	↑ 110.2
Heroin	830[4]	750	941	1,021	↑ 23.0

4 Heroin estimates for Year 1 are based on one collection period.

ESTIMATED STATE AND TERRITORY CONSUMPTION

On a state and territory level, overall methylamphetamine, cocaine, MDMA and heroin consumption has fluctuated over the life of the Program.

When comparing data from Year 1 and Year 4 of the Program, methylamphetamine consumption increased in most states and territories, most notably in Queensland. For the second consecutive year the exception is Western Australia and South Australia where methylamphetamine consumption decreased (Table 4).

Table 4. Estimated methylamphetamine consumption per jurisdiction in Year 1 to Year 4 of the National Wastewater Drug Monitoring Program.

Jurisdiction	Estimated consumption (kilograms per annum)				% Change
	Year 1	Year 2	Year 3	Year 4	Year 1 to Year 4
Australian Capital Territory	80.3	93.0	119.4	122.1	52.1
New South Wales	2,298.3	2,604.5	3,337.4	3,409.7	48.4
Northern Territory	65.5	75.5	84.8	66.6	1.7
Queensland	1,277.5	1,893.3	2,247.7	2,246.8	75.9
South Australia	1,005.3	1,159.5	943.2	980.5	-2.5
Tasmania	92.0	127.1	177.1	155.0	68.5
Victoria	2,039.2	2,477.7	3,124.6	2,980.2	46.1
Western Australia	1,547.3	1,416.8	1,482.7	1,186.2	-23.3

When comparing data from Year 1 and Year 4 of the Program, cocaine consumption increased in all states and territories, most notably in Western Australia, although starting from a relatively low base there compared to other jurisdictions (see Table 5).

Table 5. Estimated cocaine consumption per jurisdiction in Year 1 to Year 4 of the National Wastewater Drug Monitoring Program.

Jurisdiction	Estimated consumption (kilograms per annum)				% Change
	Year 1	Year 2	Year 3	Year 4	Year 1 to Year 4
Australian Capital Territory	67.8	81.2	83.4	113.9	68.0
New South Wales	1,812.3	2,397.8	2,548.0	2,988.2	64.9
Northern Territory	19.0	27.4	22.8	20.9	10.0
Queensland	319.4	576.6	714.1	918.5	187.6
South Australia	107.1	129.2	173.1	243.8	127.6
Tasmania	10.9	15.5	16.6	26.8	145.9
Victoria	676.5	819.9	968.0	1,216.0	79.7
Western Australia	43.9	67.9	110.0	147.0	234.9

When comparing data from Year 1 and Year 4 of the Program, MDMA consumption increased in all states and territories, most notably in Queensland, followed by Western Australia (see Table 6).

Table 6. Estimated MDMA consumption per jurisdiction in Year 1 to Year 4 of the National Wastewater Drug Monitoring Program.

Jurisdiction	Estimated consumption (kilograms per annum)				% Change
	Year 1	Year 2	Year 3	Year 4	Year 1 to Year 4
Australian Capital Territory	28.4	14.4	36.5	38.6	35.9
New South Wales	462.8	450.5	834.7	986.1	113.1
Northern Territory	37.8	24.1	32.4	46.4	22.8
Queensland	216.5	223.2	502.4	627.6	189.9
South Australia	56.5	66.6	70.8	127.8	126.2
Tasmania	30.6	16.7	54.9	54.1	76.8
Victoria	319.6	291.3	511.9	479.0	49.9
Western Australia	99.0	74.9	182.4	271.3	174.0

When comparing data from Year 1 and Year 4 of the Program, heroin consumption increased in most states and territories, with the exception of South Australia, where heroin consumption decreased. The most notable increase in heroin consumption occurred in Western Australia, although starting from a relatively low base there compared to other jurisdictions (see Table 7).

Table 7. Estimated heroin consumption per jurisdiction in Year 1 to Year 4 of the National Wastewater Drug Monitoring Program.

Jurisdiction	Estimated consumption (kilograms per annum)				% Change
	Year 1[5]	Year 2	Year 3	Year 4	Year 1 to Year 4
Australian Capital Territory	14.7	15.3	10.3	16.9	15.0
New South Wales	264.6	222.2	307.0	323.9	22.4
Northern Territory	1.0	1.0	1.0	1.4	40.0
Queensland	65.5	66.2	66.4	77.7	18.6
South Australia	47.8	34.8	30.5	41.8	-12.6
Tasmania	3.3	4.5	2.8	4.3	30.3
Victoria	402.1	359.4	469.7	464.4	15.5
Western Australia	31.1	46.8	53.8	91.4	193.9

The data demonstrates that domestic drug markets are complex and vary both between and within jurisdictions. Given that a relatively small proportion of the Australian population consumes illicit drugs, it is very important that data sets that purport to measure drug consumption cover a significant proportion of the population on a regular and ongoing basis and a variety of local drug markets. For this reason, it is also important that Australian drug data sets are constantly interpreted in a complementary manner.

5 Annual heroin consumption estimates for Year 1 are informed by data from only one collection period.

VALUE OF DRUGS CONSUMED

Using available national median price data, Australians spent an estimated $8.6 billion on methylamphetamine, cocaine, MDMA and heroin in Year 1 of the Program, $9.4 billion in Year 2, $11.3 billion in Year 3 and $8.9 billion in Year 4. The decrease in total value during Year 4 is shaped by the decrease in methylamphetamine consumption and general price reductions, with methylamphetamine accounting for 78 per cent of the total estimated expenditure in Year 4 (see Table 8).

Table 8. Estimated street value of annual methylamphetamine, cocaine, MDMA and heroin consumption for Year 1 to 4 of the National Wastewater Drug Monitoring Program.

Drug	Estimated street value				% Change
	Year 1 (A$)	Year 2 (A$)	Year 3 (A$)	Year 4 (A$)	Year 1 to Year 4
Methylamphetamine	7.24 billion	7.38 billion	8.63 billion	6.96 billion	-3.9
Cocaine	1.06 billion	1.54 billion	2.08 billion	1.41 billion	33.0
MDMA	145.59 million	114.19 million	211.08 million	226.72 million	55.7
Heroin	207.50 million	375.00 million	423.45 million	382.87 million	84.5
Total	**8.6 billion**	**9.4 billion**	**11.3 billion**	**8.9 billion**	3.5

RESULTS FROM THE COLLECTION

It is evident that a multi-dimensional approach that targets supply, demand and harm reduction is critical to addressing drug use in Australia. Drug consumption estimates derived from wastewater data, when used in combination with other data—such as seizure, arrest, price, purity, health and availability data—provide insight into related markets and the potential impact of supply, demand and harm reduction strategies.

Wastewater data are an important part of the suite of datasets available to increase our understanding of drug consumption, demand and supply in Australia. Making data from the Program publicly available assists to enrich understanding and informs the national conversation on drug trends and related demand. This twelfth report of the National Wastewater Drug Monitoring Program builds on national drug consumption data contained in the preceding eleven reports to identify temporal trends in drug use 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 and internationally. This, and future reports, continue to build and shape understanding on trends and changes in patterns of use, creating an increasingly detailed picture of drug consumption in Australia.

RESEARCH FINDINGS

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LIST OF ABBREVIATIONS

ABS	Australian Bureau of Statistics
ACIC	Australian Criminal Intelligence Commission
ACT	Australian Capital Territory
DASSA	Drug and Alcohol Services South Australia
LC-MS/MS	Liquid chromatography tandem mass spectrometry
LOD	Limit of detection
LOQ	Limit of quantification
MDA	3,4-methylenedioxyamphetamine
MDMA	3,4-methylenedioxymethylamphetamine
NPS	New psychoactive substances
NSW	New South Wales
NT	Northern Territory
NWDMP	National Wastewater Drug Monitoring Program
Qld	Queensland
SA	South Australia
SPE	Solid phase extraction
Tas	Tasmania
THC	Tetrahydrocannabinol
THC-COOH	11-nor-9-carboxy-tetrahydrocannabinol
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.

Nicotine consumption has replaced tobacco consumption in this report as the target metabolites may also be derived from nicotine replacement products, such as gums and patches.

THC and THC-COOH: Tetrahydrocannabinol is the main psychoactive compound in cannabis and is referred to as THC throughout this report. Cannabis consumption levels have been calculated from the THC metabolite, 11-nor-9-carboxy-tetrahydrocannabinol (THC-COOH).

1: EXECUTIVE SUMMARY

The Australian Criminal Intelligence Commission (ACIC)'s National Wastewater Drug Monitoring Program (NWDMP) reports on selected substances of concern in most populated regions of Australia. The Program commenced in August 2016. The current version of the NWDMP focuses on thirteen licit and illicit drugs, including nicotine, alcohol, methylamphetamine, cocaine and MDMA (ecstasy), with cannabis included from Report 6. Estimates of drug usage in a population are determined from measured concentrations of drug metabolites (excreted into the sewer system after consumption) in wastewater samples and results are used to monitor trends in drug consumption over the life of the Program. Wastewater treatment plants (WWTPs) located in capital cities and regional locations in all states and territories have been asked to participate in the Program. Each site has been allocated a unique code. Site names are not included in this report to maintain treatment plant confidentiality. Site codes stay assigned to each WWTP throughout the life of the Program.

For this twelfth report, wastewater samples were collected for up to seven consecutive days during weeks in August and October 2020. The August collection involved regional and capital city catchments, while October covered capital cities only. Concentrations of drug metabolites were determined in the wastewater using liquid chromatography-tandem mass spectrometric (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 by evaluating census data vs. catchment maps, together with excretion and dose data obtained from the scientific literature.

A total of 21 WWTPs in capital cities and a further 35 regional sites participated in the Program for the August 2020 period, covering a population of 13.2 million Australians. Data from this report equates to coverage of approximately 56 per cent of Australia's population for August 2020 and 48 per cent for October 2020 (capital city sites only). A total of 5,932 individual daily samples have been collected and analysed since the beginning of the Program, with new results from 509 additional samples added in this report. The collected samples provide comprehensive, Australia-wide baseline data against which subsequent results can be compared to ascertain both spatial and temporal trends. The snapshot of the scale of drug use over a week in August 2020 was compared with historical data included in previous reports. The August 2020 dataset was used for this purpose as it was more comprehensive, including both capital city and regional sites.

The spatial trends in the current reporting period and longer-term temporal trends should also be considered in the context of the COVID-19 pandemic. Australian borders were closed to non-resident arrivals in late March 2020, with Stage 3 restrictions coming into effect in April 2020, including bans on public gatherings, closures of businesses and interstate borders, social distancing restrictions and employees working from home. Towards the end of April 2020 restrictions began to ease on a jurisdiction by jurisdiction basis. With the exceptions of Victoria and some areas in New South Wales, restrictions were gradually lifted across the country through May and June 2020. Commonwealth Government income support payments started to be distributed from June 2020. Victoria experienced a second wave of restrictions following a resurgence in infections and by early July 2020 restrictions were reimposed statewide. The results in this report need to be understood in this context.

After normalising the amount of drug measured in wastewater for population size and average dose consumed, alcohol and nicotine remained consistently the highest consumed drugs in all states and territories in the August 2020 sampling. Cannabis was not included in the comparison but will be once better estimates of a typical dose are available. The consumption of nicotine and alcohol was substantially higher in regional areas compared to capital cities. Sites in New South Wales, Queensland, Tasmania and the Northern Territory had the highest levels of nicotine. Alcohol consumption was more consistent across regional parts of the country, apart from areas in South Australia and Western Australia where use was substantially lower. Levels of nicotine have been steadily increasing in some jurisdictions since the start of the Program in 2016, notably the Australian Capital Territory and regional Queensland. August data shows that overall, the Northern Territory and Tasmania had the highest capital city consumption of alcohol. Alcohol consumption has been relatively steady since the start of the Program, averaging out short-term fluctuations. South Australia and Western Australia were some of the exceptions, with declining longer-term alcohol consumption rates. The declines in alcohol consumption following COVID-19 restrictions in April were followed by a rebound in use in June once restrictions were eased. August results reveal that alcohol use continued to increase in the Northern Territory, Tasmania and Western Australia, reaching annual highs. For the most part though, alcohol use returned to pre-COVID levels or slightly below. Nicotine use appeared to be following similar local trends as those leading up to the pandemic.

Methylamphetamine was the drug most affected by events in 2020. While it continued to be the most used illicit drug when expressed as doses per day, the national average level of the drug decreased from approximately 50 doses per day per 1,000 people at the start of the year, to less than 30 doses per day per 1,000 people in August. This was despite trends over the life of the Program showing an increase in methylamphetamine use in almost every part of the country. Large differences were evident between sites in August, even within the same state or territory. New South Wales and South Australia had some of the highest capital city levels, while regional sites in Tasmania and Victoria had the highest overall use. The impact of COVID-19 was most dramatic in the Northern Territory, Tasmania and Western Australia, where the capital city averages reached historical low levels in August. The effects of the pandemic were delayed in regional Australia, with declines only becoming really apparent in August.

Cocaine consumption in Australia in August 2020 remained highest in capital city New South Wales. However, the Australian Capital Territory has experienced increased consumption of the drug over the past two years, reaching historically high levels in this reporting period. A characteristic of cocaine use is the average consumption being lower in regional centres. This reporting period was no different. The overall trend over the life of the Program showed increases in many states and territories. The pandemic only briefly interrupted measured levels in April. Since then, use has mostly returned to pre-COVID levels or has increased, including in Victoria with its extended lockdown. South Australia and Western Australia experienced the only declines of the capital cities. MDMA usage was relatively low compared to previous results, though no consistent patterns were evident across the country. Regional use was higher than in the capital cities. Some states and territories showed increased use after the initial declines associated with April restrictions, while others showed decreases. Overall MDA use was relatively low, with no consistent pattern being evident. Sites in regional Queensland recorded the highest levels, while regional averages overall were higher than in the capital cities. With the ongoing pandemic, MDA use has declined almost everywhere, Queensland being the exception.

Oxycodone and fentanyl are prescription pharmaceutical opioids with abuse potential. Per capita oxycodone consumption was substantially higher in regional parts of the country in August 2020 compared to the capital cities, most evident in Victoria and Queensland. Similar to previous findings, Tasmania had the highest rates of use of the capital cities. A decline in long-term use of the substance in Australia has been a feature. However, over the course of 2020, levels have plateaued in many jurisdictions, or have even increased in the case of Tasmania. Fentanyl use was also more prevalent in regional parts of the country. The rate of decline of consumption appeared to accelerate after COVID-19 in many parts of the country, particularly the Northern Territory and South Australia. Many areas reached their lowest levels of fentanyl consumption in the current collection period.

Heroin consumption remained mostly centred in Victoria and parts of New South Wales, though the Australian Capital Territory reached its highest levels to date and exceeded levels in all but one New South Wales site. Victoria also recorded historical highs in August 2020. Average use of the drug was lower in regional areas compared to the capital cities in the reporting period. Although no consistent long-term trends of heroin use have been apparent over the course of the Program, heroin consumption has increased since the onset of COVID-19 in many capital cities and regional areas.

The cannabis metabolite, 11-nor-9-carboxy-tetrahydrocannabinol (THC-COOH), a specific marker for cannabis consumption, is excreted in extremely small amounts. This may be a cause of variability in back-calculated results, so a cautious approach is needed when making comparisons. The results of the August 2020 collection showed that use increased in many jurisdictions and some of the highest levels to date have been recorded. The regional average rate of consumption was high compared to capital cities. South Australia and parts of Queensland and Tasmania had high consumption levels. Tasmania had the highest use of the capital cities. Cannabis consumption trends in capital city sites between April and August 2020 were variable, with capital city consumption in New South Wales and Queensland being less than the national average in August 2020.

For the other drugs included in the NWDMP, methylone and mephedrone concentrations were generally at or below detection levels at most participating sites. The rise in detection frequency of mephedrone in Australian capital cities recommenced after a short period of decline mid-year. The two stimulants will not be specifically included in future reports. Instead, the occurrence of emerging stimulants will be reported collectively, when such compounds appear in wastewater.

2: INTRODUCTION

2.1 PREAMBLE

Wastewater analysis is a technique for monitoring the population-scale consumption of substances. The University of Queensland and University of South Australia were commissioned to provide drug consumption data to the ACIC for an initial three-year Program from 2016 to 2019, including nine public reports. The two universities have been recommissioned to provide data for a further four years, including a further 12 public reports. Wastewater treatment sites have been assessed, bimonthly in the case of capital city sites and every four months for regional sites. The aim has been 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 build on the baseline data of substance use across Australia to establish trends. This latest NWDMP report compares consumption data from previous reports with results obtained subsequently from all sites in August 2020 and capital cities in October 2020.

Compounds of concern include nicotine from nicotine intake (cigarettes, gum, patches, e-cigarettes, etc.), ethanol from alcohol intake, pharmaceutical opioids with abuse potential, illicit substances such as methylamphetamine, MDMA, cocaine and heroin, as well as two new psychoactive substances (NPS). Amphetamine and MDA were not included in the initial reports. The former is a by-product of methylamphetamine pyrolysis as well as one of its metabolites. Amphetamine is also a prescribed drug but can be used as an illicit substance. However, we found the levels of amphetamine corresponded largely with the expected values from the excretion of methylamphetamine. Similarly, MDA is a metabolite of MDMA but can also be used as an illicit drug. However, since the proportion of MDA derived from MDMA is known, the difference between measured MDA and MDMA metabolite has been included in the NWDMP since Report 3. The amount of MDA was calculated by subtracting 1.65 mg of MDA for every 100 mg of MDMA consumed (Pizarro et al. 2002; Khan & Nicell 2011) and is expressed in units of mg excreted per day per 1,000 people. Cannabis was measured by its urinary metabolite, THC-COOH. The report presents patterns of substance use across Australia, showing differences in levels between capital cities and regional centres, within and between states and territories, and nationally. Cannabis results are expressed only as mg consumed per day per 1,000 people and will also be expressed as dose per day per 1,000 people when better estimates of a typical dose become available.

3: METHODS

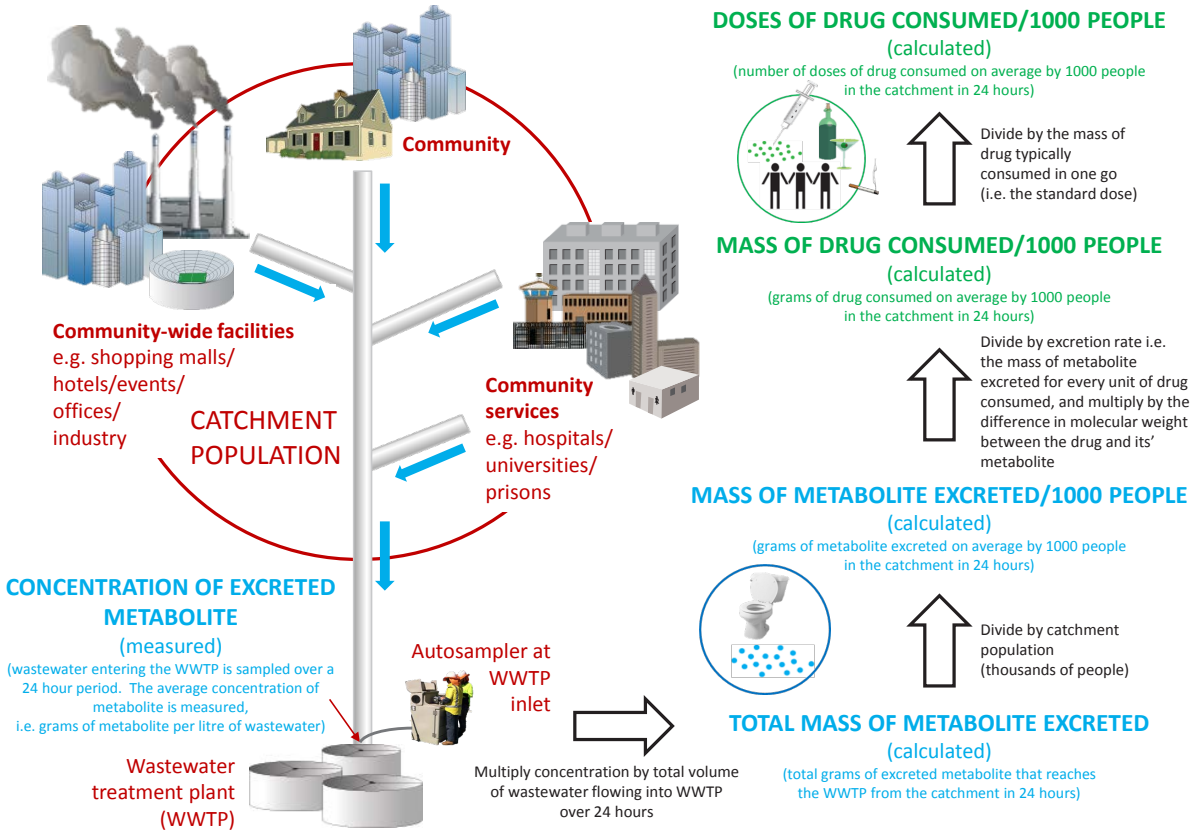
The method underlying wastewater-based monitoring of drug use in a given population is based on the principle that any given compound that is consumed (irrespective of whether it is swallowed, inhaled/smoked or injected) will subsequently be excreted. This may be either in the chemical form it was consumed and/or in a chemically modified form that is referred to as a metabolite. Once the excreted compound or metabolite is flushed, it will enter the sewer system, assuming the toilet forms part of a wastewater catchment.

The drugs and their metabolites of interest were included in the first NWDMP report (available at www.acic.gov.au), as well as an in-depth description of the methodologies involved.[6]

6 Information in relation to heroin appears in Report 3.

Collectively, waste products in the sewer system arrive at a WWTP where wastewater samples are collected over a defined sampling period. Measuring the amount of a 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 aid with collecting the samples from the influent autosampler (where the wastewater enters the treatment plants). Details of the calculation methods are given in Report 1. From the August 2018 collection period, operators collected a second daily influent sample with sodium metabisulphite (0.5% m/v) as preservative to allow for the detection of the cannabis metabolite.

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 Report 1. An updated excretion table including THC-COOH and dose can be found in Appendix 1. Methods to extract and analyse the cannabis metabolite are outlined in Tscharke et al. (2016).

3.1 PARTICIPATING WASTEWATER TREATMENT PLANTS (WWTPs)

Fifty-six WWTPs across Australia participated in the NWDMP for the August 2020 collection period (Figure 2). Of these, 21 sites were located in capital cities and a further 35 were regional sites, covering a wide range of catchment population sizes. Sites were selected by the Australian Criminal Intelligence Commission. The number of participating sites for this report and a complete list of participating sites, number of samples and relative catchment sizes are listed in Table 9 and Appendix 2. 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 August 2020 showing the number of capital city and regional plants by state and territory. The colours in this figure are matched with others in the remainder of the report to identify results relating to individual states and territories.

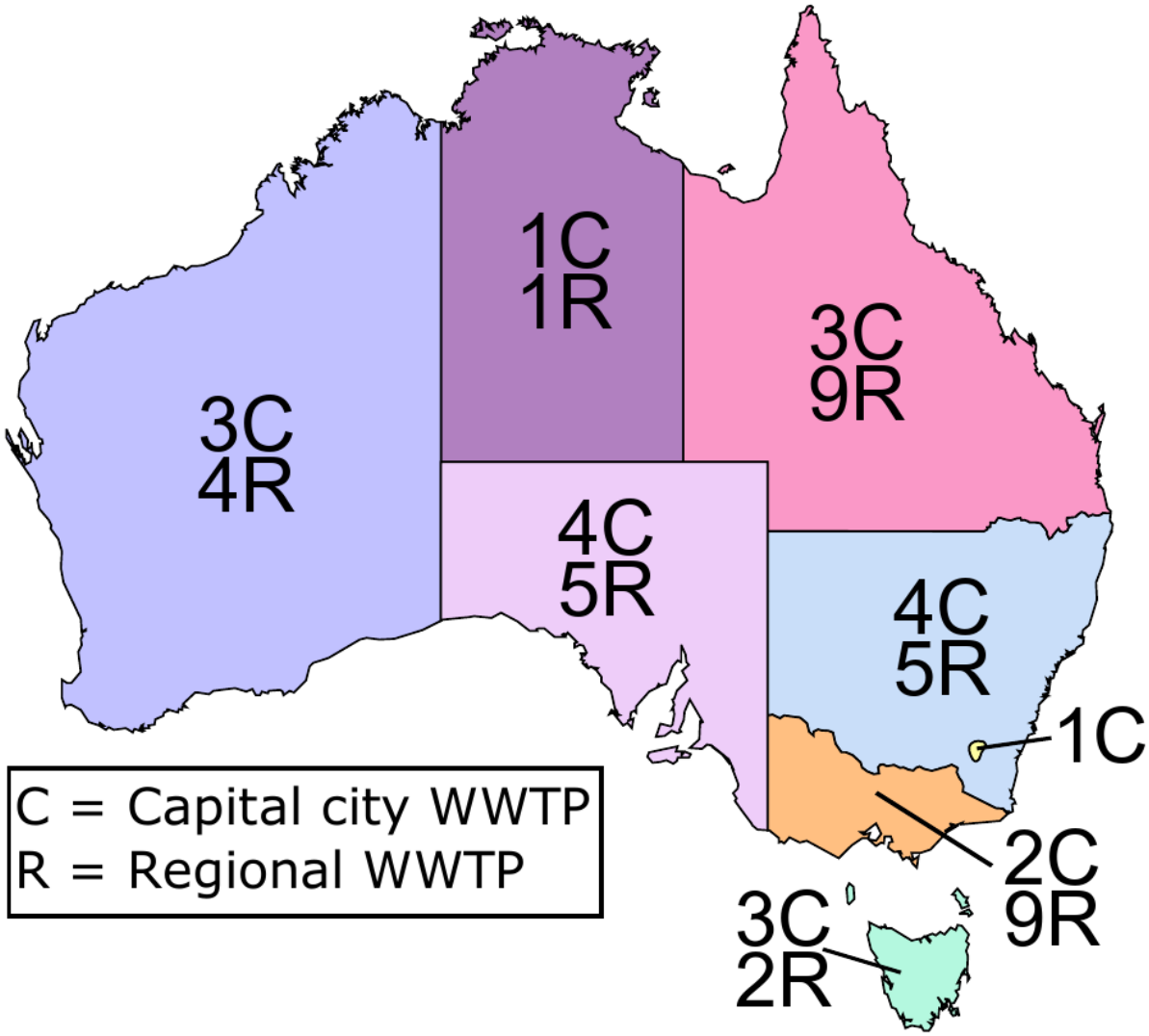


Table 9: Number of participating WWTPs for the periods covered in this report. One collection period aims to collect data from both regional (R) and capital city (C) sites, while the other collection period aims to collect data from capital city sites only.

State/territory	Aug 2020 Capital	Aug 2020 Regional	Oct 2020 Capital
ACT	1	0	1
NSW	4	5	3
NT	1	1	1
Qld	3	9	3
SA	4	5	4
Tas	3	2	3
Vic	2	9	2
WA	3	4	3
Sites	**21**	**35**	**20**
Population (millions) C & R	**11.3**	**1.9**	**11.2**
% of Australian Population	**48.2**	**7.9**	**47.9**
Total population (millions)		**13.2**	**11.2**
% of Australian population		**56.1**	**47.9**

Estimates have been rounded to the nearest 0.1 million. Census 2016 population used (23,401,892) for population percentage estimates.

3.2 SAMPLE COLLECTION AND PREPARATION

Daily composite samples were collected by treatment plant staff on seven consecutive days, or where seven days was not feasible, across as many consecutive days as possible. Regional sites in South Australia have only been providing weekend samples since April 2018, which should be considered when interpreting historical results where the number of sampling days was five—see Appendix 3, Report 6. In addition, weekend samples in many of the Tasmanian sites were not available. Small revisions may be made to historical data when more accurate data become available, for example, updated flow measurements supplied by wastewater treatment authorities. Samples were stored at 4°C or were frozen prior to transport to South Australia or Queensland. 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) and Bade et al. (2019). All other descriptions of calculations, extractions and analytical methods are outlined in Report 1 (available at www.acic.gov.au). Methods to detect and analyse THC-COOH are outlined in Tscharke et al. (2016).

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 Australian Bureau of Statistics (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 the 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). For the specific case of MDA, the amount of MDA excreted following MDA consumption is not known, and therefore this drug can only be expressed as how much drug was excreted into the sewer network, e.g. the mg excreted per 1,000 people per day. For cannabis, the approximate dosage is not well defined, and results are expressed as mg consumed per 1,000 people per day.

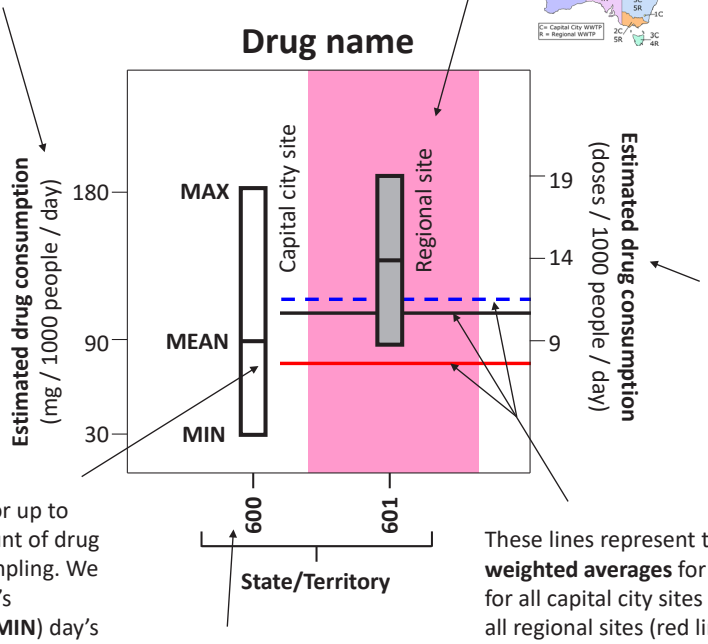
Figure 3: Explanation of the graphical representation of data for individual sites and bubble maps. General concepts relevant to all graphs in the report are also outlined (unique site codes, explanation of vertical axes, colour coding).

The **left hand axis** shows the estimated total mass consumed (in milligrams, mg) of a drug which is calculated by measuring the concentration of the drug's metabolite in a 24 hour wastewater composite sample, multiplying by the flow volume in the 24 hours, dividing by the population size and applying an excretion factor for the metabolite (see Equation 1, Report 1 for details).

To convert the mass consumed (left axis) to the estimated doses consumed (right axis), we divide the estimated mass consumed by the standard dose amount. Dose amount and excretion factors are given in Appendix 1 of Report 4. In this example, at Site 600, the minimum consumption was 30 mg in one day, the maximum was 180 mg and average was 90 mg per day over the sampling period (for every 1,000 people).

We collect wastewater data for up to 7 days and estimate the amount of drug consumed for each day of sampling. We plot the maximum (**MAX**) day's consumption, the minimum (**MIN**) day's consumption and the average (**MEAN**) across the 7 days. If the box is long, there is a large difference in consumption patterns over the week; for example, if drugs are used excessively at weekends but not often during the week. Alternatively, a short box suggests a similar drug usage every day of the week. See also main text.

Colours help identify the State or Territory that the data relates to (colours are consistent between Figures).



Unique number allocated to each WWTP to maintain confidentiality. WWTP names will not be disclosed publicly.

The **right hand axis** shows the estimated number of doses of a drug consumed by 1,000 people in the catchment in a 24 hour period; e.g., one dose would be 1 cigarette, 1 standard drink or 1 injected amount of drug. In this example, at Site 601, the minimum consumption was 9 doses in one day, the maximum was 19 and average was 14 per day over the sampling period (for every 1,000 people).

These lines represent the **population weighted averages** for drug consumption for all capital city sites (blue dotted line), all regional sites (red line) and for all sites combined (black line). The method to calculate weighted population averages is given in the main text. In this example, the average consumption for regional Site 601 (horizontal bar within red checked box) is above both the average for regional sites and all sites nationally. In contrast, the average consumption for capital city Site 600 is below the national average.

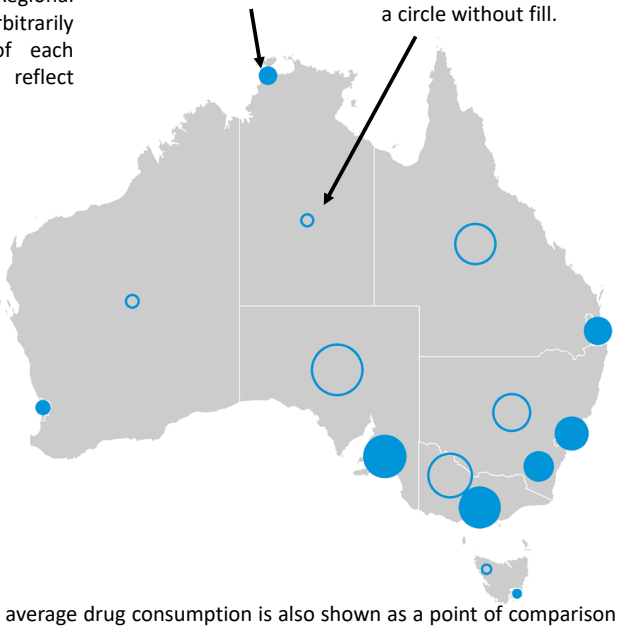
Figure 3 (continued): Explanation of the graphical representation of data for individual sites and bubble maps. General concepts relevant to all graphs in the report are also outlined (unique site codes, explanation of vertical axes, colour coding).

Bubbles:
Capital city site averages are drawn over the capital city of a jurisdiction and the regional site averages are drawn in the middle of the State or Territory. Regional bubbles are drawn arbitrarily close to the centre of each jurisdiction and do not reflect location of sites.

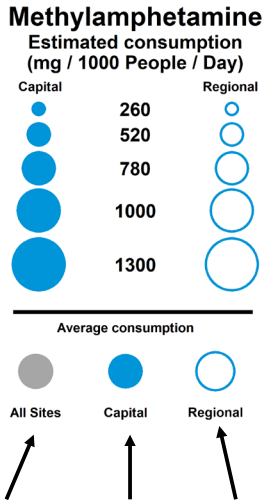
This type of plot gives a rough overview of drug consumption per jurisdiction. The other temporal and spatial comparison graphs give greater resolution to compare between locations and over time, and should be used for analysis.

Capital city average:
Population-weighted average of all capital sites tested per jurisdiction. Capital sites are indicated by a filled circle.

Regional city average:
Population-weighted average of all regional sites tested per jurisdiction. Regional sites are indicated by a circle without fill.



Legend:
The population-weighted average drug consumption for each jurisdiction is represented as a scaled circle. Representative consumption estimates are shown at the right of the bubble plot. Each bubble is scaled individually based on the consumption level.



Aggregated data:
The population-weighted average drug consumption is also shown as a point of comparison for all sites, all capital, and regional sites that were tested within the timepoint. This incorporates sites from **all jurisdictions** for the timepoint under investigation. These are also represented with sizes representing the scale of use categories used for the jurisdictional averages.

Instrumental method limits of detection and limits of quantification: 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 determined 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 be present at undetectable levels. The limit of quantification (LOQ)[7] 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 LOQ 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 practice for back calculations to estimate per capita consumption, a concentration below the LOD was included as a value of LOD/√2. A concentration above the LOD but below LOQ is included at the midpoint between the LOD and LOQ (i.e. (LOD + LOQ)/2). The frequency of detection of each analyte of interest is included in Appendix 3.

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. This is because the starting day of the collection week did not always correspond for every plant. We present only maximum, minimum and average (for the individual sites) (e.g. Figure 3) and only population-weighted average 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 tend to have lower daily variation, suggesting that their consumption is consistent throughout the week (Lai et al. 2015, Tscharke et al. 2016).

7 LOQ is the lowest level that can be accurately measured.

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 for August 2020 (section 4.1), temporal trends for states and territories for the past two years (section 4.2) and within each state and territory (section 4.3). August 2020 data were used for Section 4.1 as it included the latest set of results for the full suite of sites included in the Program. We recommend exercising caution when comparing results between sites as some plants provided samples for fewer days than others and the collection week did not correspond in all instances. A list of the detection frequency for each drug can be found in Appendix 3. This report retained the current population estimates introduced in Report 4 by integrating the specific wastewater catchment areas against the high-resolution population data released from the 2016 Census. 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. The uncertainties in population numbers may be particularly evident in smaller regional communities or sites where short-term population changes occur due to employment opportunities, tourism or festival events.

4.1 INDIVIDUAL SITE COMPARISON OF DRUG USE IN AUGUST 2020

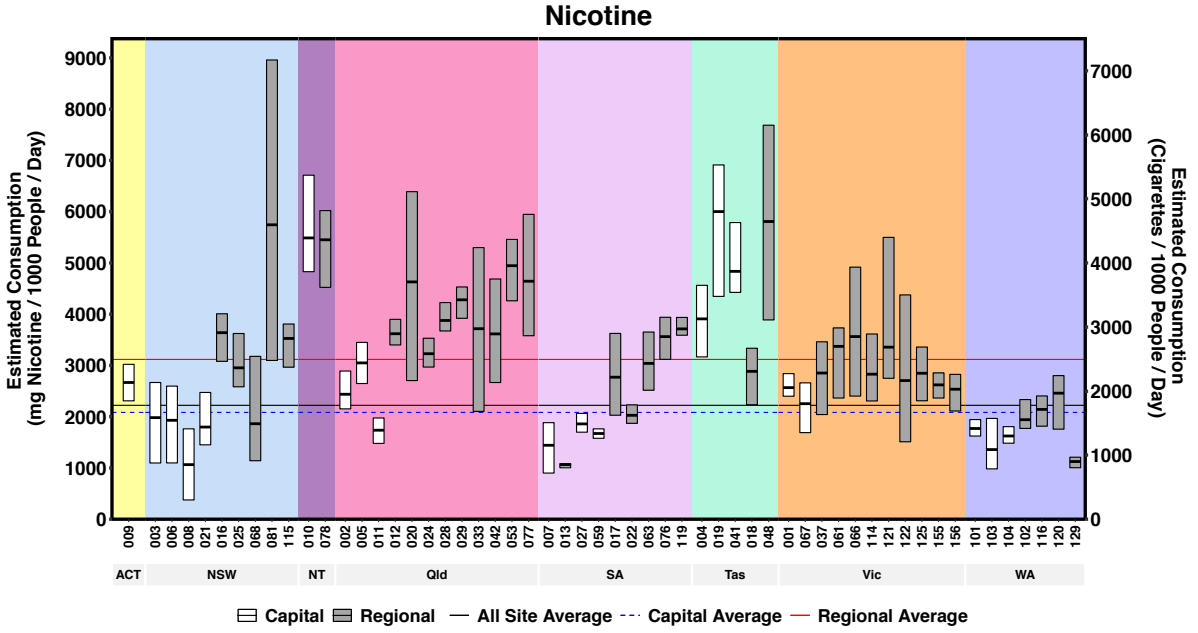
4.1.1 NICOTINE AND ALCOHOL

Two nicotine metabolites, cotinine and hydroxycotinine, were used to estimate the consumption of tobacco. The estimate is expressed as nicotine in this report as the method cannot distinguish between nicotine intake from tobacco, electronic cigarettes and nicotine replacement therapies such as patches and gums. The results show that in August 2020 the consumption of nicotine was highly variable between sites across the country (Figure 4). Nicotine use on average was much higher in regional Australia compared to the capital cities (red horizontal and dotted blue lines, respectively). Levels in the Northern Territory and Tasmania were the highest overall, while specific regional sites in New South Wales and Queensland were well above average. In contrast, capital city sites in New South Wales, South Australia and Western Australia all had below average nicotine consumption.

Alcohol consumption was measured using a specific metabolite of ethanol. The difference between the average consumption of alcohol in regional and capital city sites was less than nicotine. Nevertheless, average regional use was higher than the capital cities (Figure 5). At the state and territory level, exceptions were evident. The mean use across city and regional South Australia was similar, while Western Australia regional centres consumed less alcohol than in the city. The Northern Territory recorded the highest levels in the country. It was interesting to note that Victoria recorded alcohol consumption levels below or at the national average in both the capital city sites and regional centres. This was the state most affected by a second wave of COVID-19 infections, with significant restrictions on movement and social interactions at the time of the August collection.

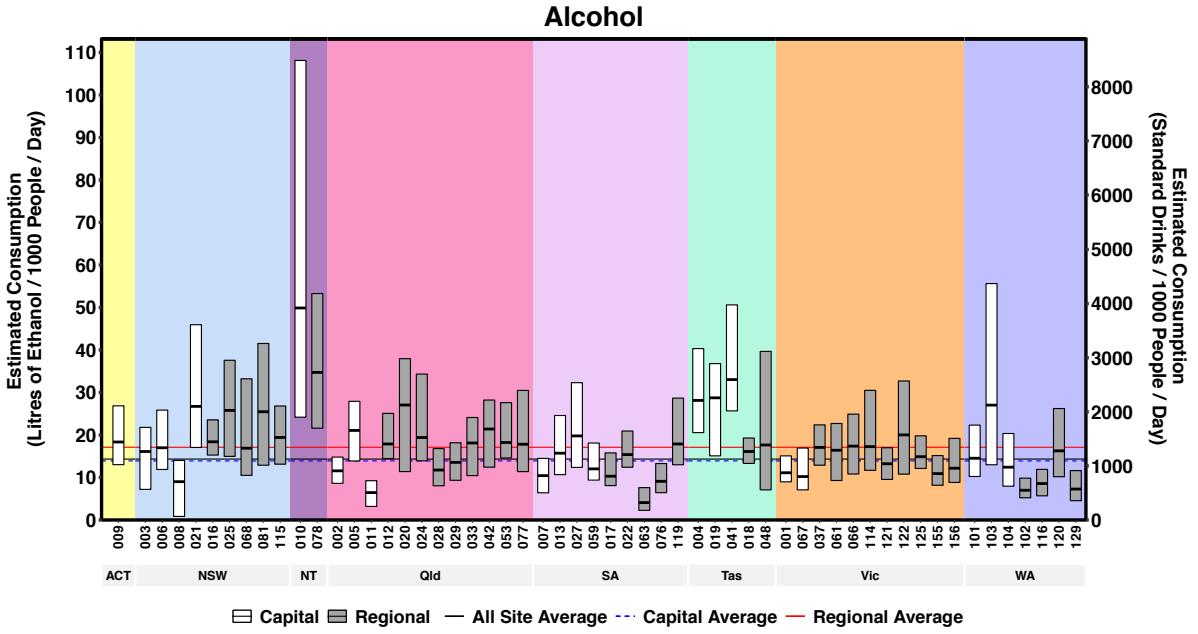
The relative consumption levels can be represented in a pictorial way by showing the relative scale of use of nicotine (Figure 6) and alcohol (Figure 7) as capital city or regional ‘bubbles’ for each state and territory. The higher than average consumption of both nicotine and alcohol is evident from the size of the bubbles in the Northern Territory.

Figure 4: Estimated nicotine consumption for August 2020 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 5-7.



- High regional average
- Variable across Australia

Figure 5: Estimated alcohol consumption for August 2020 in volume consumed per day (left axis) and standard drinks per day (right axis) per thousand people. The number of collection days varied from 5-7.



- Regional average higher
- Large differences between sites

Figure 6: Estimated average nicotine consumption per jurisdiction for August 2020 in number of cigarettes per day per thousand people. The number of collection days varied from 5-7.

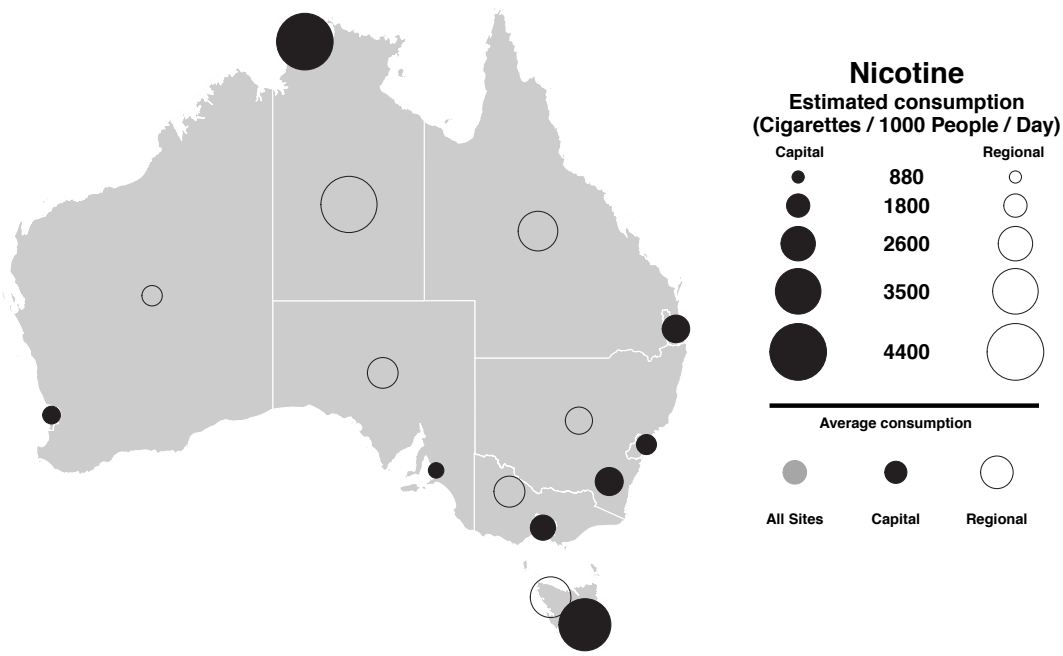
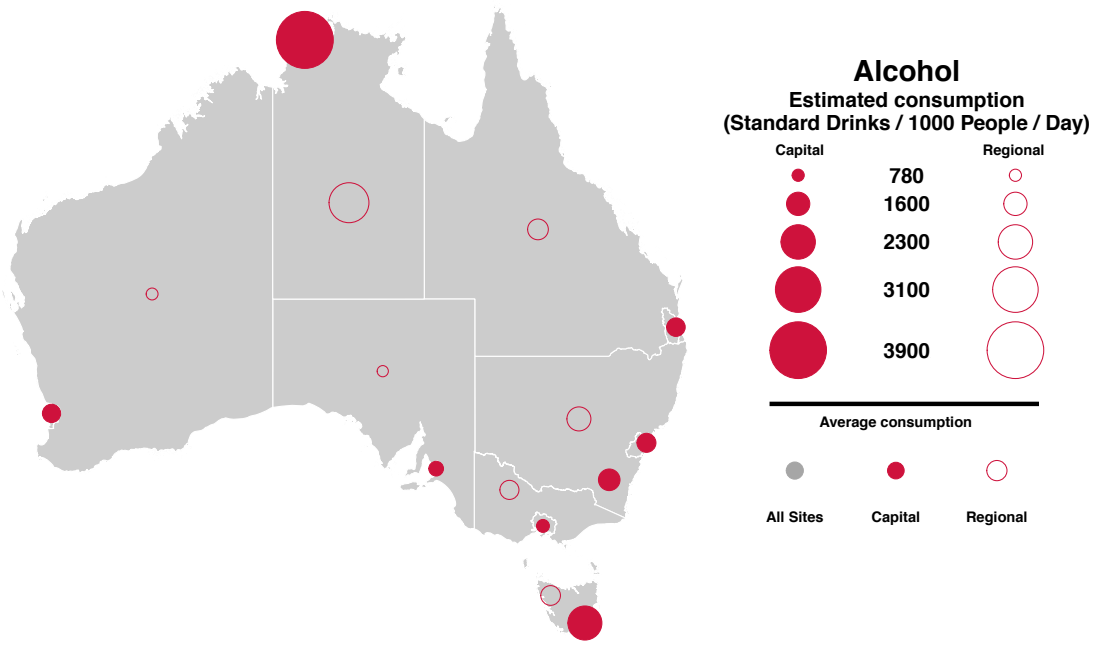


Figure 7: Estimated average alcohol consumption per jurisdiction for August 2020 in number of standard drinks per day per thousand people. The number of collection days varied from 5-7.



4.1.2 STIMULANTS

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

4.1.2.1 METHYLAMPHETAMINE

The level of methylamphetamine use was highly variable across sites, both in terms of capital cities and regional catchments (Figure 8). Regional centres had higher average use in August 2020. At some sites, notably Site 3 in New South Wales and Site 66 in Victoria, the variation over the course of the collection week was very wide. This is inconsistent with the use of the substance, which is usually relatively stable over the short-term. Site 3 in capital city New South Wales and parts of regional South Australia and Victoria recorded the highest daily levels. The Northern Territory, Tasmania and Western Australia showed overall use well below the national averages.

4.1.2.2 AMPHETAMINE

The measured concentration of amphetamine in the August 2020 samples mostly fell within a range which is consistent with the reported excretion rates following methylamphetamine consumption (Gracia-Lor et al. 2016). The results were in agreement with our previous findings (see Appendix 4 of Report 1). Therefore, we assumed that the levels of amphetamine in wastewater samples were predominantly due to the metabolism of methylamphetamine. It is possible that some of the measured amphetamine could be the result of ingestion of the drug, but the high levels of methylamphetamine means a firm conclusion is not possible.

4.1.2.3 COCAINE

Benzoylecgonine, the specific metabolite of cocaine, was used to estimate the consumption of the stimulant. Contrary to methylamphetamine, capital city areas on average had higher cocaine use than regional centres (Figure 9). Compared to methylamphetamine, daily doses per thousand people were much lower at 7, compared to 28. The Australian Capital Territory, New South Wales and Site 5 in Queensland had the highest capital city consumption figures in the nation while Site 12 in Queensland recorded the highest regional use. Cocaine consumption was generally low in most other parts of Australia, particularly the regional centres of the Northern Territory and Western Australia. Tasmanian regional sites were unable to provide weekend samples. As a larger proportion of cocaine may be consumed on weekends, these results may under-represent consumption in that state.

4.1.2.4 MDMA (3,4-METHYLENEDIOXYMETHYLAMPHETAMINE)

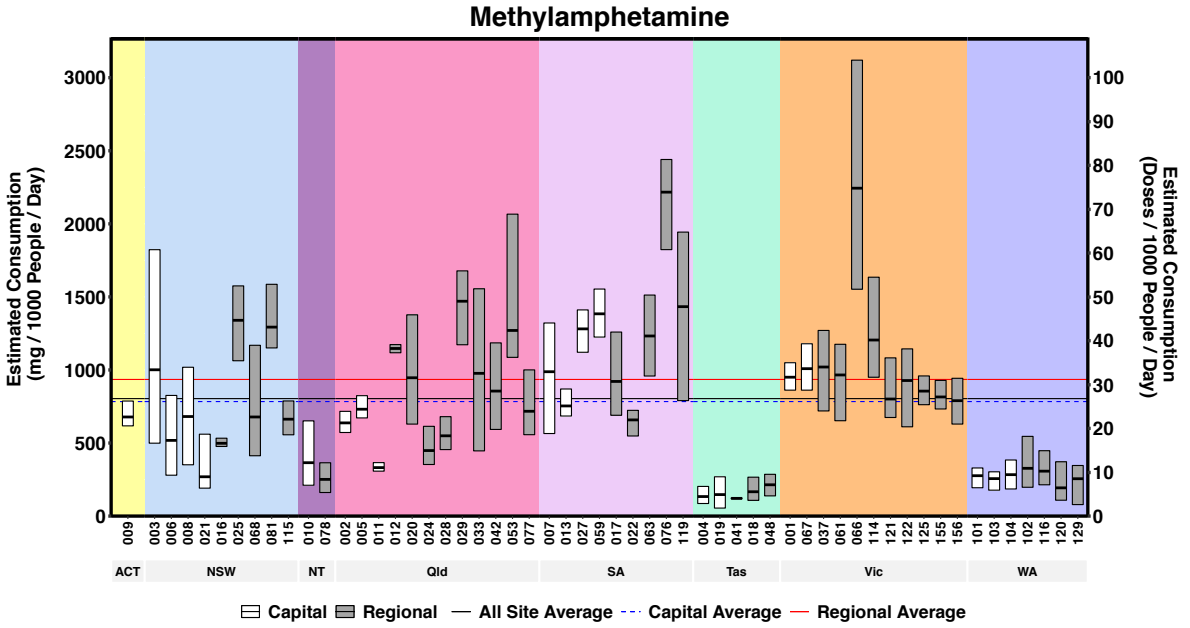
The average consumption of MDMA was lower than the other two stimulants (Figure 10). The variation over the course of the sampling week was large, especially capital city sites in the Northern Territory and Western Australia where the highest use was recorded. The large spread in values over the short-term was consistent with the weekend use of the drug, particularly at sites 10 and 103. A direct comparison of regional and capital city sites in Tasmania is inappropriate as the regional centres did not sample on weekends when MDMA consumption is typically higher. See Appendix 2 for a list of the number of samples collected per site. Overall, regional average use of MDMA was only slightly higher than in the capital cities. This is unusual, as the gap between the two geographical areas tended to be much larger in previous collection periods.

4.1.2.5 MDA (3,4-METHYLENEDIOXYAMPHETAMINE)

MDA is both a drug in its own right and a metabolite of MDMA. Since the proportion of MDA eliminated after MDMA consumption is known, the proportion of MDA attributable to MDMA metabolism was subtracted from the total measured amount of MDA for each site. Results for MDA were expressed as mg excreted per 1,000 people per day (daily mass load) and not as consumption due to the lack of metabolic information of MDA elimination following MDA consumption. Levels of the drug were low across Australia, especially the capital cities (Figure 11). The regional average was high, but this could be attributed to Queensland, the only state with relatively high use.

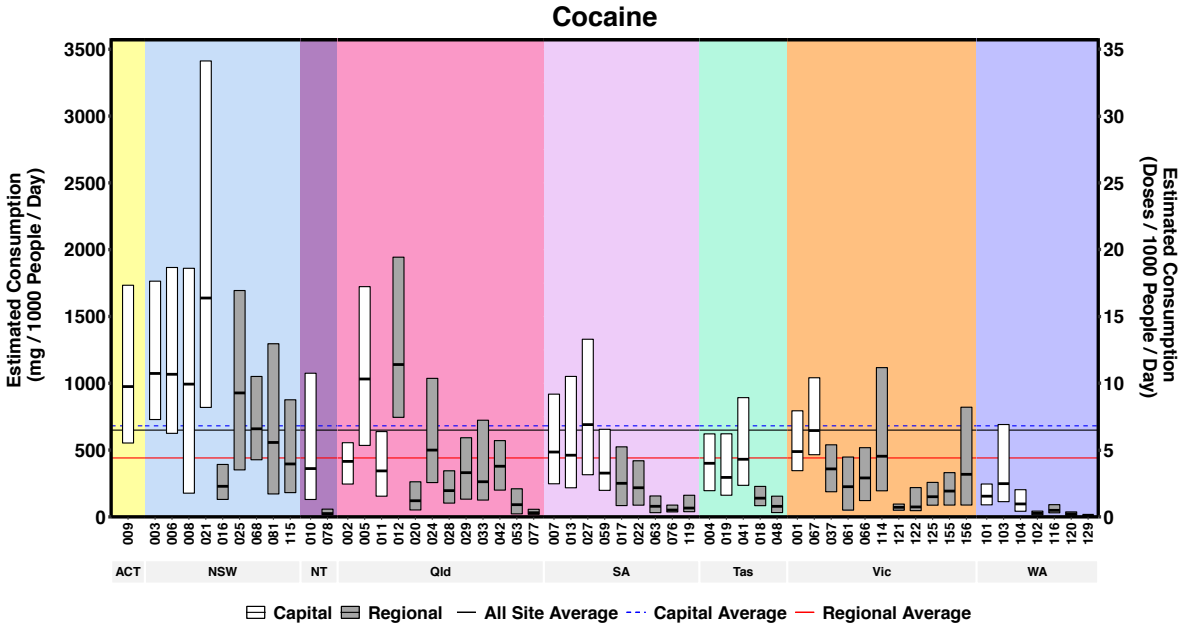
The scale of use of each stimulant is expressed as a bubble graph to compare regional and capital city use of methamphetamine (Figure 12), cocaine (Figure 13), MDMA (Figure 14) and MDA (Figure 15) across the country. The popularity of cocaine on the south-eastern seaboard remains apparent.

Figure 8: Estimated methylamphetamine consumption for August 2020 in mass consumed per day (left axis) and doses per day (right axis) per thousand people. The number of collection days varied from 5-7.



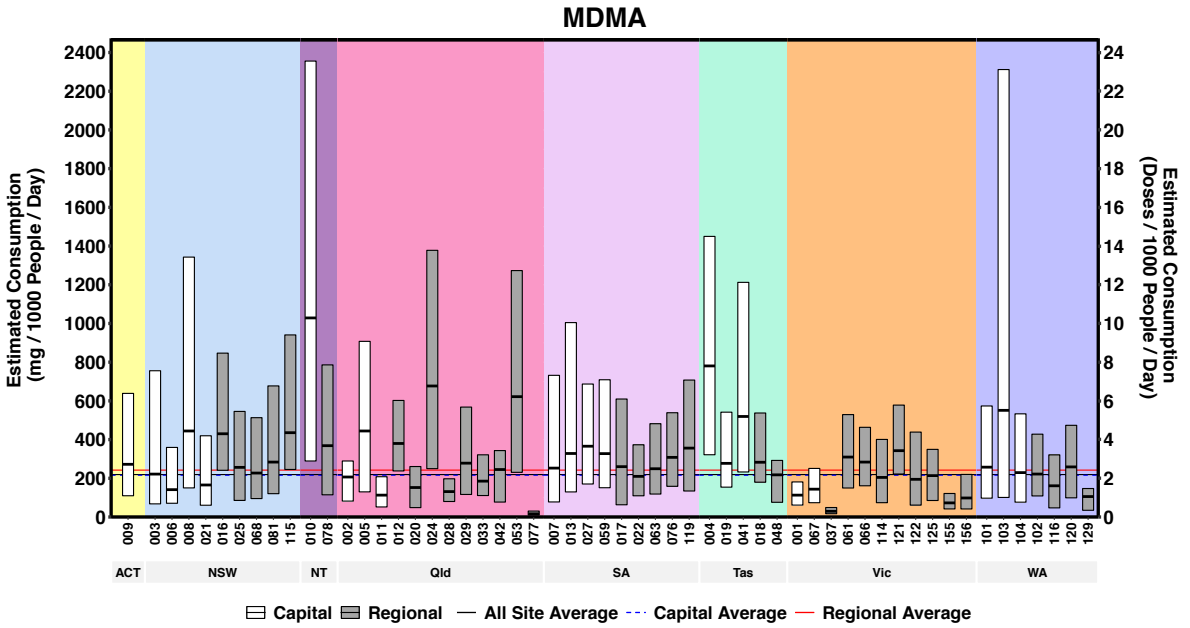
- Higher regional consumption
- Variable across Australia

Figure 9: Estimated cocaine consumption for August 2020 in mass consumed per day (left axis) and doses per day (right axis) per thousand people. The number of collection days varied from 5-7.



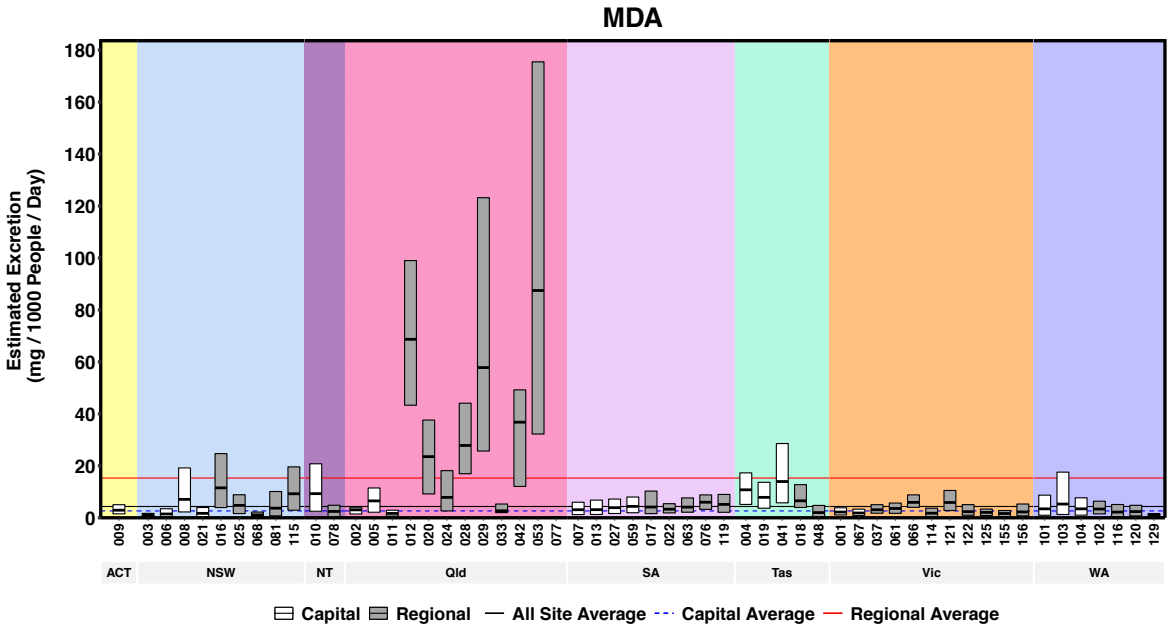
- Higher capital city consumption
- High overall consumption in NSW and ACT

Figure 10: Estimated MDMA consumption for August 2020 in mass consumed per day (left axis) and doses per day (right axis) per thousand people. The number of collection days varied from 5-7.



- Overall, low consumption rates nationally
- Wide weekly spread indicates higher weekend consumption

Figure 11: Estimated MDA excretion for August 2020 in mass excreted per day per thousand people. The number of collection days varied from 5-7.



- Use predominantly in regional Qld
- Relatively low levels in general

Figure 12: Estimated average methylamphetamine consumption per jurisdiction for August 2020 in mg consumed per day per thousand people. The number of collection days varied from 5-7.

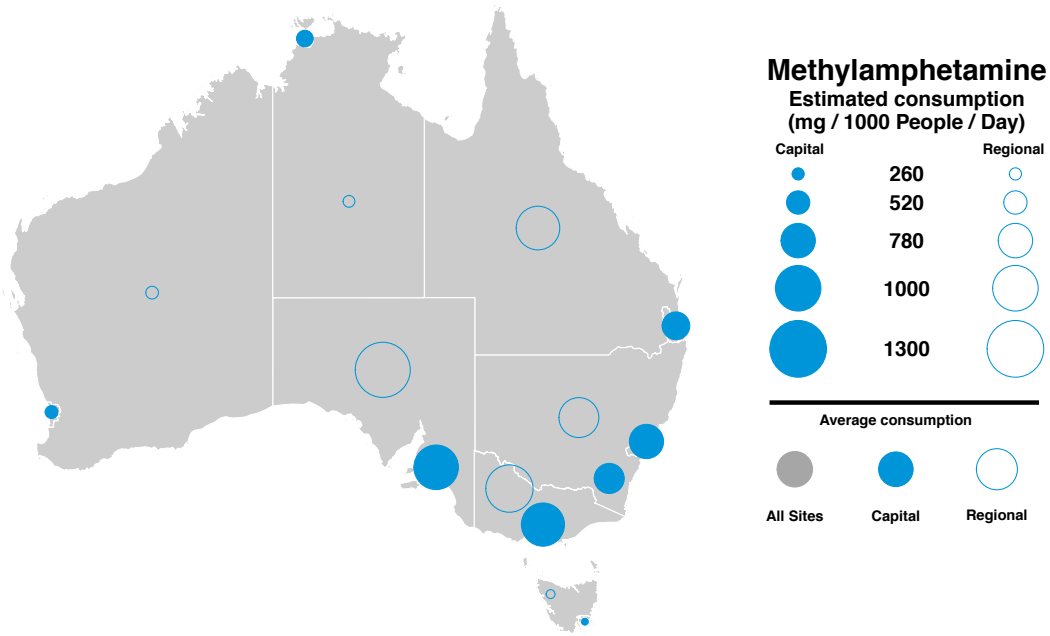


Figure 13: Estimated average cocaine consumption per jurisdiction for August 2020 in mg consumed per day per thousand people. The number of collection days varied from 5-7.

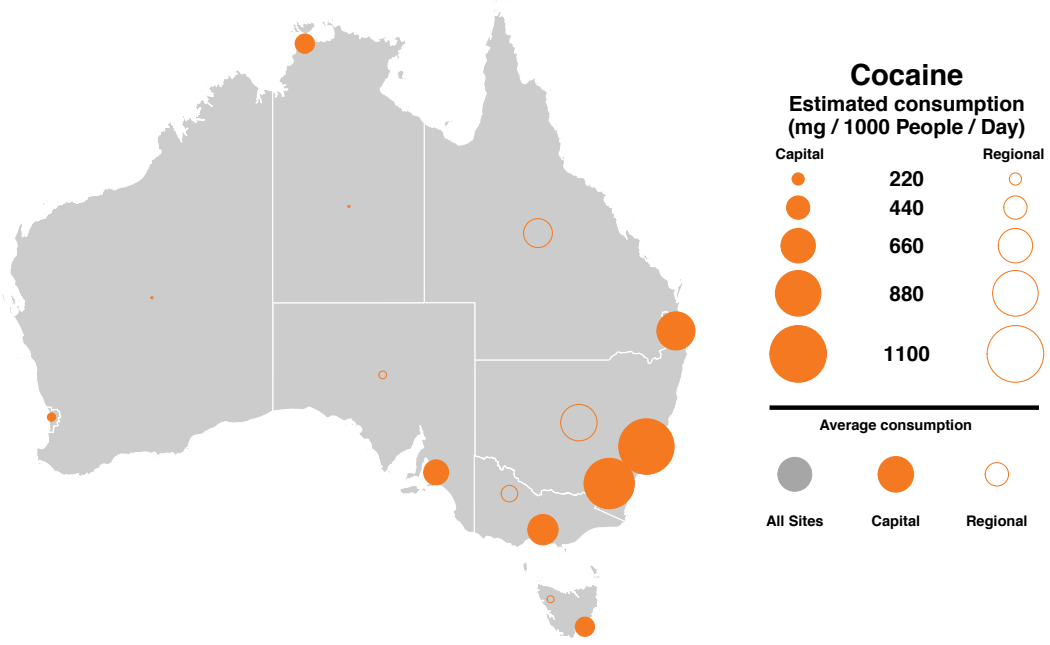


Figure 14: Estimated average MDMA consumption per jurisdiction for August 2020 in mg consumed per day per thousand people. The number of collection days varied from 5-7.

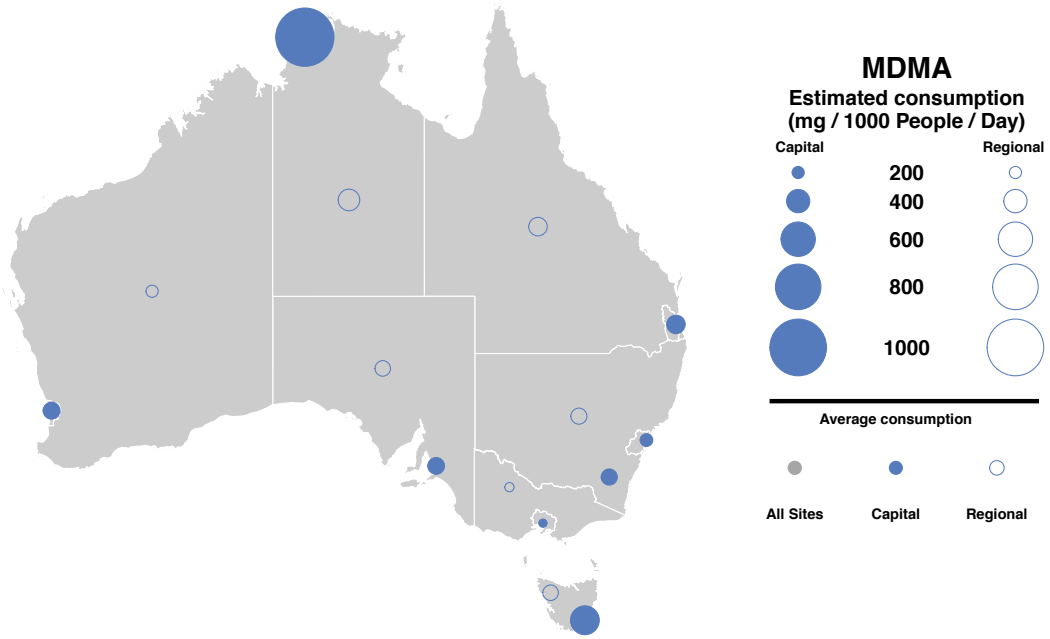
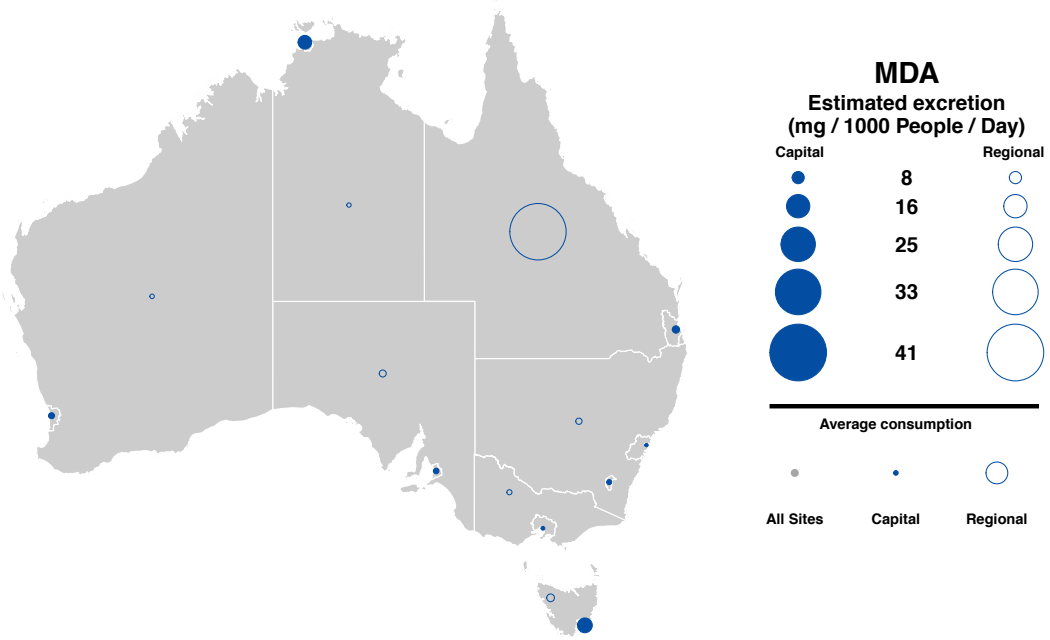


Figure 15: Estimated average MDA excretion per jurisdiction for August 2020 in mg excreted per day per thousand people. The number of collection days varied from 5-7.



4.1.3 OPIOIDS

Two prescription opioids were measured, as well as heroin, an illicit drug. Oxycodone and fentanyl are legally prescribed pharmaceuticals with abuse potential. Although wastewater analysis cannot be used to differentiate between prescribed use for therapeutic purposes and use for non-medical purposes, the relative scale of use of these substances remains of interest as they have the potential for addiction.

4.1.3.1 PHARMACEUTICAL OPIOIDS

The metabolism and excretion profiles of oxycodone and fentanyl are well established. The main metabolite of each compound was measured to estimate drug consumption.

Oxycodone consumption across Australia in August 2020 was variable and a very large difference was evident between the overall regional and capital city averages (Figure 16). The difference was mainly attributable to New South Wales, Queensland and Victoria. In general, regional Queensland and Victoria had the highest consumption, while Tasmania had the highest rates of use of the capital cities. The Northern Territory and Western Australia had relatively low overall consumption levels compared to the national averages.

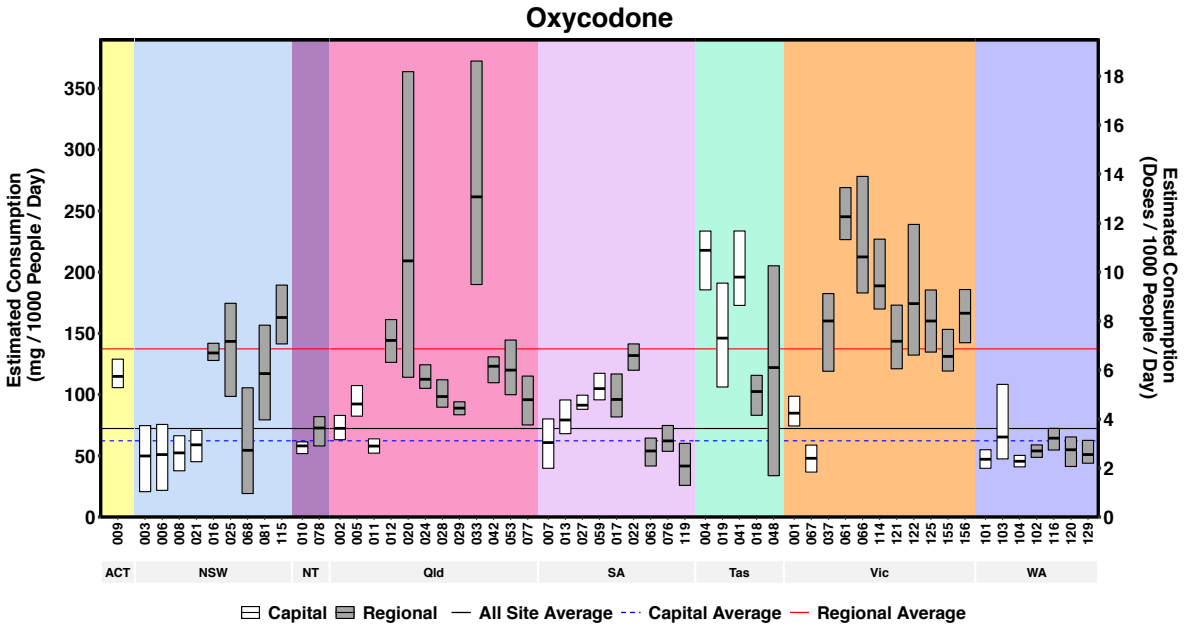
Fentanyl use was similarly variable across Australia and once again regional use of this pharmaceutical opioid exceeded that in the capital cities (Figure 17). Some regional catchments in New South Wales, Queensland and South Australia had the highest levels of use. Specific days at some sites had levels below the quantification limits of the method. The wide spread across the collection week at many sites is peculiar for a prescribed pharmaceutical, but may be partially attributable to the relatively low levels of the drug in wastewater.

The relative scale of oxycodone and fentanyl use was apparent when results were aggregated by jurisdiction and capital or regional area and presented in bubble graph form. Generally higher oxycodone consumption rates in regional areas and in capital city Tasmania were apparent (Figure 18). Fentanyl consumption was relatively consistent between most capital cities, apart from the Northern Territory (Figure 19).

4.1.3.2 HEROIN

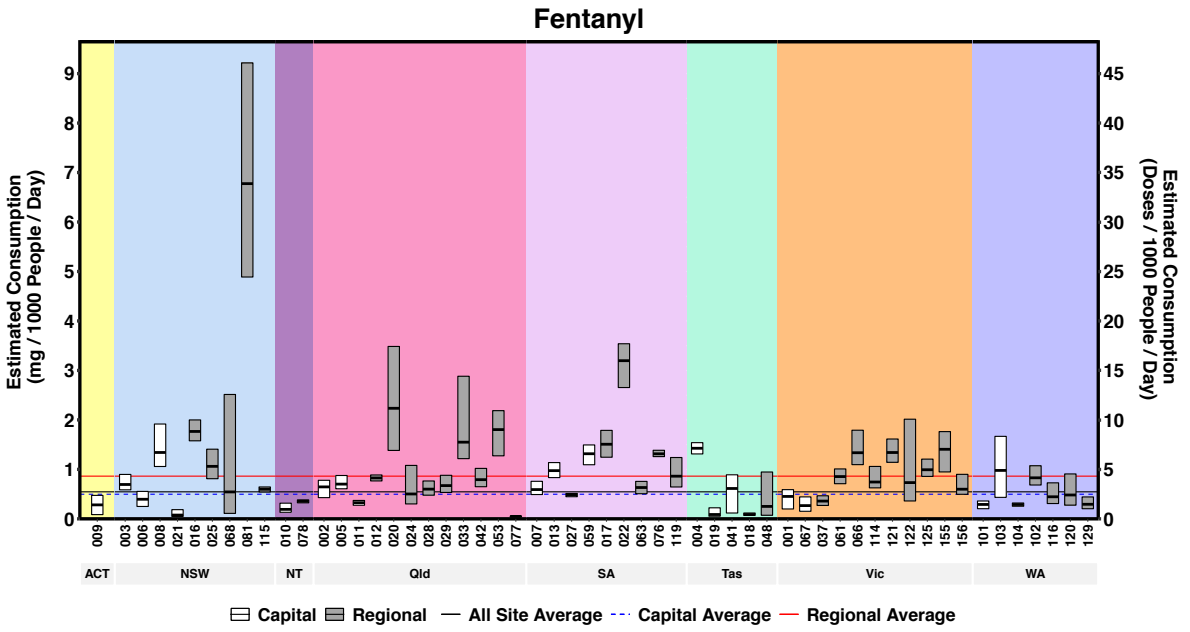
Heroin is metabolised in the body and excreted in low amounts as the unique metabolite, 6-monoacetylmorphine (6-MAM). Since the metabolite is characteristic of heroin use, it can be used to distinguish heroin from other opioids such as morphine and codeine. In contrast to the two pharmaceutical opioids, heroin consumption in regional areas was generally much less than in the capital cities (Figure 20). Victoria Site 67 had very high consumption rates across the sampling week, well above most other catchments. The Australian Capital Territory and a capital city site in New South Wales also had relatively high levels. Heroin levels in regional Victoria were also higher than other parts of Australia. Many regional sites had levels at or below limits of quantification. The elevated heroin consumption in capital city Victoria is clearly evident from the bubble graph (Figure 21).

Figure 16: Estimated oxycodone consumption for August 2020 in mass consumed per day (left axis) and doses per day (right axis) per thousand people. The number of collection days varied from 5-7.



- Higher regional average
- Tasmania highest of the capital cities

Figure 17: Estimated fentanyl consumption for August 2020 in mass consumed per day (left axis) and doses per day (right axis) per thousand people. The number of collection days varied from 5-7.



- Higher and variable regional average
- No detections at some sites

Figure 18: Estimated average oxycodone consumption per jurisdiction for August 2020 in mg consumed per day per thousand people. The number of collection days varied from 5-7.

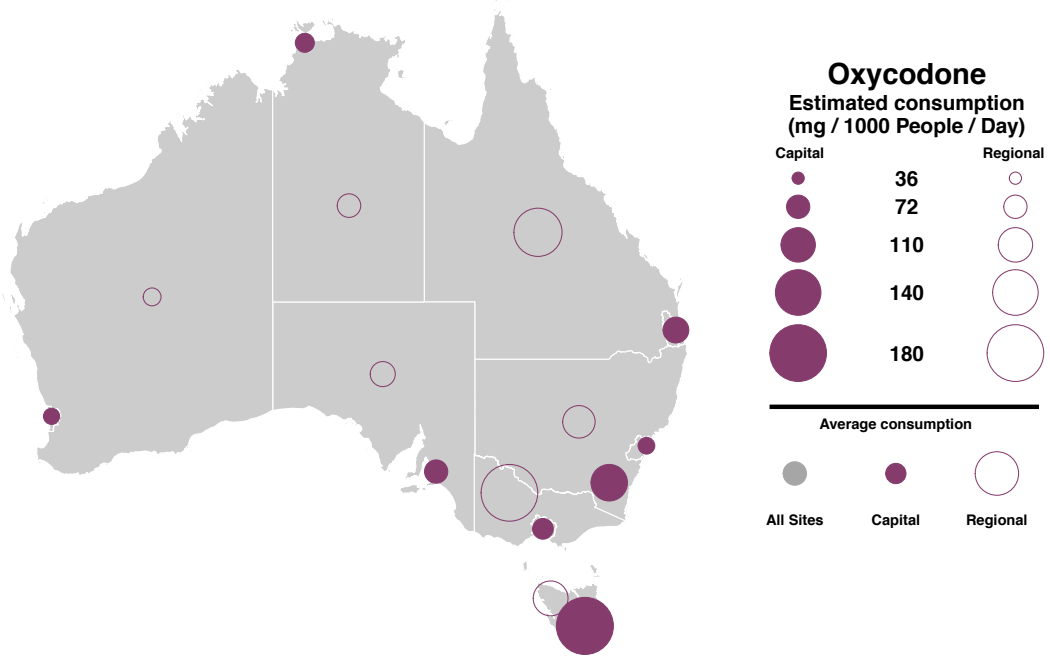


Figure 19: Estimated average fentanyl consumption per jurisdiction for August 2020 in mg consumed per day per thousand people. The number of collection days varied from 5-7.

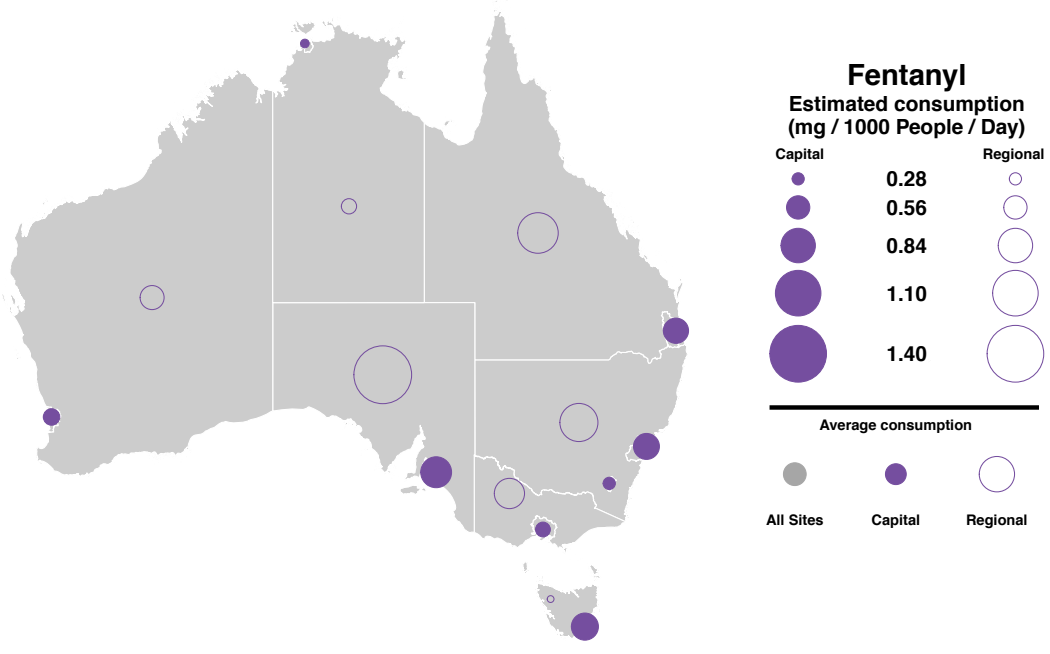
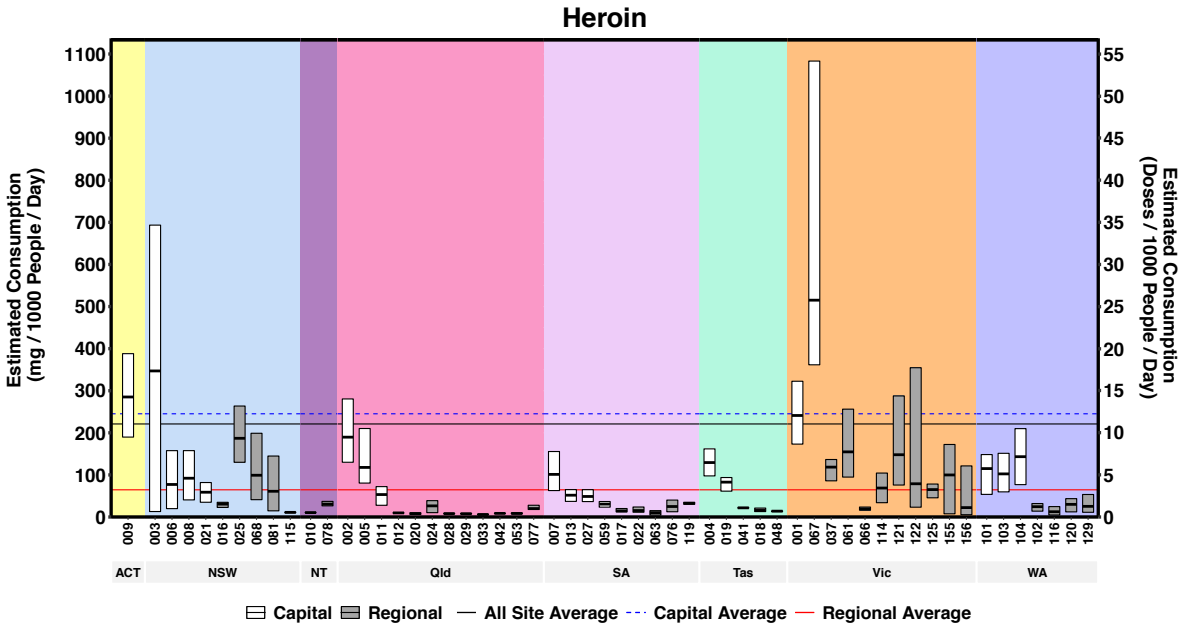
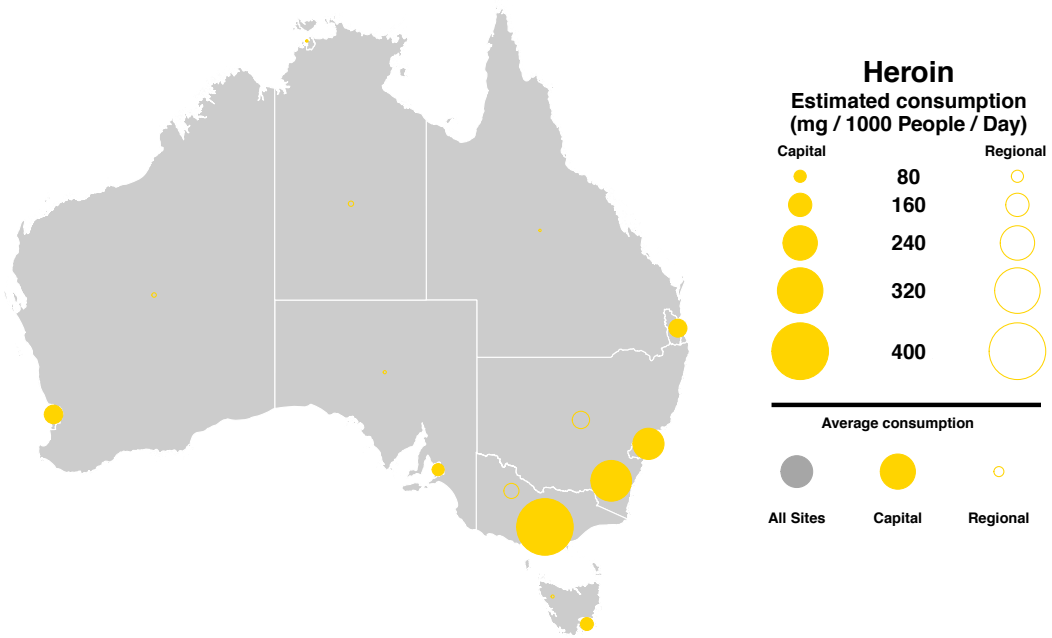


Figure 20: Estimated heroin consumption for August 2020 in mass consumed per day (left axis) and doses per day (right axis) per thousand people. The number of collection days varied from 5-7.



- Highest consumption in Victoria
- Lower regional consumption, often not detected

Figure 21: Estimated average heroin consumption per jurisdiction for August 2020 in mg consumed per day per thousand people. The number of collection days varied from 5-7.



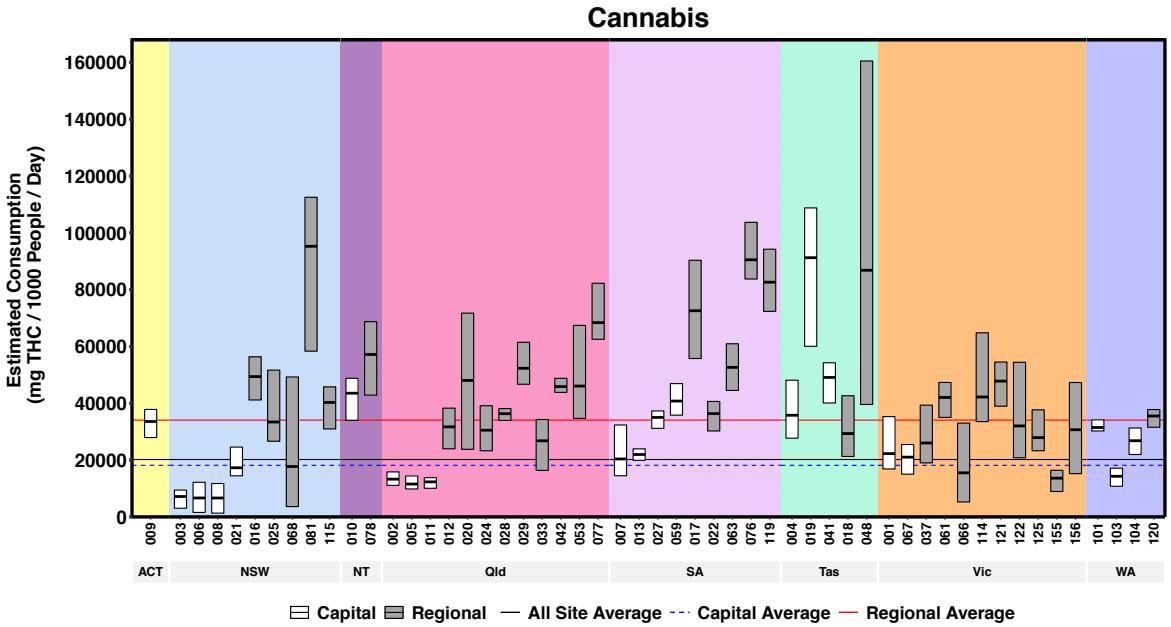
4.1.4 CANNABIS

Tetrahydrocannabinol (THC) is the main psychoactive compound found in cannabis. The compound is metabolised and largely cleared through the gut. A small proportion (0.06 per cent) is excreted through the kidneys as 11-nor-9-carboxy-tetrahydrocannabinol (THC-COOH). The latter is known to adsorb to various surfaces, including sewer infrastructure. Therefore, in terms of wastewater analysis, the sewer design and collection method may play a part in the reportable levels of the target metabolite used for the purposes of the NWDMP. Upon collection, samples have to be preserved to avoid degradation of THC-COOH, without using acidification (McCall et al. 2016). This is one reason why cannabis consumption is not reported on a regular basis in other countries where wastewater analysis is routinely conducted. Acidification is a common preservation technique. For the NWDMP, separate samples are collected each day and preserved specifically for THC-COOH analysis.

Cannabis consumption was expressed as the daily mass load (mg) of consumed active ingredient (THC) consumed per 1,000 people. An average dose was not defined as for other drugs in the report. The dose of cannabis depends on several factors, such as the part of the plant, the strain, or whether an extract was used. This will be included in graphical representations of the data when an appropriate dose becomes available.

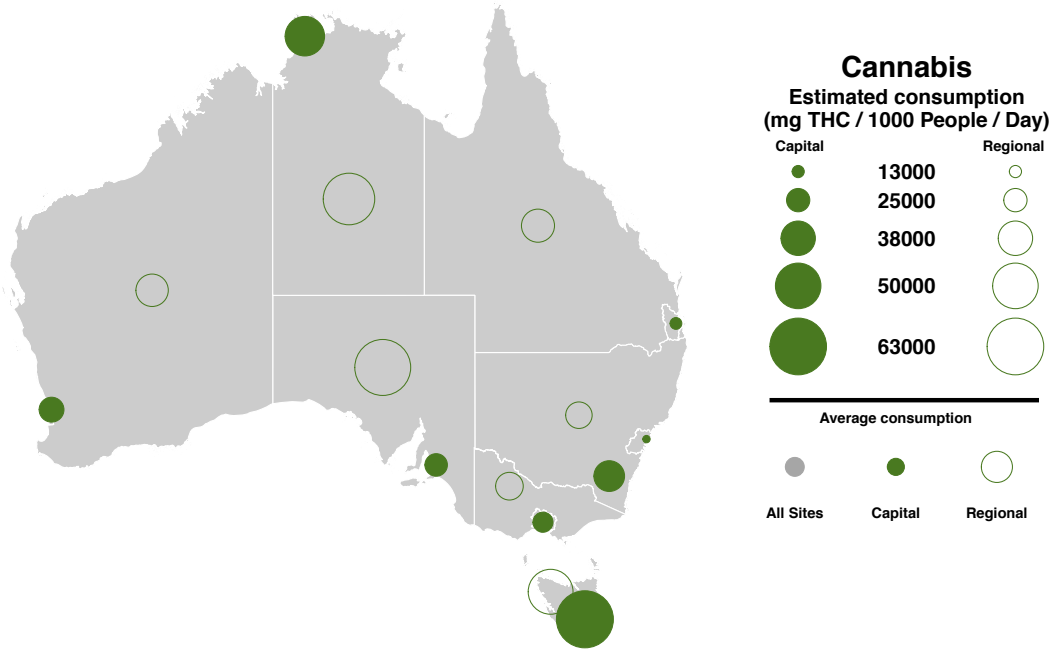
Very large spatial differences were evident across Australia (Figure 22). The average use across regional Australia in August 2020 exceeded capital city consumption. The highest daily values were observed in regional Tasmania, Site 48, while the median values over the week were high in parts of regional South Australia. Tasmania had the highest consumption of the capital city sites. In contrast, capital city New South Wales mostly had very low levels of cannabis use and Queensland also had levels below the national average. The bubble plot and jurisdictional differences of cannabis use across Australia show the generally higher consumption in regional areas, particularly regional South Australia, and Tasmanian capital city sites (Figure 23).

Figure 22: Estimated cannabis consumption for August 2020 in mass consumed per day (left axis). The number of collection days varied from 5-7.



- High regional consumption
- Variable use across the country

Figure 23: Estimated average cannabis consumption per jurisdiction for August 2020 in mg consumed per day per thousand people. The number of collection days varied from 5-7.



4.1.5 NEW PSYCHOACTIVE SUBSTANCES

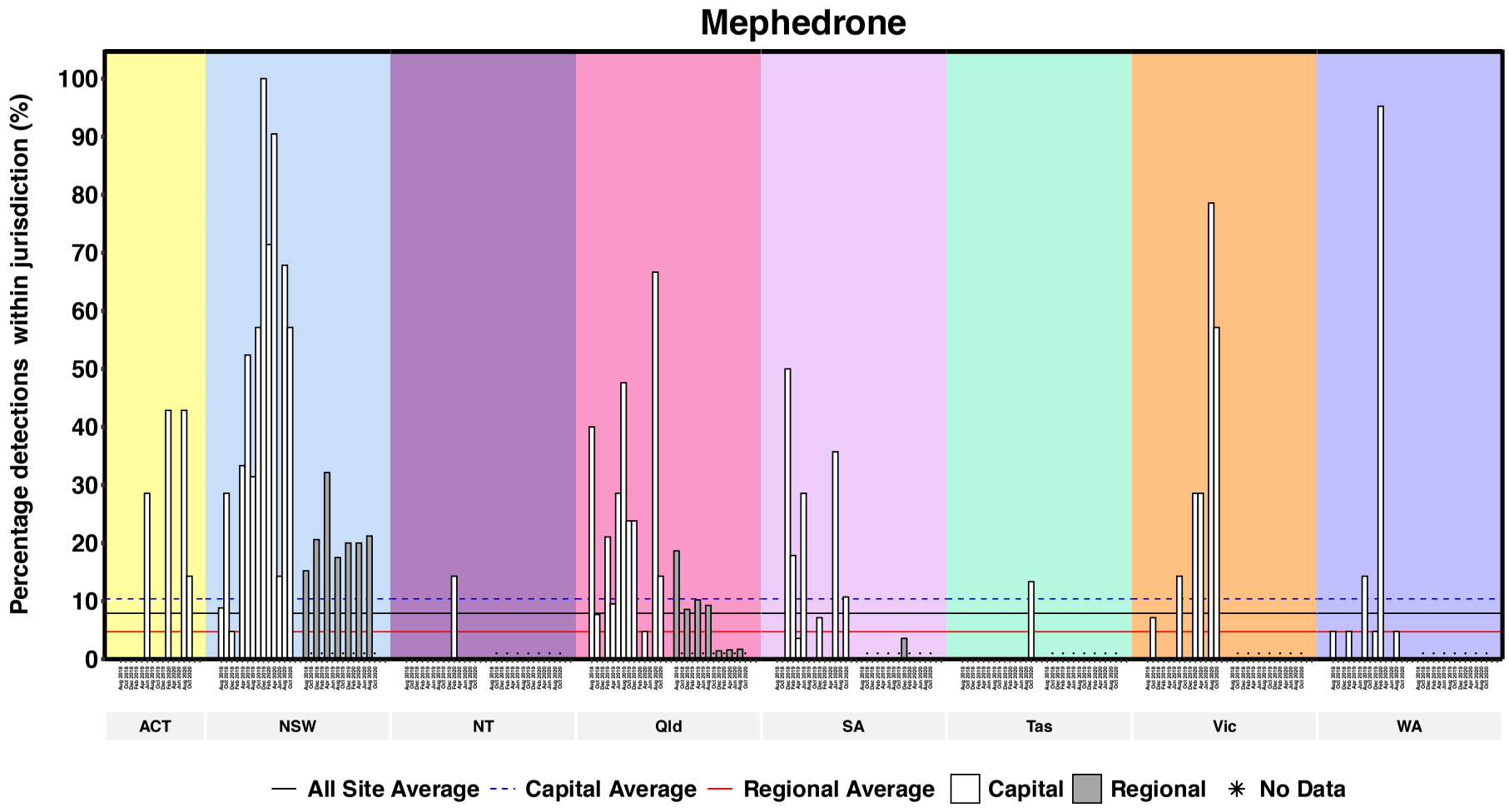
Two compounds are included under the NPS class in the NWDMP: methylone and mephedrone. Limited information is available on the human metabolism and excretion of these drugs. Therefore, the parent compound was measured. Due to the low rates of detection for these drugs, results are reported as the number of detections made (Table 10). Sites that showed the presence of the two compounds are qualitatively listed in Table 10 for August 2020. Mephedrone detections were mainly in capital city catchments and were most frequent in New South Wales, followed by Queensland and Victoria. Very few detections were recorded elsewhere in Australia. For methylone, the vast majority of detections were observed in Queensland and a few in New South Wales and elsewhere. The detections in Queensland occurred mostly in regional parts of the state.

Table 10: The number and code of sites per state and territory where mephedrone and methylone were detected. The total number of daily samples that were assessed was 376.

	Number of detections August 2020		Sites detected August 2020	
State /territory	**Mephedrone**	**Methylone**	**Mephedrone**	**Methylone**
ACT	3	-	009	-
NSW	26	14	003, 006, 008, 068	003, 008, 021, 025, 081
NT	-	3	-	010
Qld	15	42	002, 005, 012	005, 012, 020, 024, 028, 029, 042, 053
SA	-	1	-	119
Tas	-	-	-	-
Vic	11	-	001, 067	-
WA	1	1	101	103
Total	**56**	**61**	**11 Sites**	**16 Sites**

The temporal changes in detections per state and territory (proportion of samples above LOD) are shown as relative detection frequencies for mephedrone and methylone up to October 2020 in capital cities and August 2020 in regional centres (Figure 24a and 24b, respectively). Mephedrone detections have remained relatively low overall, although the detection frequency has remained relatively high in New South Wales and has been increasing in Victoria. The number of detections of methylone has been more variable, but the general trend over time is a decrease in most parts of the country. Regional Queensland has been the exception. Detections of the two NPS were less frequent in other regional areas, which is evident from the bubble plots (Figure 24c). In view of the sporadic nature of methylone and mephedrone detections, these compounds will no longer be included as uniquely targeted NPS of interest in future reports.

Figure 24a: Estimated percentage of positive detections per jurisdiction for mephedrone, August 2018 to October 2020. This is the number of detections as a percentage of the total number of samples analysed per jurisdiction. The number of collection days varied from 5–7.



- New South Wales and Victoria had most recent detections
- Some regions recorded no detections

Figure 24b: Estimated percentage of positive detections per jurisdiction for methylone, August 2018 to October 2020. This is the number of detections as a percentage of the total number of samples analysed per jurisdiction. The number of collection days varied from 5–7.

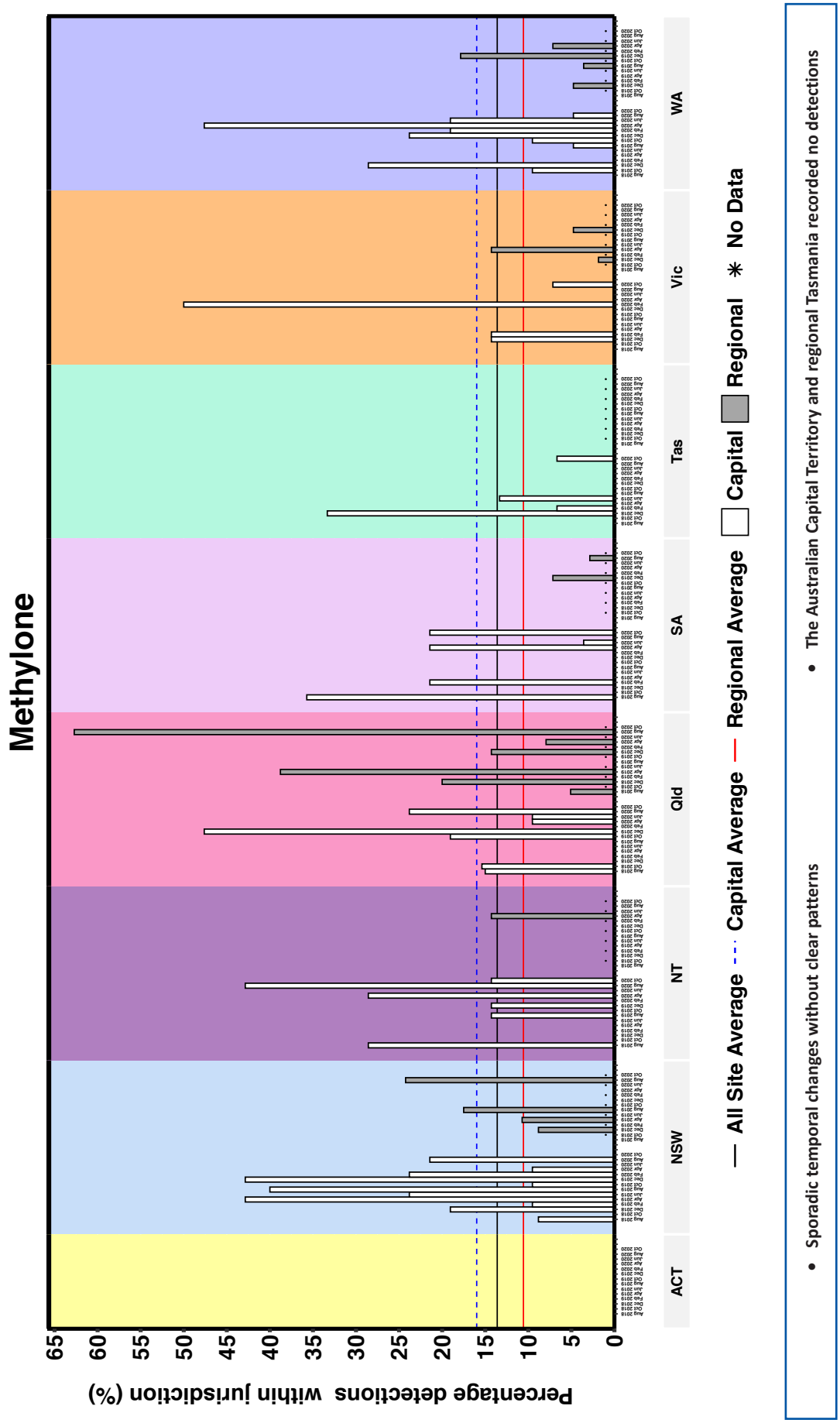
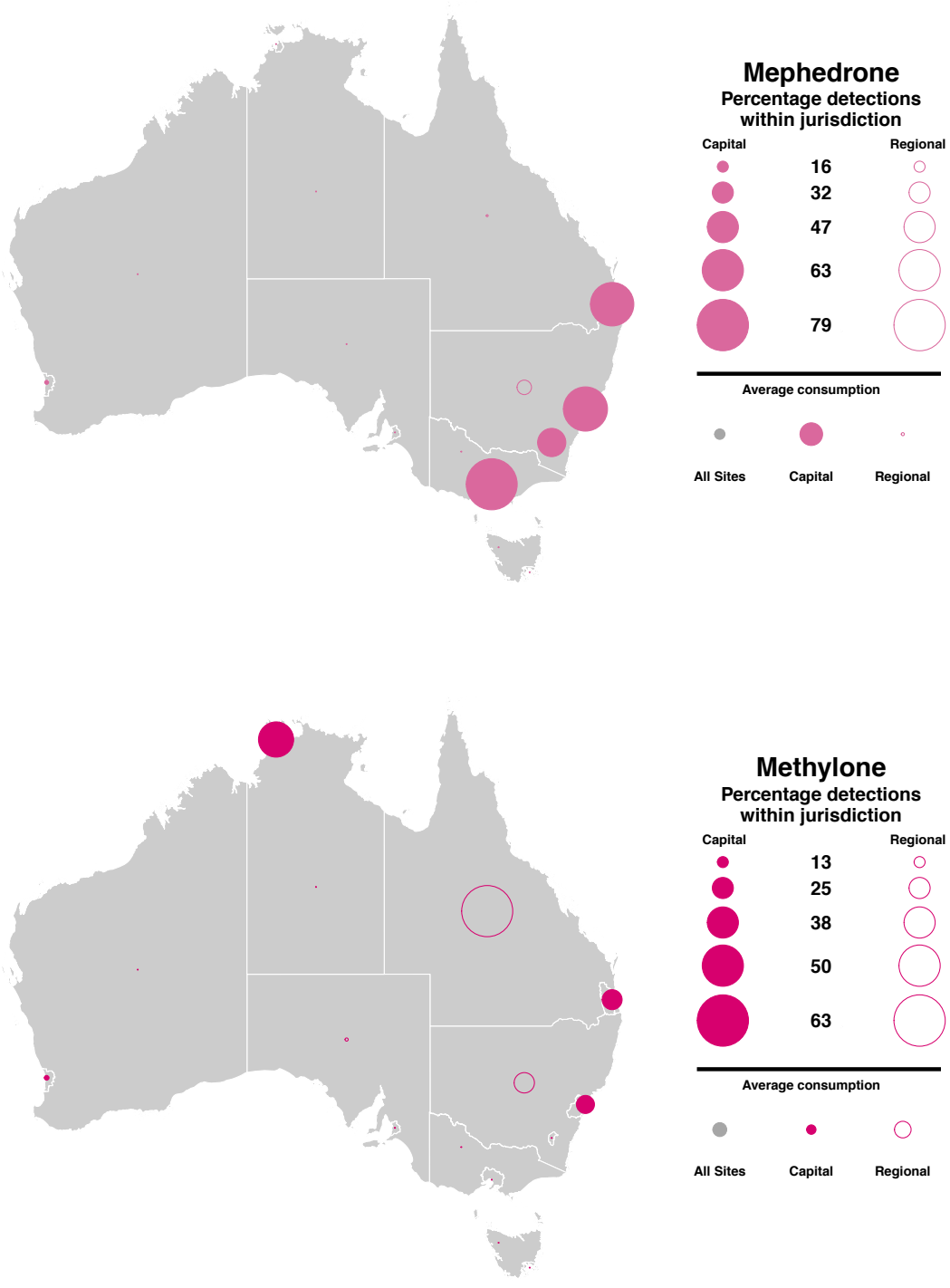


Figure 24c: Estimated percentage of positive detections per jurisdiction for mephedrone and methylone for August 2020. This is the number of detections as a percentage of the total number of samples analysed per jurisdiction. The number of collection days varied from 5–7.



4.2 TEMPORAL CHANGES IN DRUG CONSUMPTION ESTIMATES BY JURISDICTION

The total level of each drug outlined in the preceding reports per state or territory was compared with subsequent collection periods included in the current report. The data relating to capital cities in this section have been updated to include both the August and October 2020 collections, while regional areas were updated for August 2020. This needs to be considered when comparing results between sections 4.1 and 4.2. Although every effort was made to assess the same sites for each period, 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 2 and Appendix 3, Report 6 and Appendix 2 in this report). Due to the larger number of data points collected by the Program, the current reporting period is reported with around two years of previous data. Prior data dating back to 2016 for each substance of interest will be made available on the ACIC website by jurisdiction.

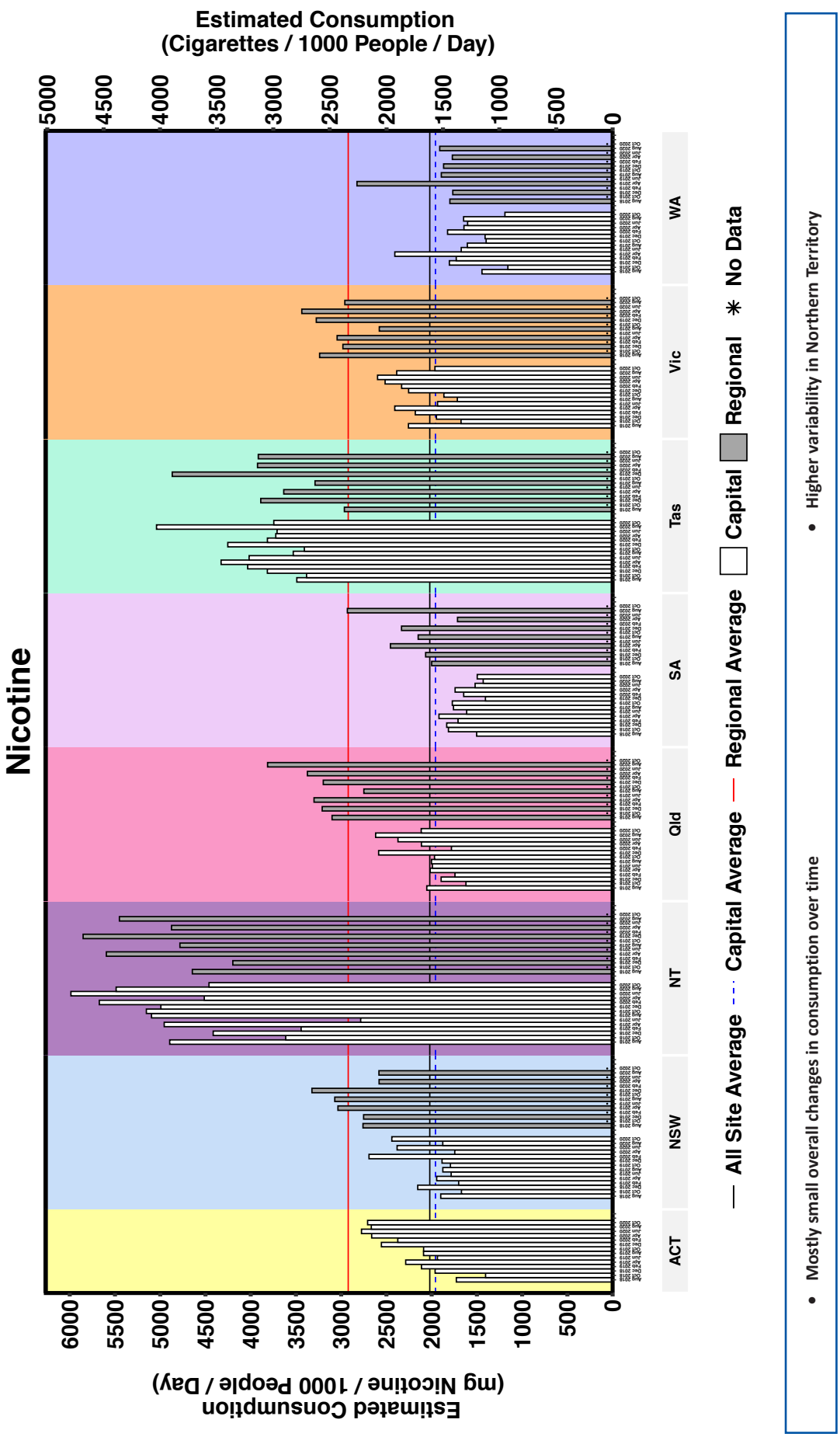
Note: the horizontal red, blue and black lines on each temporal graph which represent the averages are the cumulative average across all sampling time points and all samples analysed.

4.2.1 NICOTINE AND ALCOHOL

Patterns in nicotine consumption have been variable across Australia and short-term changes tend to be a feature in many states and territories (Figure 25). The Australian Capital Territory and capital city sites in New South Wales show increased consumption over the past two years. Nicotine use in Queensland has started to show an increase since the start of 2020, whereas a decline has been evident in capital city South Australia over the past few months. Elsewhere in the country, changes in nicotine consumption were relatively minor and no clear patterns were evident. The Northern Territory and Tasmania tended to be the regions with highest overall use. The cumulative regional average nicotine consumption (red line) remains well above capital city levels (blue dashed line).

Alcohol consumption appeared to be more affected by the initial effects of the COVID-19 pandemic (Figure 26). In the capital cities of almost every state and territory, alcohol use decreased in the month of April. Thereafter, consumption recovered to previous levels or increased, particularly in the Northern Territory where restrictions were eased before most other parts of the country. South Australia and regional Western Australia were the only regions where alcohol use has been declining to any appreciable extent over the past three years. The effects of COVID-19 were noticeable at the early stages too, but use has since recovered in South Australia as well. Victoria was the only state severely affected by a second wave of the pandemic and alcohol consumption in the state appears to reflect that, with lower levels detected since June 2020. The difference in the cumulative average consumption of alcohol in regional areas compared to the cities was less pronounced than nicotine, but consumption was also higher outside the capital cities. The escalation in alcohol use in regional Australia since 2019 was reversed in Tasmania, Victoria and Western Australia. The Northern Territory has tended to have the highest overall use of alcohol since the start of the Program, followed by Tasmania.

Figure 25: Estimated average consumption of nicotine by state/territory, August 2018 to October 2020, where 1 cigarette provides 1.25 mg of nicotine. [8]



8 Nicotine consumption data have been adjusted to refine the factor used to convert consumed mass load to dose. Overall trends in nicotine consumption remain unchanged.

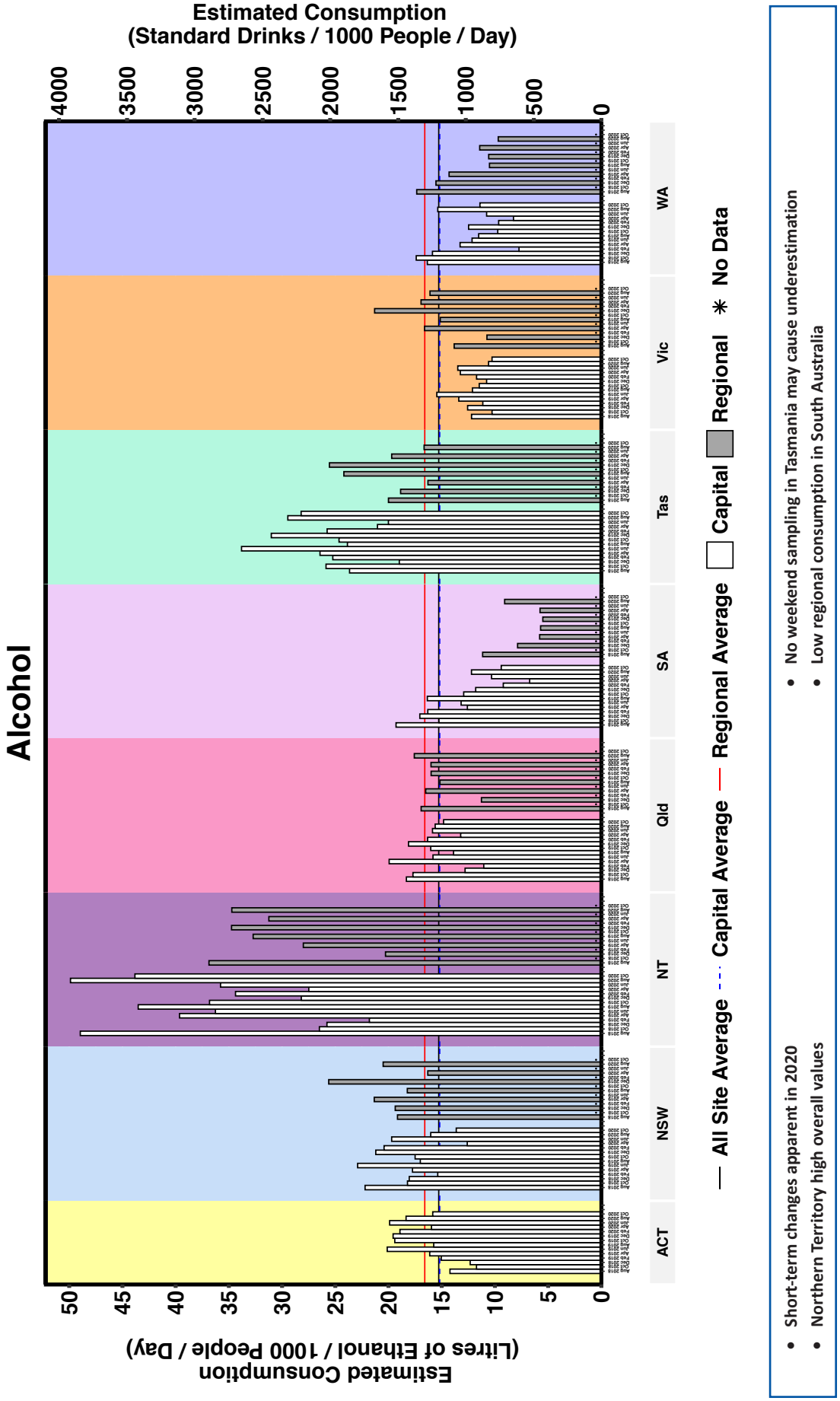


Figure 26: Estimated average consumption of alcohol by state/territory, August 2018 to October 2020. A standard drink is 10.0 g, or 12.6 mL.

4.2.2 STIMULANTS

Short-term trends in methylamphetamine use varied substantially across the country (Figure 27). The pandemic clearly had a major influence on supply and demand, as demonstrated by the sharp declines in the use of the drug after April 2020, when various local and international border restrictions came into effect. The drop in methylamphetamine levels was less apparent in regional areas early on in the pandemic. In all but South Australia, regional use remained relatively unchanged up to June, after which it declined by large amounts almost everywhere. Tasmania and Western Australia experienced the biggest reduction in measured levels in August across all parts of each state. In the capital cities of these two states, methylamphetamine use increased again in October, though still short of pre-COVID levels. On a year-to-year basis, 2020 has seen a reduction in the use of Australia's most used stimulant across almost the entire nation. Capital city New South Wales was the only area where use in October 2020 exceeded levels observed in 2019.

Long-term changes in use of methylamphetamine are also apparent in Queensland, South Australia and Western Australia, where data are available back to before the start of the NWDMP (Figure 28). The effect of COVID-19 restrictions was clearly evident, with large declines in recent drug use in every jurisdiction. This was despite some medium and longer term trends showing rising levels up to this point, particularly in sites in Queensland and Victoria. In Western Australia, the recent decrease in use was unprecedented in the context of the Program.

Cocaine has been showing increases in consumption in most capital cities and many regional parts of Australia for a few years now (Figure 29). COVID-19 had an initial impact on consumption in some states and territories, notably the capital city sites. With the easing of restrictions, use in the Australian Capital Territory and Tasmania has increased sharply, while New South Wales has returned to pre-COVID levels. In other parts of the country, for example capital city South Australia and Western Australia, use has continued to decline in the current reporting period. Regional parts of the country appeared less affected by the pandemic, possibly due to the lower level of consumption historically associated with the demographic.

MDMA use across Australia declined almost everywhere in April 2020, coinciding with the introduction of social restrictions. However, there was a subsequent resurgence in use in many jurisdictions (Figure 30). Victoria was one of the few states where the decline was largely maintained after the initial lockdown. Capital cities mostly dropped to lower levels in October 2020, with the exception of South Australia where use returned to pre-COVID levels. The Northern Territory recorded the highest levels in the capital city in August 2020 since the initial result at the start of the Program in August 2016, while the regional catchment in the territory reached historically high MDMA levels in the current reporting period. Overall, use in regional areas appears to have been less affected by the pandemic, although low relative levels amplify any fluctuations.

MDA use, corrected for the proportion derived from MDMA (Khan & Nicell 2011), showed a decline in 2020 compared to 2019 in many capital city sites, particularly in October (Figure 31). This resulted in historical low levels being seen in many areas. Use of the drug in the Northern Territory increased sharply after the initial April lockdown, but levels fell back again in the current reporting period. The only jurisdiction with substantial rises in recent use was regional Queensland. Overall, average regional use of MDA was well above that of the capital cities, driven by the larger regional centres, particularly in Queensland.

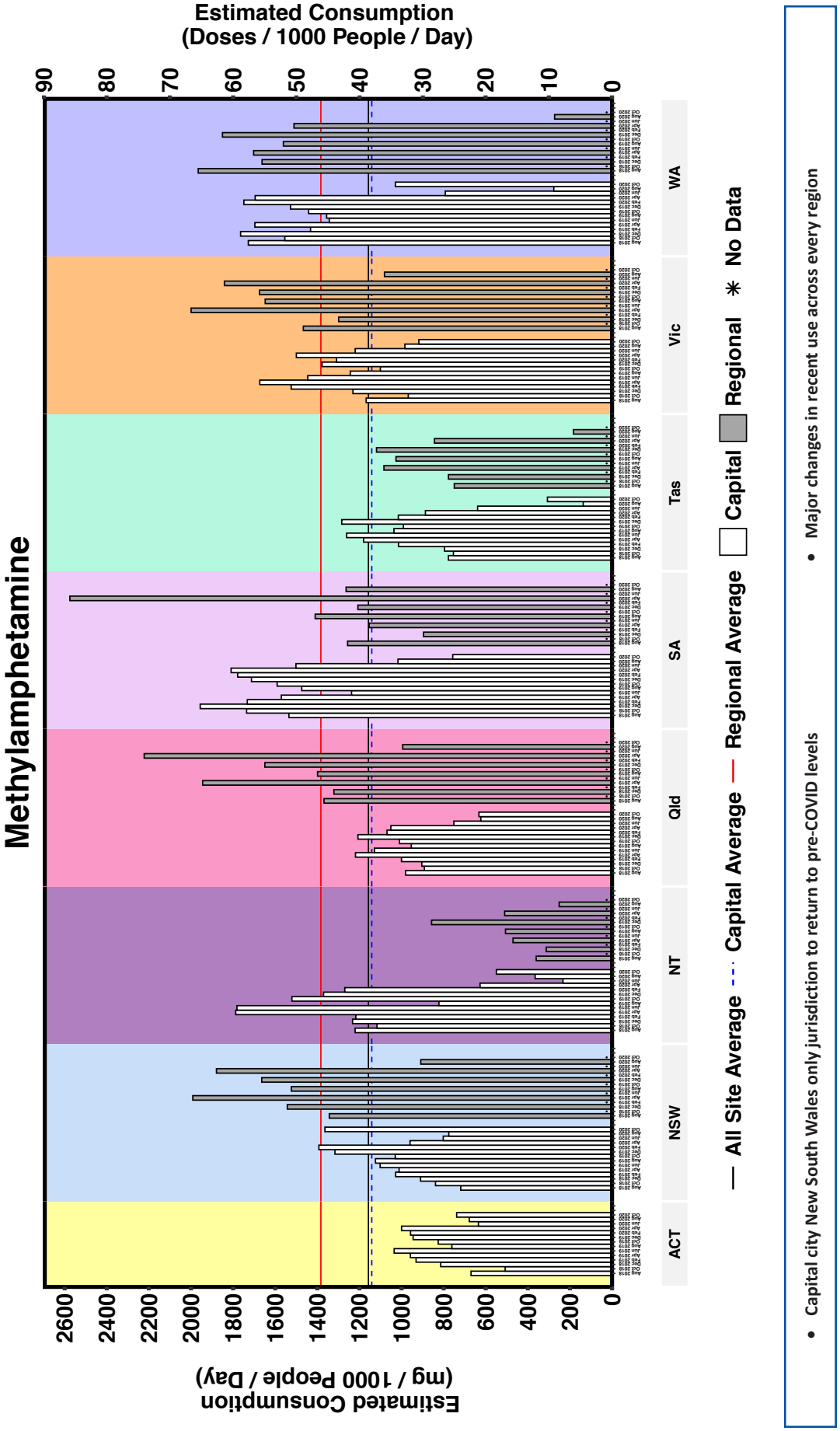


Figure 27: Estimated average consumption of methylamphetamine by state/territory, August 2018 to October 2020.

Figure 28: Change in methylamphetamine consumption for sites with historical data.

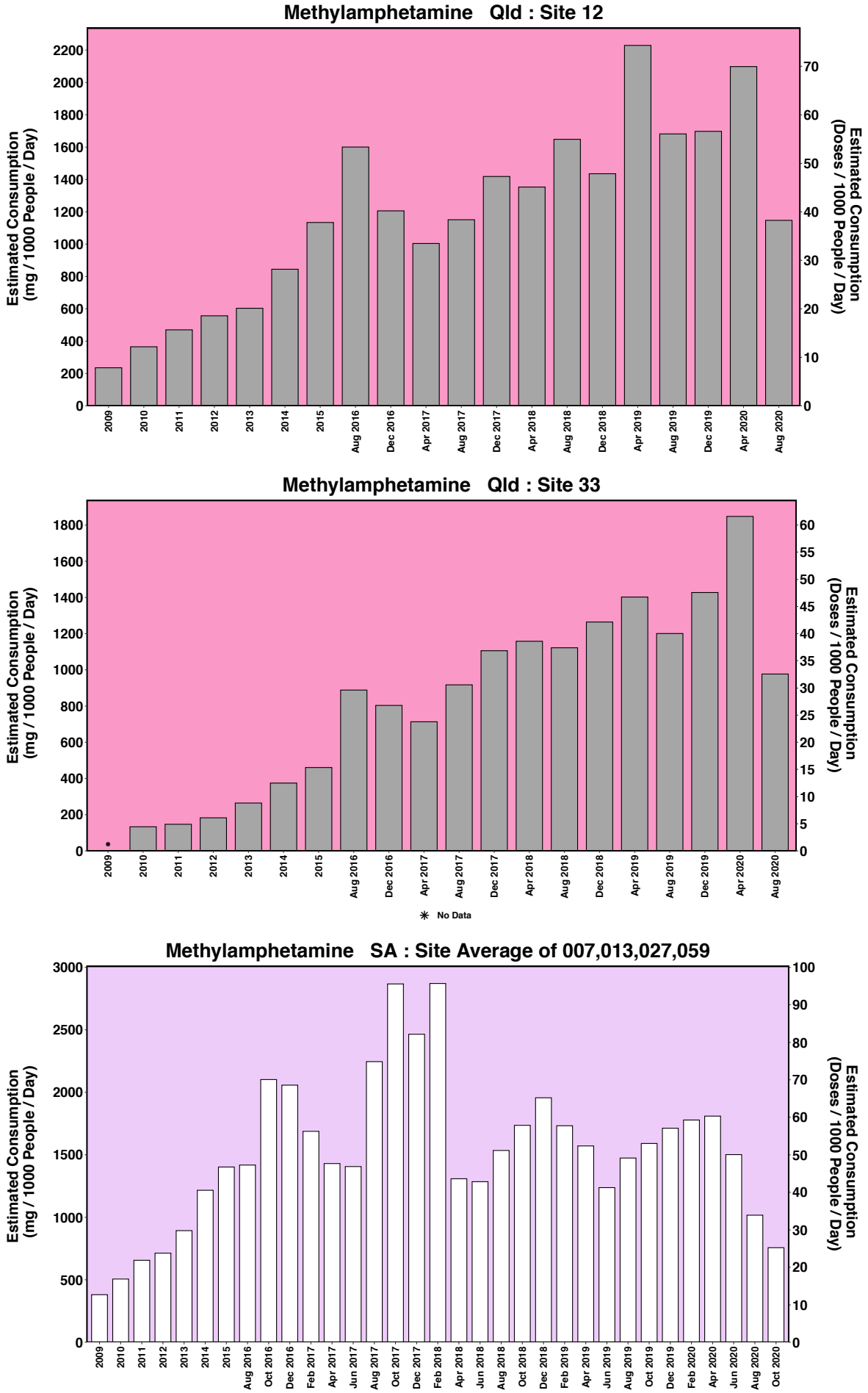
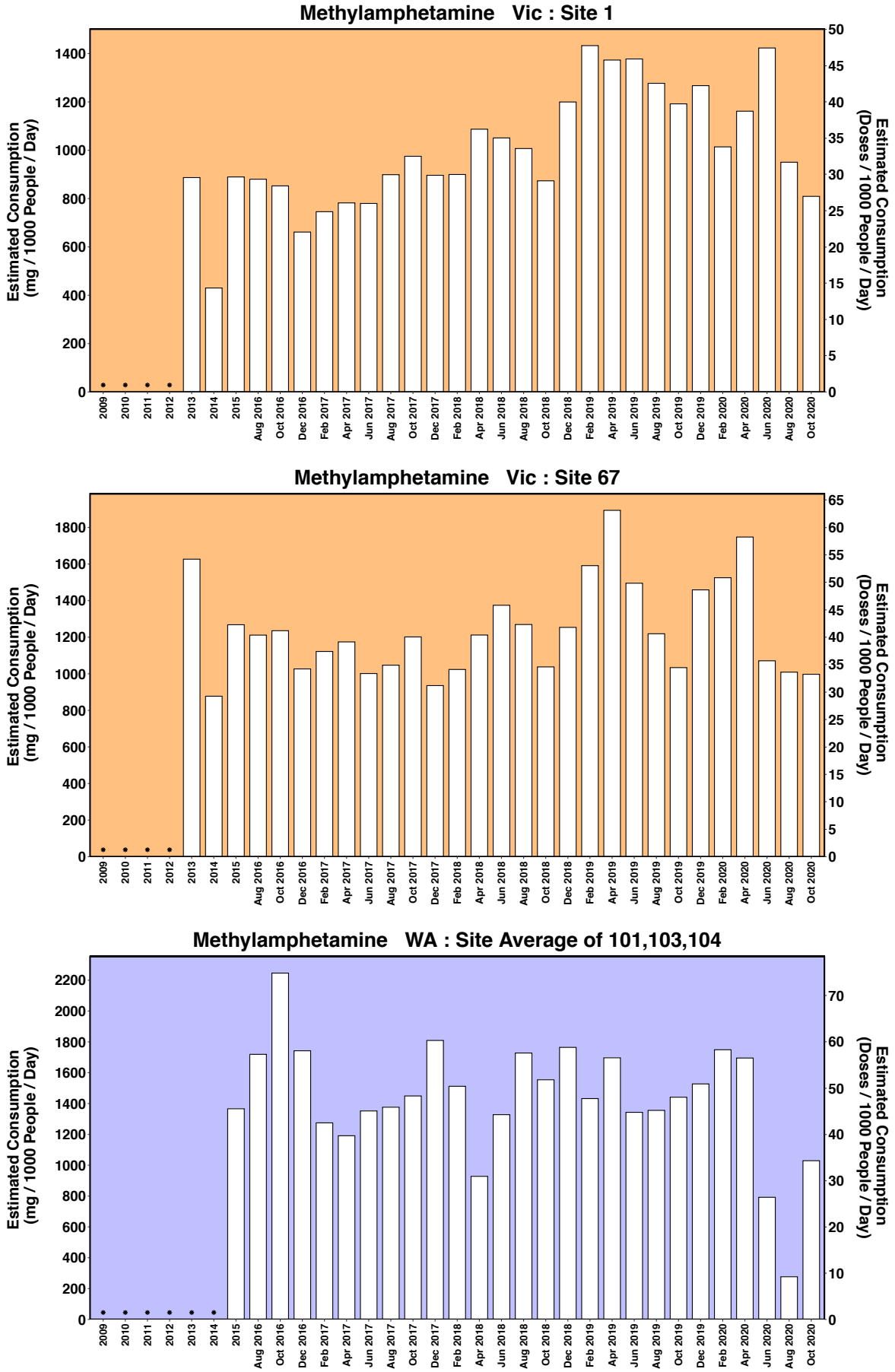


Figure 28 (continued): Change in methylamphetamine consumption for sites with historical data. Both Victorian sites were the average of one week per year in 2013, 2014 and 2015.



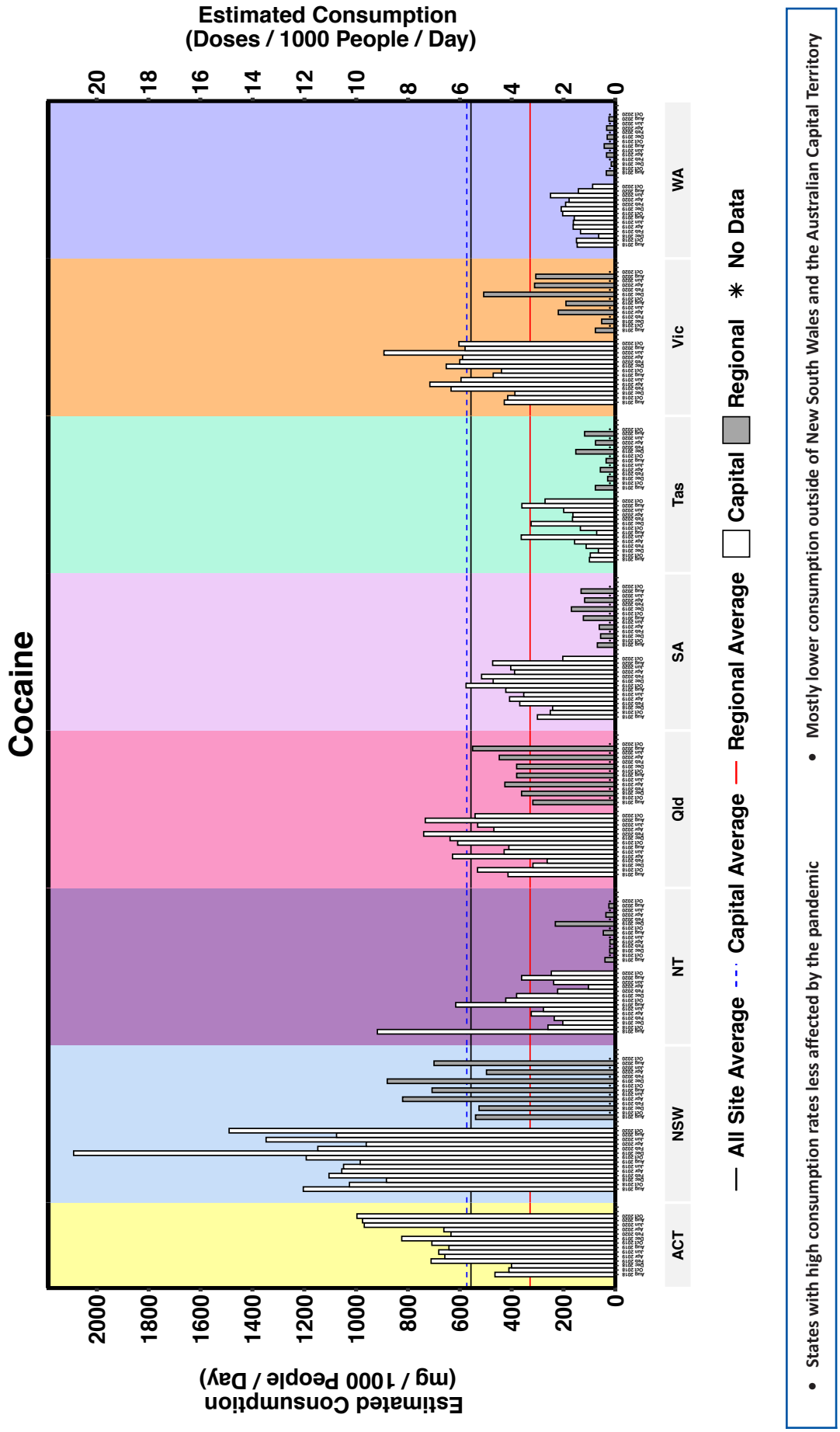


Figure 29: Estimated average consumption of cocaine by state/territory, August 2018 to October 2020.

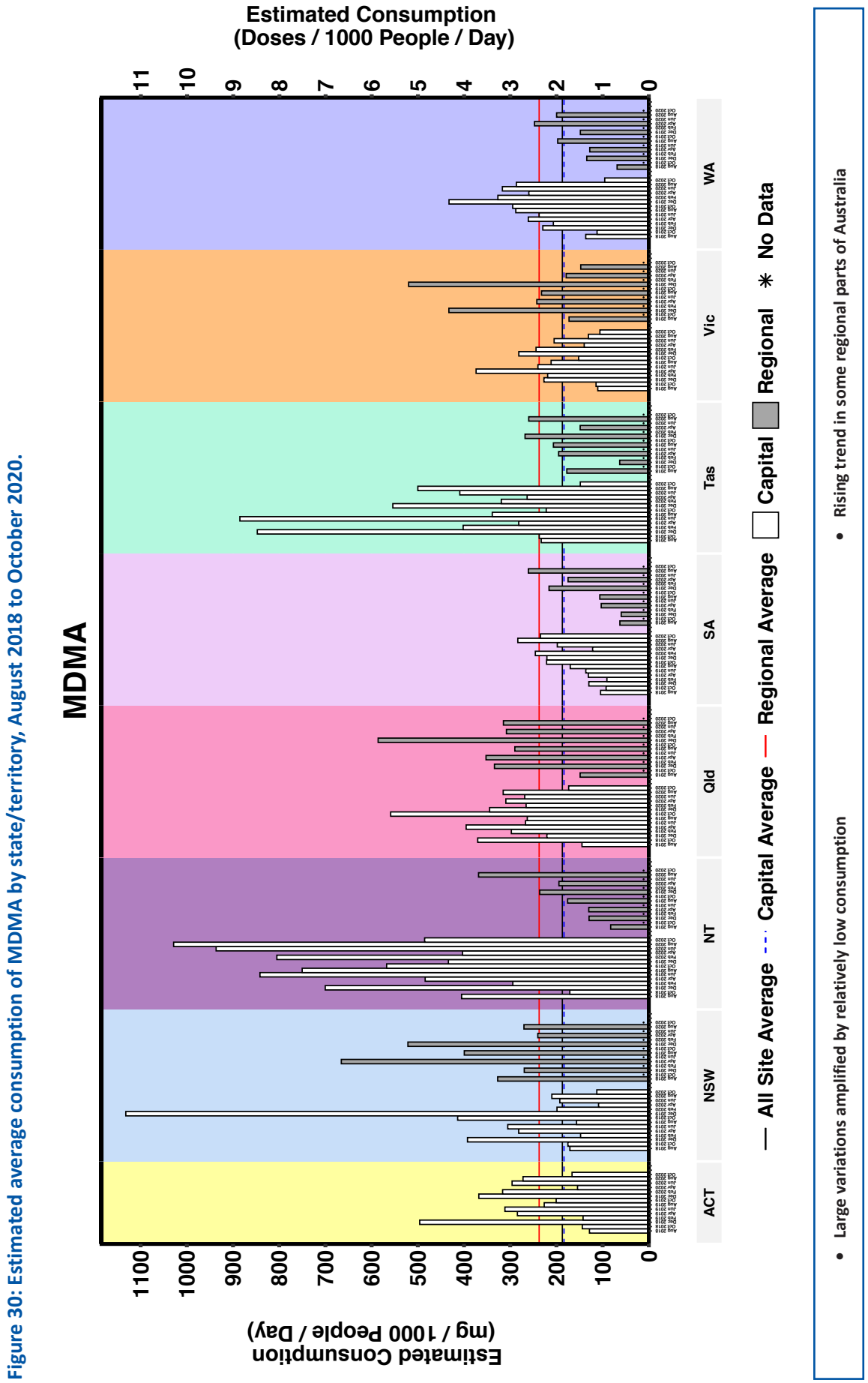
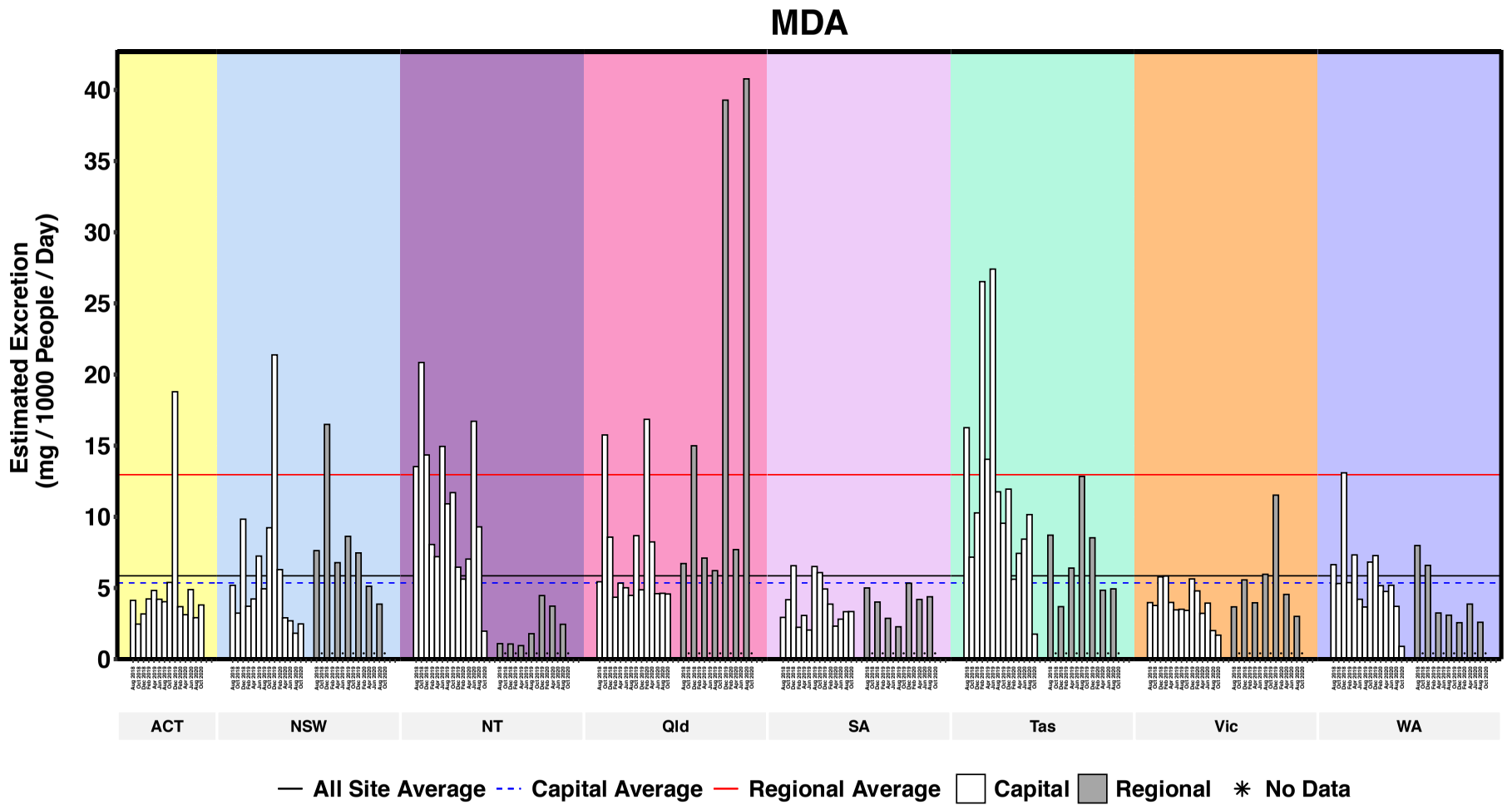


Figure 30: Estimated average consumption of MDMA by state/territory, August 2018 to October 2020.

Figure 31: Estimated average excretion of MDA by state/territory, August 2018 to October 2020.



- Low overall use, with sporadic outbreaks in regional Queensland
- Historical low levels in many jurisdictions

4.2.3 OPIOIDS

Declining levels in every part of Australia monitored have been the feature of oxycodone consumption since 2018 (Figure 32). This has been in contrast to the first two years of the Program when use steadily increased. Results from the current period showed that the downward trend levelled off over the course of 2020 in many jurisdictions, with the exception of capital city Tasmania and Victoria where oxycodone use progressively increased after the April lockdown. Consumption rates in the regional catchments remained very high compared to the capital cities. Tasmania and regional Victoria tend to be the highest consumers of oxycodone on a population basis, followed by the Australian Capital Territory and regional Queensland.

Fentanyl consumption has similarly been declining over the past two years (Figure 33). The pandemic has resulted in an acceleration of the rate of reduction in fentanyl levels on a community level. This has been especially evident in capital cities of the Northern Territory, South Australia and Tasmania. In some of the other parts of Australia, the rates of decline appeared to be less affected by COVID-19, e.g. Western Australia where there has been a steady decrease since 2018. Capital city Victoria showed an increase in use immediately following the lockdown, but levels declined as the state subsequently went into a second round of restrictions. Results for the current collections were lower than the previous period for all sampling areas. Regional South Australians were amongst the highest consumers of fentanyl at the time of the current sampling period.

In contrast to the pharmaceutical opioids, heroin use in Australia occurs largely in the capital cities, especially Victoria (Figure 34). Consumption of the drug appeared to peak in 2020 in many jurisdictions. Capital city Victoria and the Australian Capital Territory recorded their highest levels in August 2020. Tasmania, the Northern Territory and regional parts of South Australia were amongst the lowest users. Heroin consumption has been measured in capital city South Australia since 2013 (Figure 35). A gradual, long-term decline was evident from 2013 to early 2019, followed by a rapid increase towards the end of that year. However, since the start of the pandemic in Australia, heroin use has steadied at a lower level in the capital city's catchments.

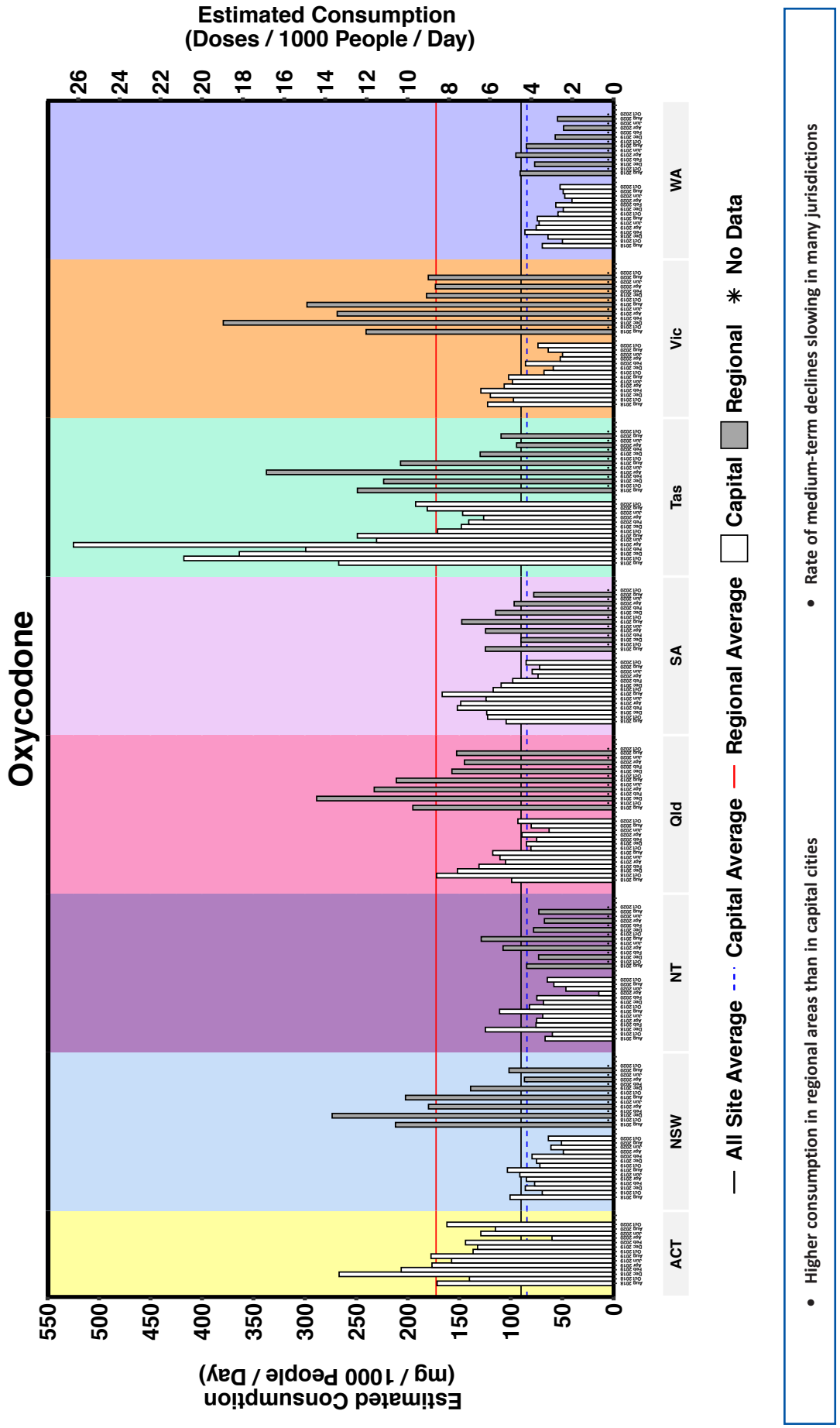


Figure 32: Estimated average consumption of oxycodone by state/territory, August 2018 to October 2020.

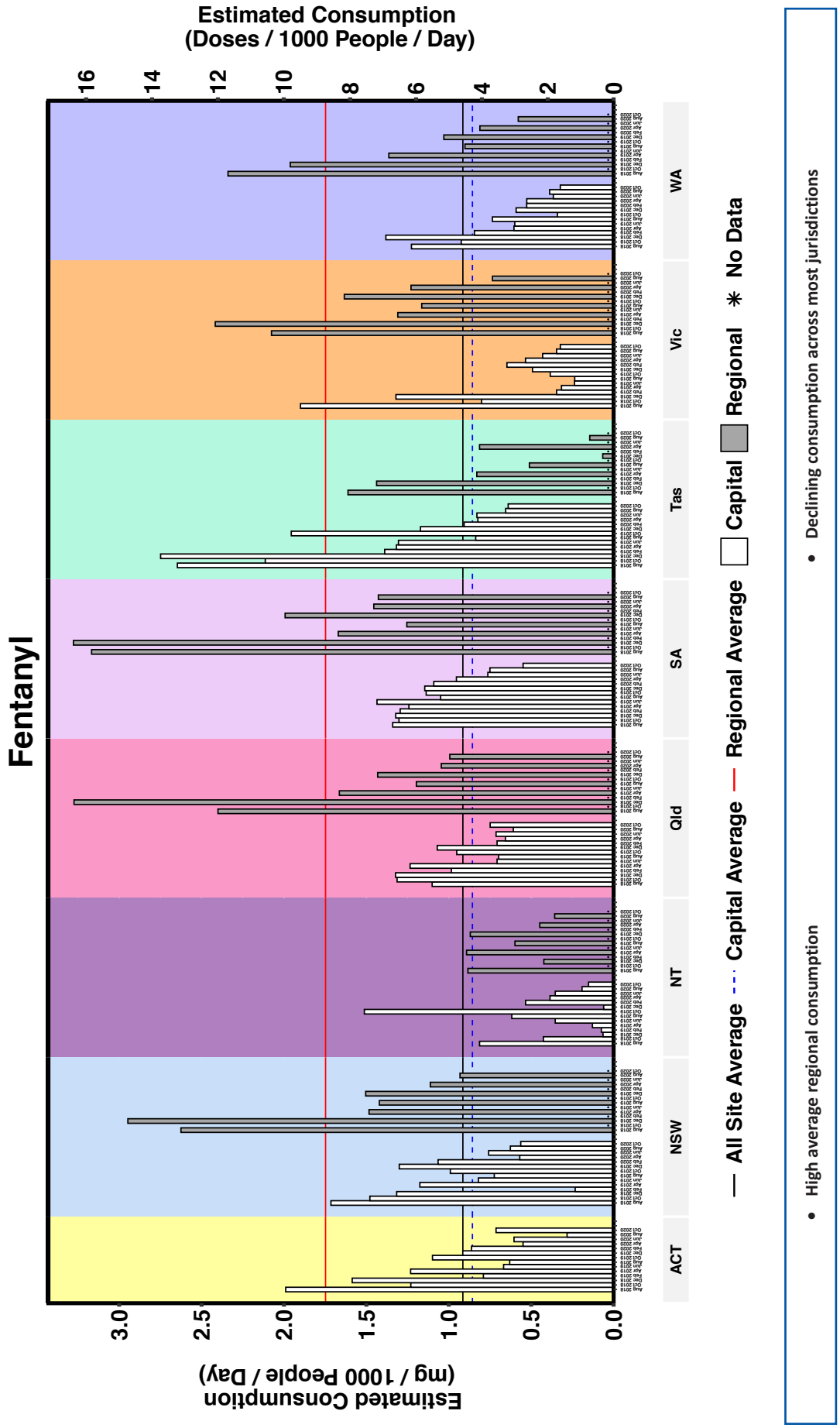


Figure 33: Estimated average consumption of fentanyl by state/territory, August 2018 to October 2020.

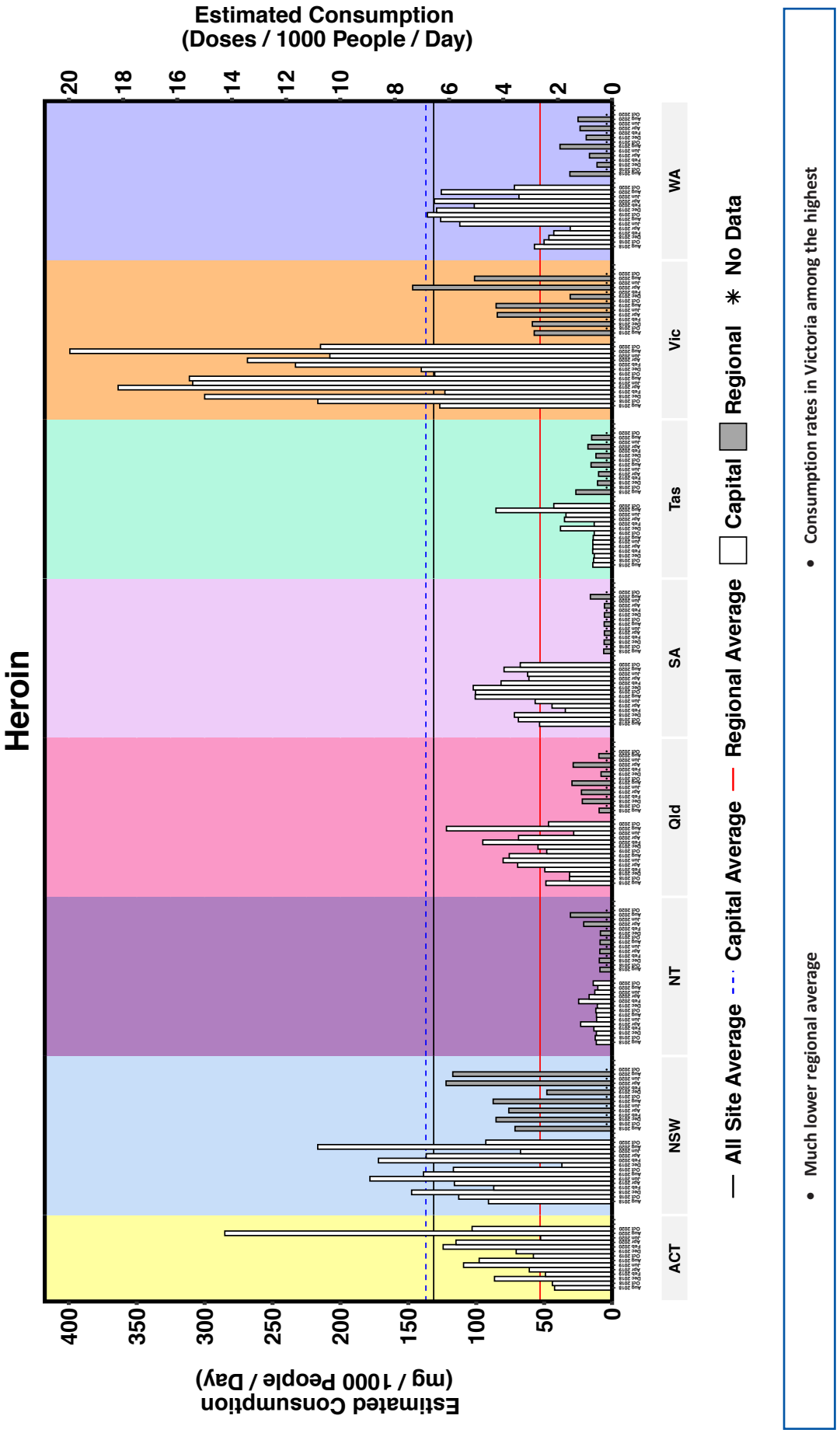
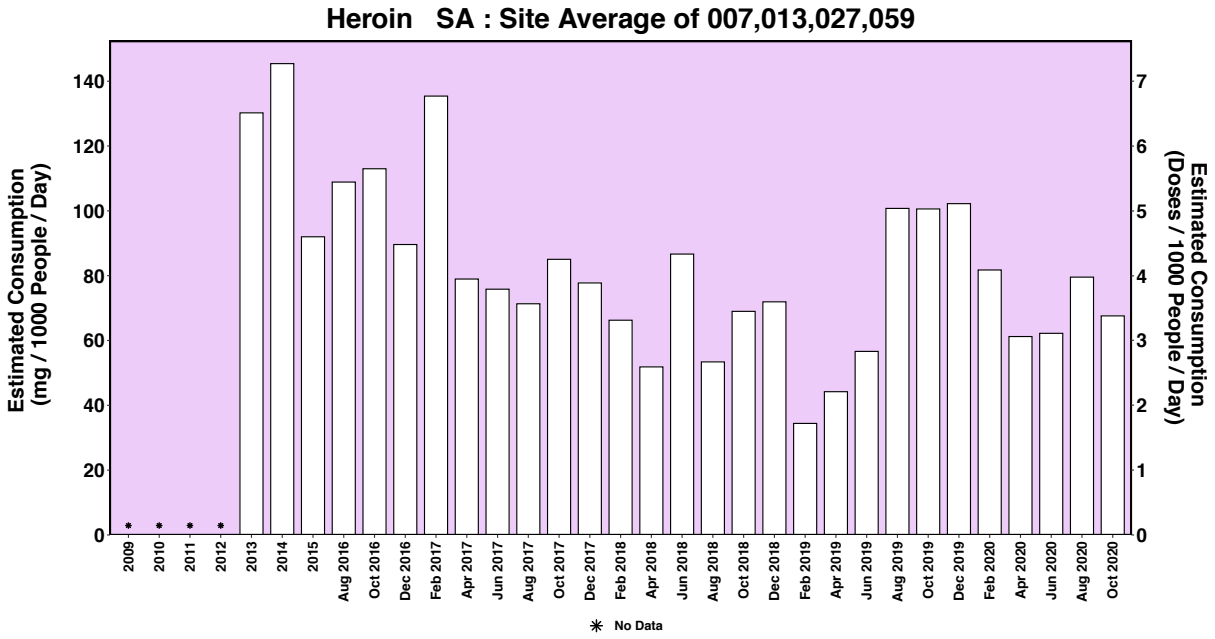


Figure 34: Estimated average consumption of heroin by state/territory, August 2018 to October 2020.

Figure 35: Change in heroin consumption for South Australia.



4.2.4 CANNABIS

Cannabis was first included in the Program in August 2018. Despite recent developments, longer term trends are starting to emerge. Cannabis use in the Australian Capital Territory and regional parts of the Northern Territory, Queensland and South Australia have been steadily increasing (Figure 36). Elsewhere, consumption has been largely stable, with some short-term fluctuations. When COVID-19 related restrictions came into effect in April 2020, cannabis consumption in most capital cities increased compared to February 2020. That pattern appeared to be maintained up to August across regional parts of the country as well, with many jurisdictions reaching historically high levels. Regional consumption has been substantially higher than capital city levels, with the highest consumption spread over several states and territories, in particular the Northern Territory, Tasmania and regional South Australia. Use in sites covering the larger population centres of New South Wales, Victoria and Queensland were much lower. Consumption in these capital cities was less than half that in the regional areas within the respective jurisdictions.

Consumption of cannabis has previously been measured in capital city South Australia since 2011. An upward trend emerged until early 2019, followed by a short-term decline until February 2020 (Figure 37). Since then, cannabis use in the capital of the state has seen a general increase.

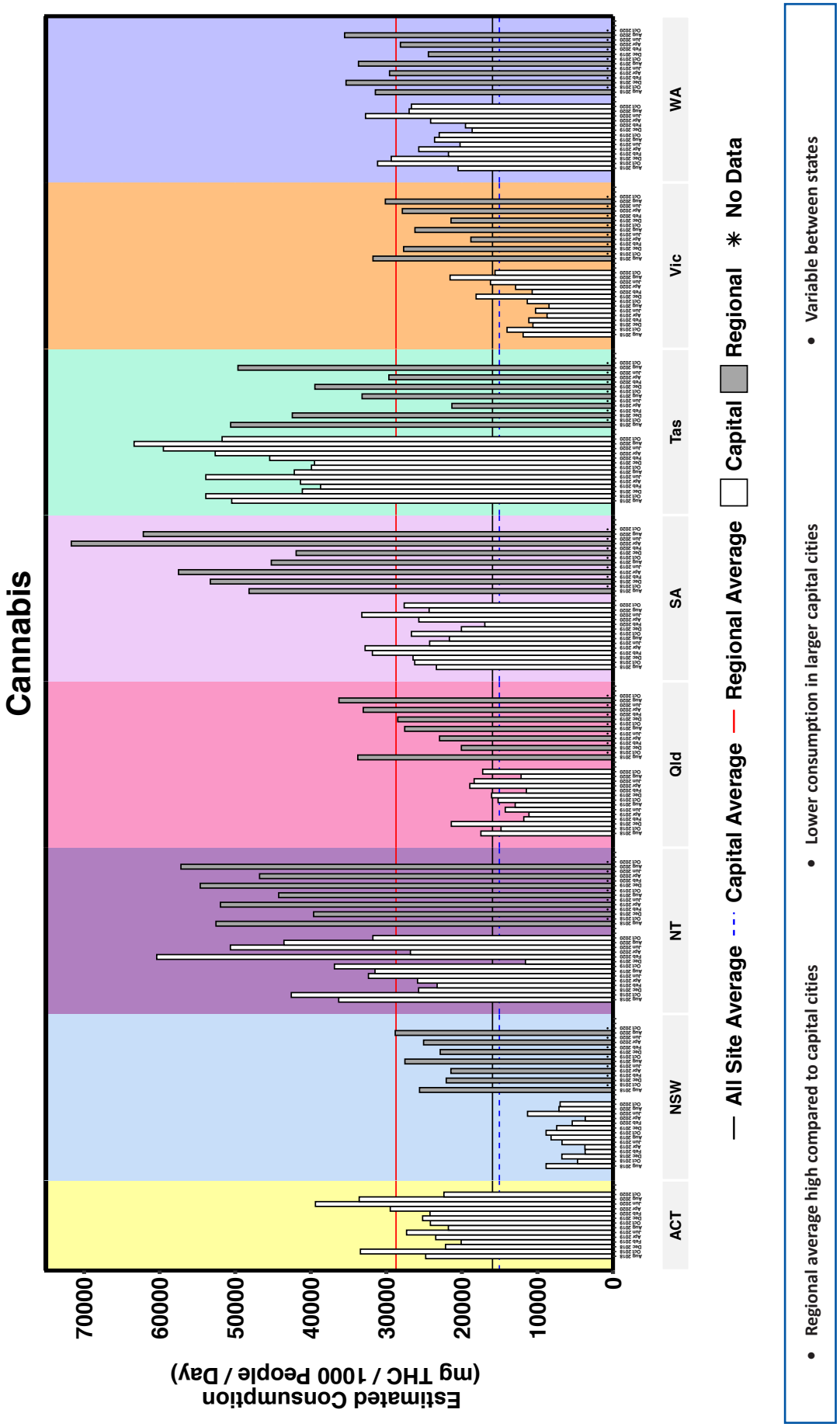
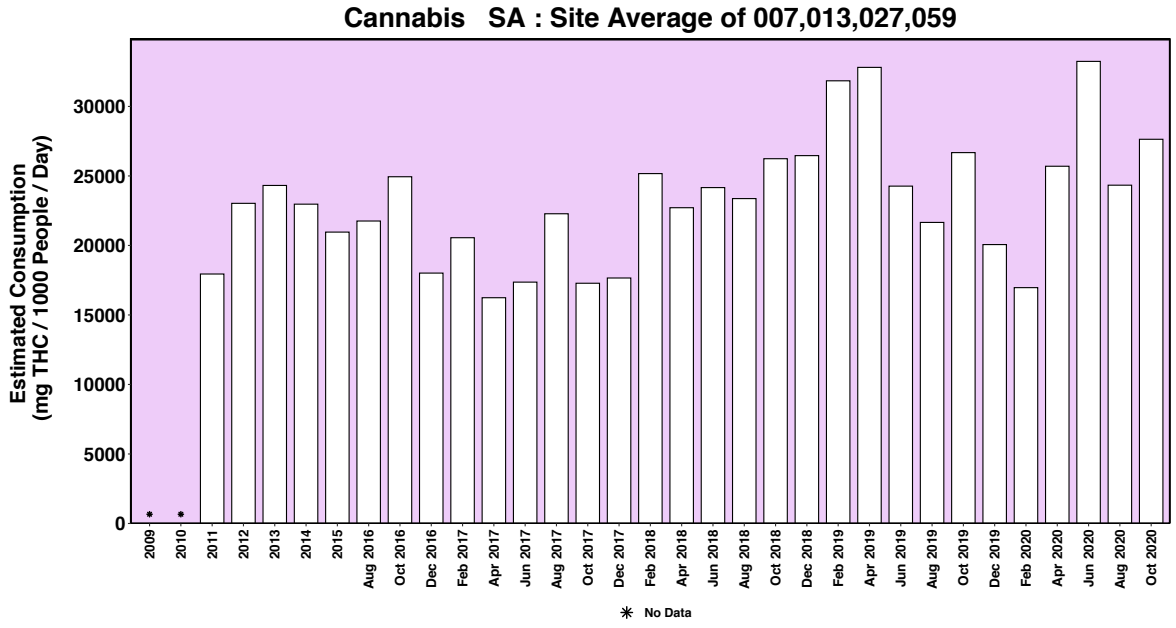


Figure 36: Estimated average consumption of cannabis by state/territory, August 2018 to October 2020.

Figure 37: Change in cannabis consumption in capital city South Australia. Cannabis is detected via the THC metabolite, THC-COOH.



4.2.5 NEW PSYCHOACTIVE SUBSTANCES (NPS)

Methylone and mephedrone were only detected sporadically and at very low levels compared to other substances included in the report (August 2020 mephedrone and methylone results are shown in Table 10).

4.2.6 NATIONAL CAPITAL CITY AND REGIONAL AVERAGES

In order to show the national trends in the use of individual substances, all capital city and regional sites were combined and displayed as separate graphs for the total sampling period (Figure 38). Fewer sites were sampled in October 2016. Therefore, the contributing population was smaller between these dates and some approximations were necessary to account for the absence of densely populated regions (e.g. October 2016 for capital city New South Wales and Queensland).

Overall methylamphetamine consumption rates in regional Australia increased more than in the capital cities from early 2017 to late 2019. With the onset of the pandemic and various restrictions coming into effect in early 2020, use of methylamphetamine dropped substantially. In the current reporting period of August (all sites) and October (capital cities), levels in regional and capital city Australia have declined to the lowest levels since the start of the Program in 2016. The increased divergence between methylamphetamine use in capital cities and regional centres at the time of restrictions coming into effect in April was erased in August.

MDMA consumption rates declined overall over the first year of the Program, followed by a gradual increase towards the end of 2019. The rates of change were more pronounced in regional areas with a larger decline early on (August 2016 to April 2017), followed by a more substantial increase than in the cities. Levels of MDMA use reached their peaks in both demographic areas in late 2019. The April 2020 lockdowns had an immediate effect on the use of the substance. Levels across the country declined to those last observed in 2018. At the end of the current reporting period, capital city use was reminiscent of 2017 patterns.

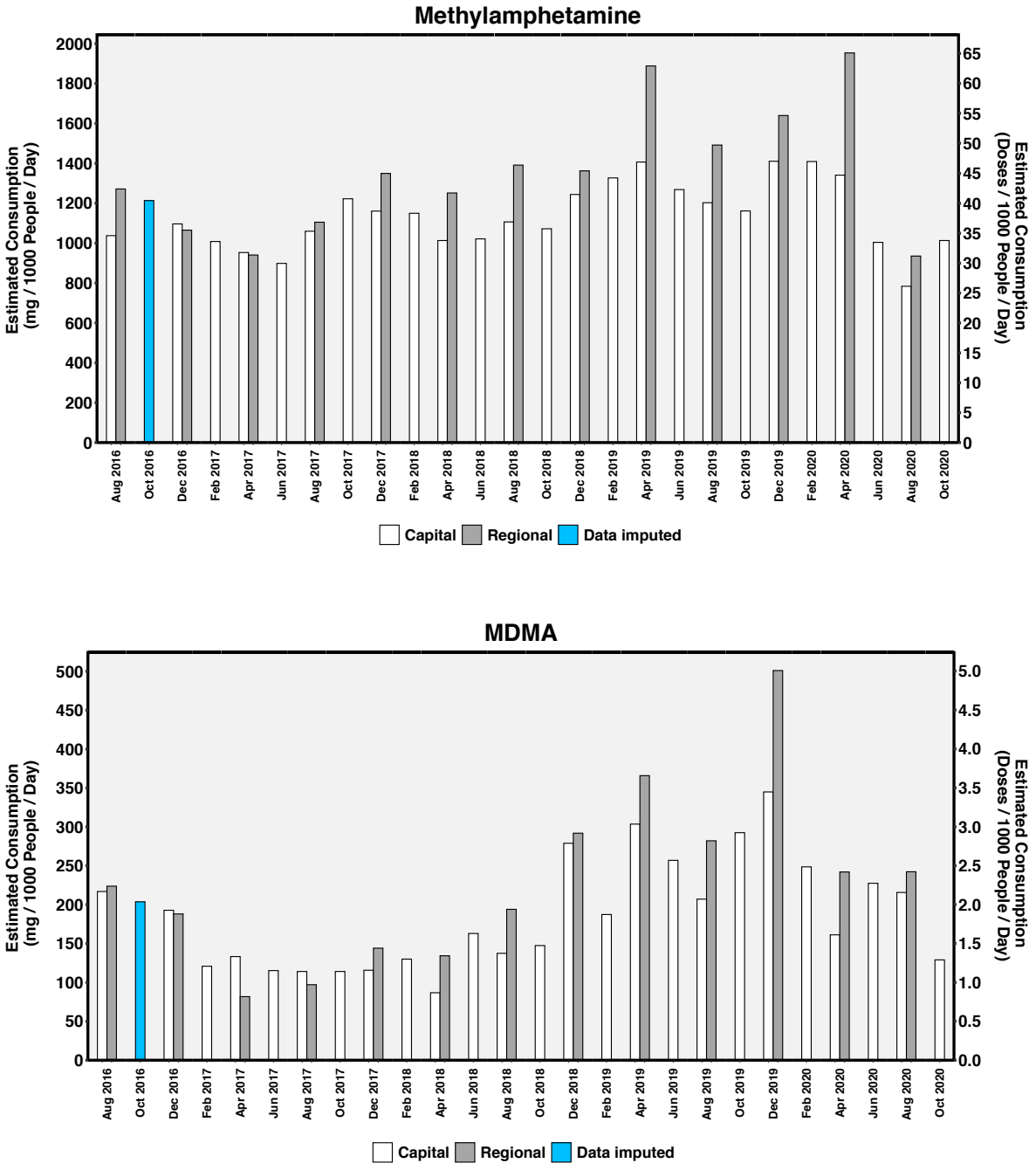
Long-term trends relating to cocaine and heroin consumption clearly showed the discrepancy between capital city and regional use of these illicit substances. Overall cocaine consumption in the capital cities has been trending upwards over the lifespan of the Program. At a regional level, short-term fluctuations early on changed to a rising trend towards the end of 2019. COVID-19 appears to have arrested the increased regional consumption, although the effect is less dramatic than methylamphetamine. At a capital city level, consumption reached a historical high in June, after a slight decline in April. Use has remained high since then.

Heroin similarly reached its highest recorded levels in capital cities during the pandemic, dropping back after August. Consumption of the drug in regional areas is at a relatively low rate and patterns are more erratic. Nevertheless, regional use appears to be on target for an annual high.

In terms of legal substances with abuse potential, alcohol and nicotine consumption remained largely unchanged from the start of the Program, with only small fluctuations evident (Figure 39). Capital city use has been consistently lower than in regional Australia and also more variable. Results from this reporting period show a marginal decline in capital city nicotine consumption, while regional areas remained essentially constant. In the case of alcohol, the April 2020 ban on social events and general restrictions caused a decline in averages in both regional and capital city areas. Levels recovered after April but have declined again in the capital cities more recently. A distinct difference between capital cities and regional Australia was observed for the two pharmaceutical opioids monitored in the Program. Capital city populations consumed both drugs at substantially lower levels compared to regional areas, although the gap in fentanyl consumption has been decreasing over the course of 2020. Oxycodone consumption increased steadily after early 2017 and reached a peak in December 2018, declining since then. This has been more apparent in the case of regional centres. Fentanyl use showed a peak in consumption from late 2017 to early 2019, stabilising for a period at relatively low rates, before declining again in this reporting period. Currently fentanyl use is at the lowest levels since the Program commenced in 2016.

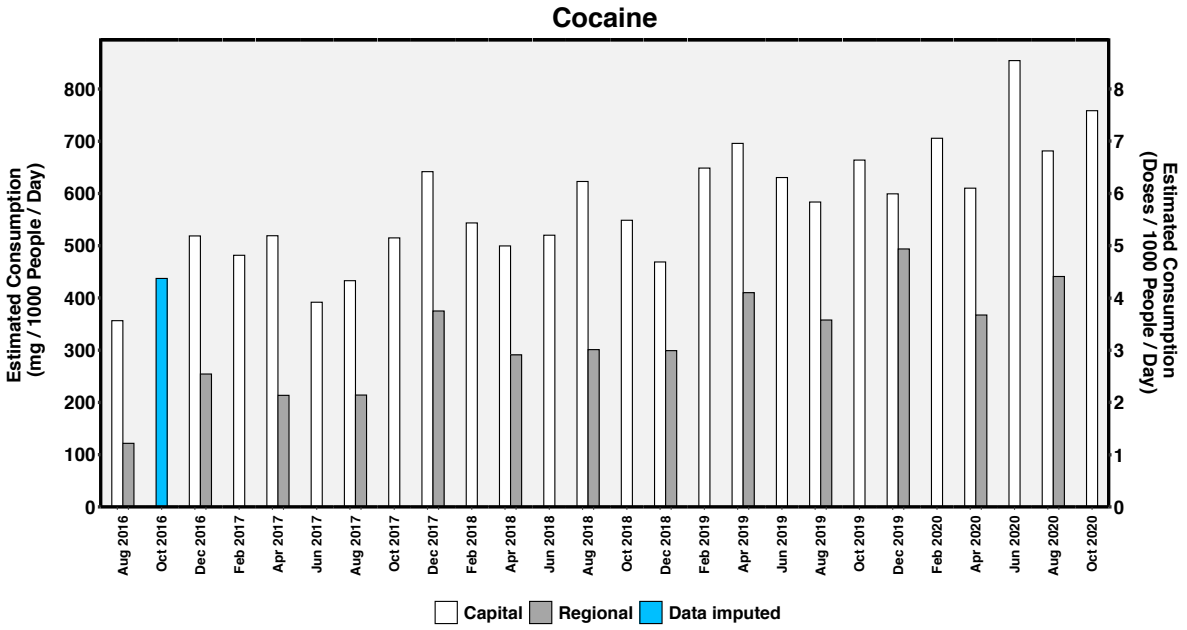
The remaining substances, cannabis, MDA, mephedrone and methylone had mixed patterns in the national context. Cannabis showed relatively steady consumption rates across capital cities and a rising trend in regional areas since the autumn of 2019 (Figure 40). Although an increase in capital city use after the start of the COVID-19 pandemic is apparent, a similar increase was observed towards the end of 2019. MDA also appeared stable across city sites for most of the monitoring period. Use in capital cities has been declining over the course of 2020, particularly after the lockdown period in April. The regional overall rates of MDA use were variable, which was mainly driven by sites in Queensland. The mephedrone and methylone detection rates varied across the course of the Program for samples collected in capital city and regional areas. Methylone detection frequency declined towards early 2018 and has remained low. A slight upward trend off a very low base was apparent in the capital cities over the period 2018 to April 2020, but detections have declined since then. In contrast, the detection frequency of mephedrone in capital cities increased steadily to just before the April lockdowns, at which point it dropped back to 2018 levels. However, once restrictions were partially lifted across the nation, mephedrone detections increased to the highest frequency over the life of the Program. Interestingly, the situation in regional Australia has been quite the opposite, with mephedrone detections declining since April 2019.

Figure 38: The population-weighted average of all sites for methylamphetamine, MDMA, cocaine and heroin.



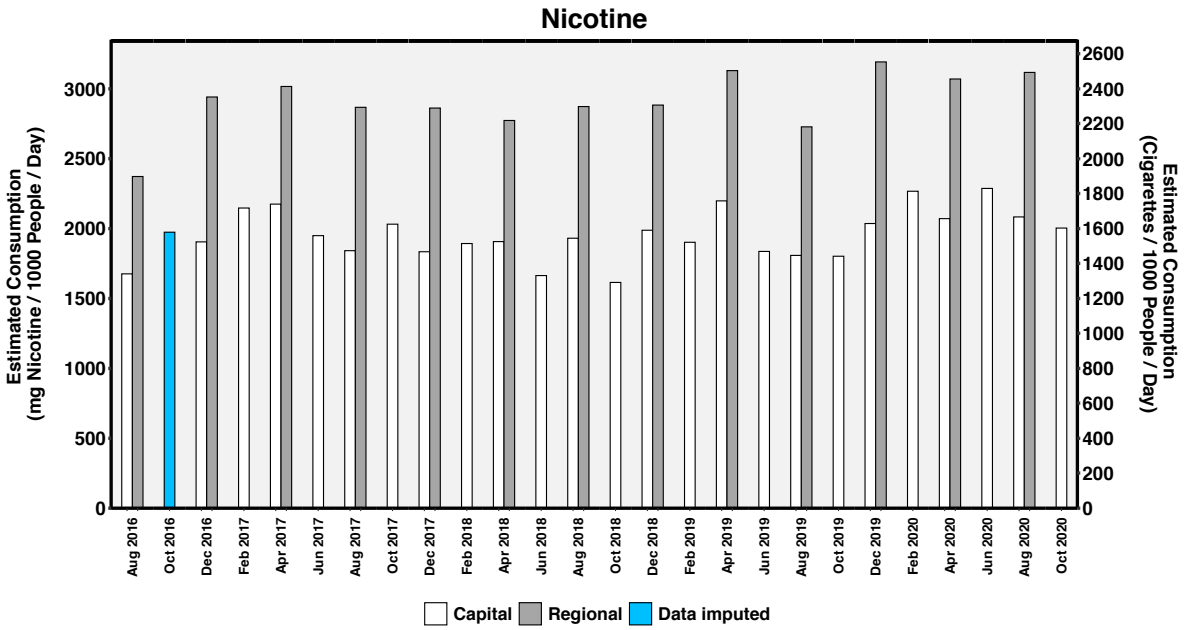
Regional areas are only sampled every second collection period. As Queensland and New South Wales capital city sites were not sampled in October 2016, their average consumption in August and December 2016 was used to provide the overall October estimate.

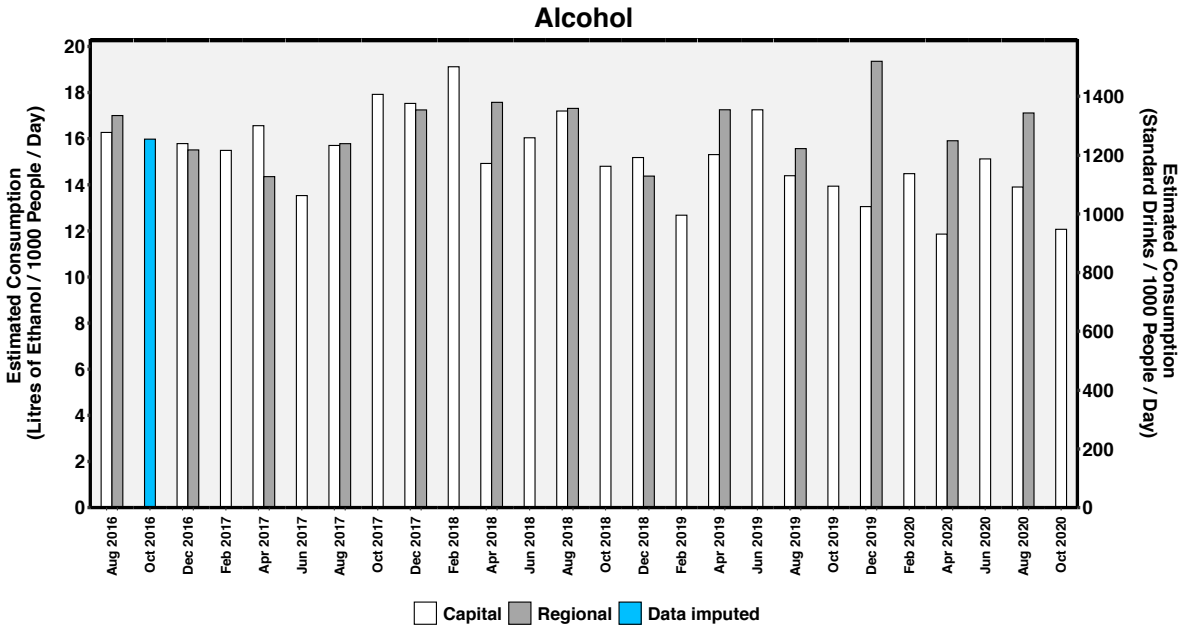
Figure 38 (continued): The population-weighted average of all sites for methylamphetamine, MDMA, cocaine and heroin.



Regional areas are only sampled every second collection period. 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 overall October estimate.

Figure 39: The population-weighted average of all sites for nicotine[9], alcohol, oxycodone and fentanyl.

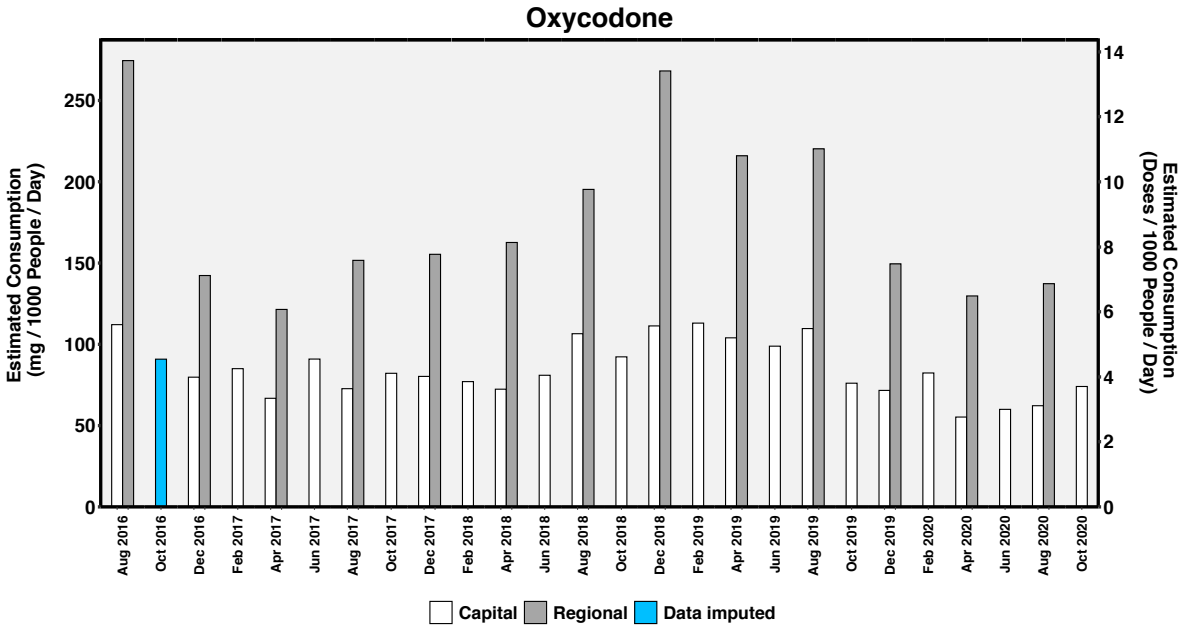


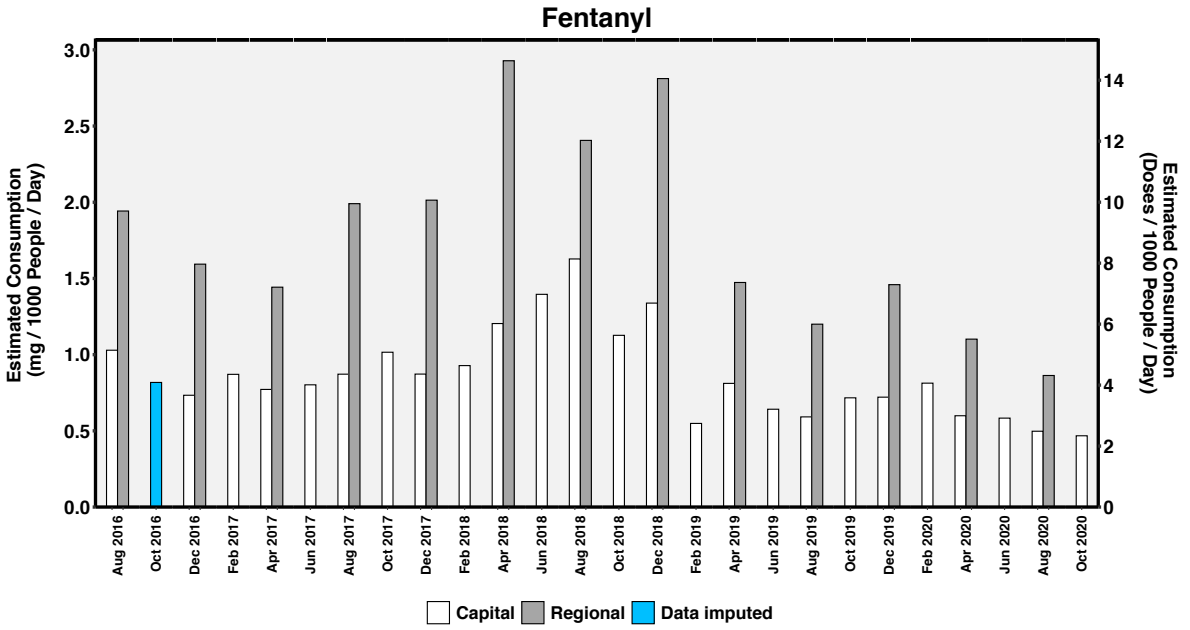


Regional areas are only sampled every second collection period. As Queensland and New South Wales capital city sites were not sampled in October 2016, their average consumption in August and December 2016 was used to provide the overall October estimate.

9 Nicotine consumption data have been adjusted to refine the factor used to convert consumed mass load to dose. Overall trends in nicotine consumption remain unchanged.

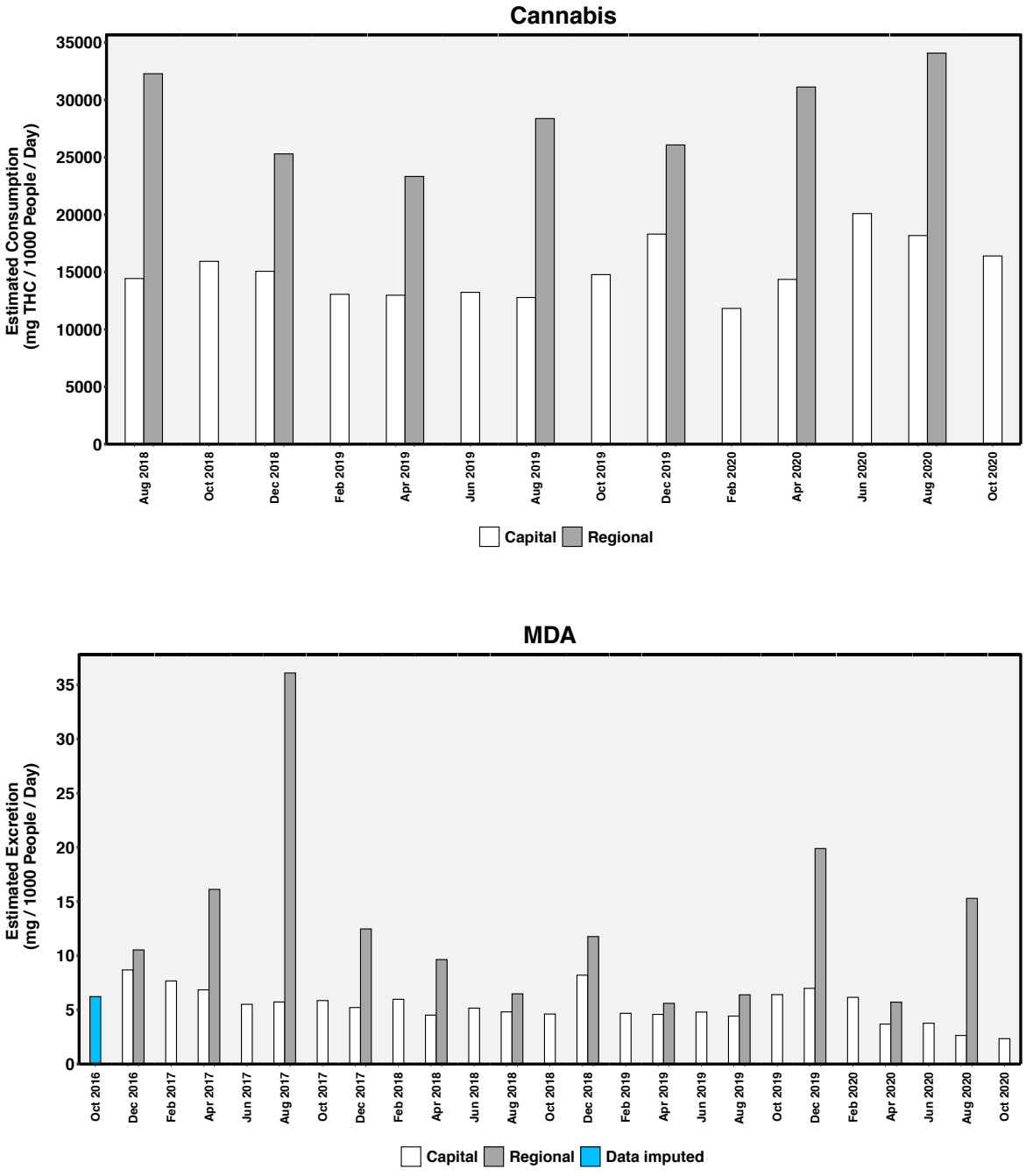
Figure 39 (continued): The population-weighted average of all sites for nicotine, alcohol, oxycodone and fentanyl.





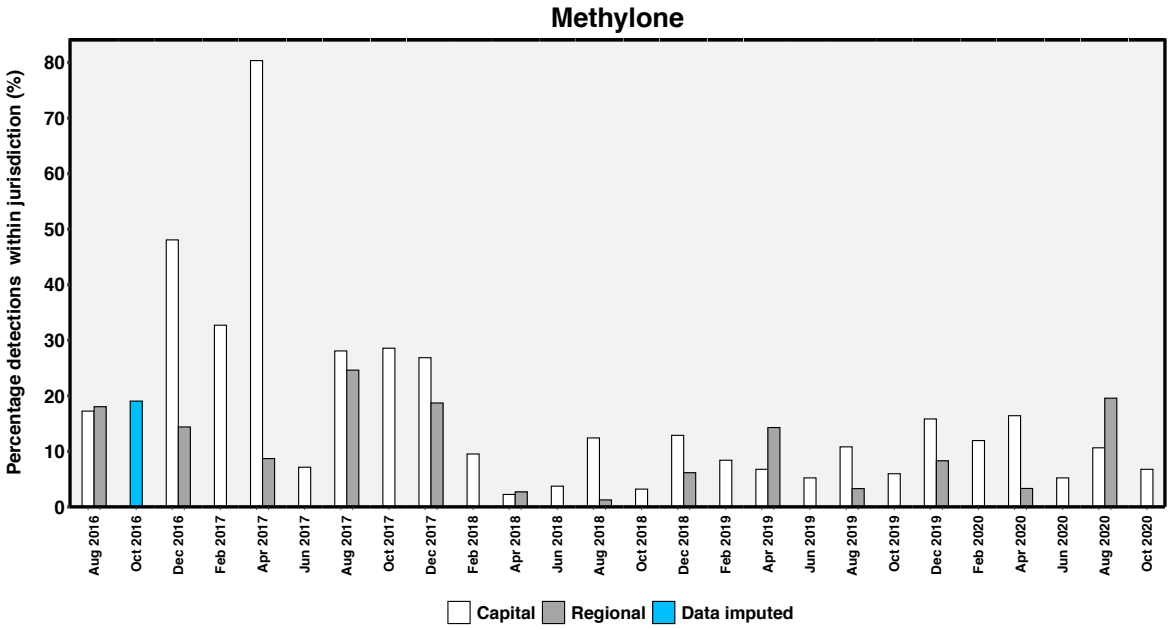
Regional areas are only sampled every second collection period. As Queensland and New South Wales capital city sites were not sampled in October 2016, their average consumption in August and December 2016 was used to provide the overall October estimate.

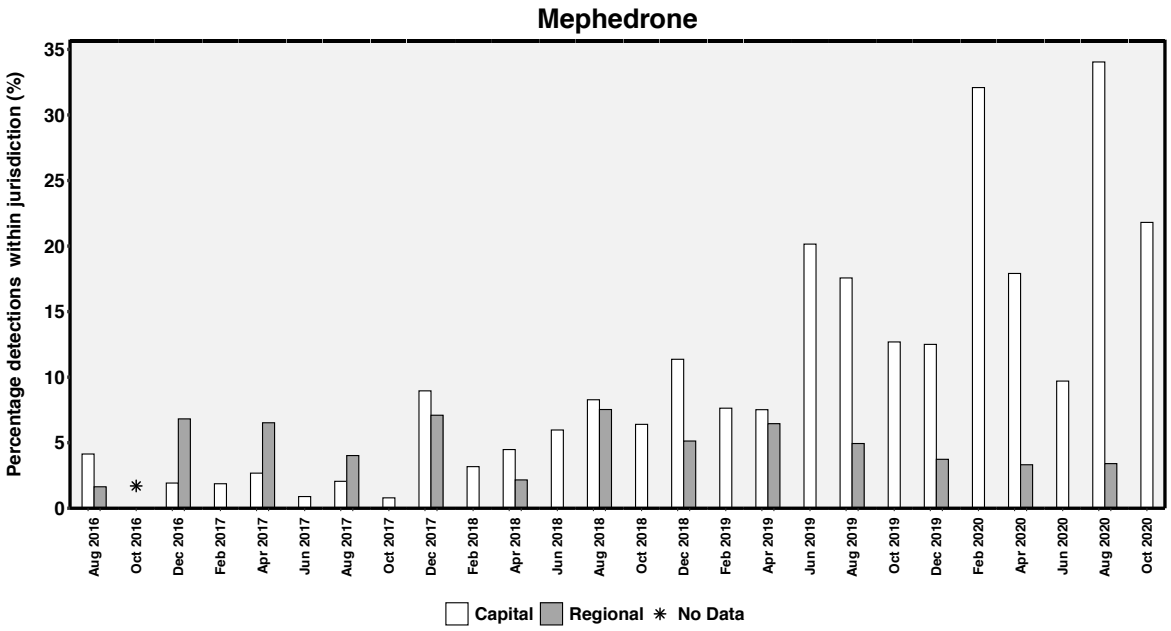
Figure 40: The population-weighted average of all sites for cannabis, MDA, methylone and mephedrone.



Regional areas are only sampled every second collection period. 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 overall October estimate.

Figure 40 (continued): The population-weighted average of all sites for cannabis, MDA, methylone and mephedrone.





Regional areas are only sampled every second collection period. 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 overall October estimate.

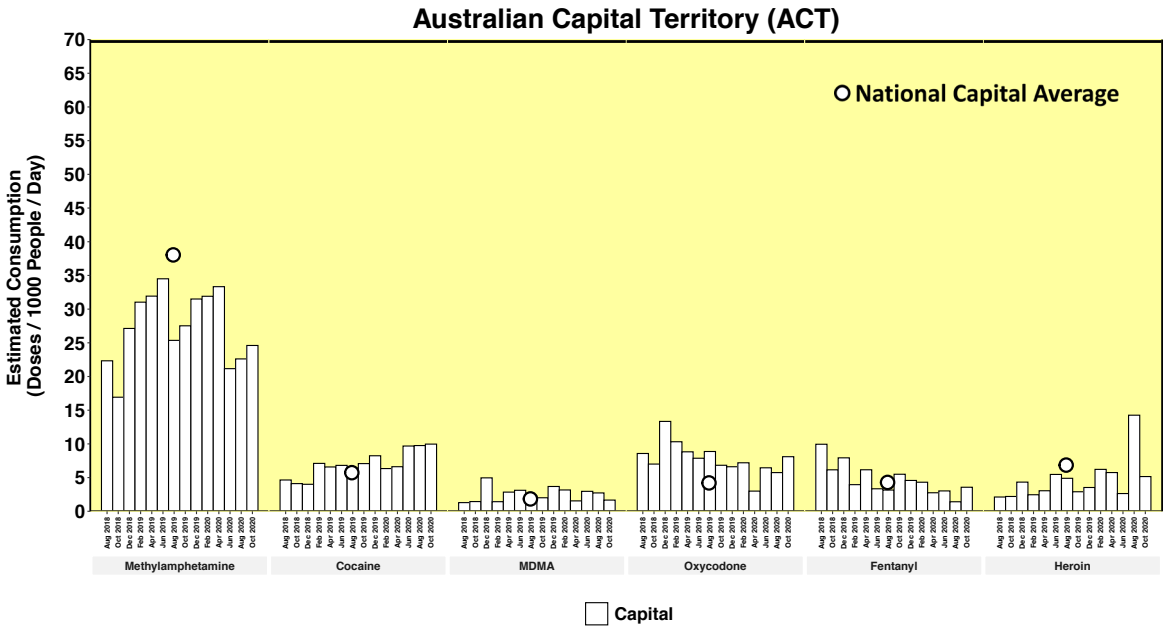
4.3 DRUG PROFILE FOR EACH STATE AND TERRITORY

For the purpose of comparing the scale of use of different types of drugs within the same region (for example, within a state or territory), drug consumption was reported as the number of doses consumed. Cannabis has been omitted from this section in this and previous reports since the definition of a typical dose of cannabis is not well defined. Cannabis will be included in comparisons when an appropriate dose figure becomes available. In the absence of pharmacokinetic excretion data for MDA, methylone and mephedrone, these compounds were also excluded from the section.

When the amount of drug measured in wastewater was normalised for population size and average dose consumed (conversion factors listed in Report 1, and in Appendix 1), alcohol and nicotine remained consistently the highest consumed drugs in all states and territories. For example, the national average consumption of nicotine and alcohol per 1,000 people per day was approximately 1,800 cigarettes (Figure 4) and 1,000 standard drinks (Figure 5), whereas for methylamphetamine, the national average consumption was fewer than 30 doses per 1,000 people per day (Figure 8).

Aside from nicotine and alcohol, of the illicit drugs with dose information available, methylamphetamine use remained highest of the drugs included in the report (Figure 41). This was the case across all regions of Australia, with the scale of use of methylamphetamine consistently high for both capital cities and regional sites. Even with the dramatic reduction in methylamphetamine use in some states due to the pandemic, e.g. Western Australia where use has declined to historical lows, the drug is still used at higher levels than any other illicit substance included in the graphs. Tasmania is the only state where oxycodone use matched methylamphetamine levels in the current reporting period. In terms of the profiles of other drugs monitored by the NWDMP (cocaine, MDMA, oxycodone and fentanyl), the patterns were less consistent. The proportional increase in cocaine in the Australian Capital Territory over the past two years is conspicuous. In most states, a decline in pharmaceutical opioid use is apparent, especially in regional areas. Victoria was the state most affected by a second wave of COVID-19 infections and associated lockdowns. However, recent patterns in illicit drug use appeared to be consistent with most other states, except in the case of heroin use, which has increased recently. Overall, 2020 has altered the drug landscape in Australia with significant reductions in methylamphetamine use to levels not seen before during the life of the Program. The pandemic resulted in short-term changes in alcohol use at a national level, while use of drugs such as MDMA and cocaine varied more on a state and territory level.

Figure 41: Profile of average drug consumption by state or territory, August 2018 to October 2020 for capital sites and to August 2020 for regional sites. 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). The circles represent the cumulative national average of all time points for respective drugs.



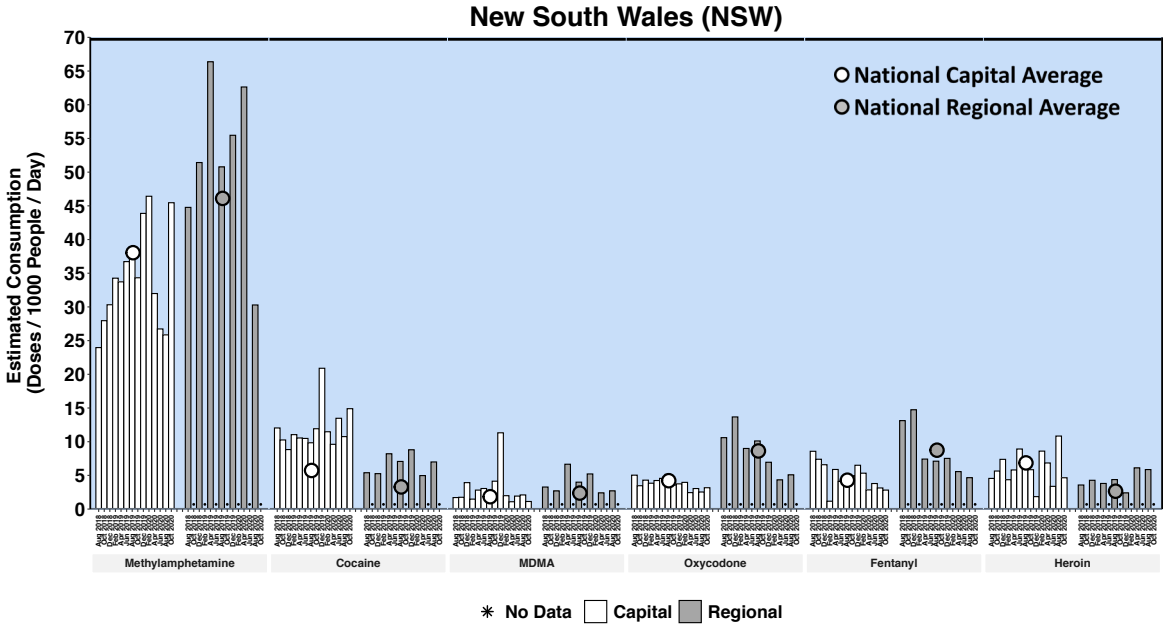
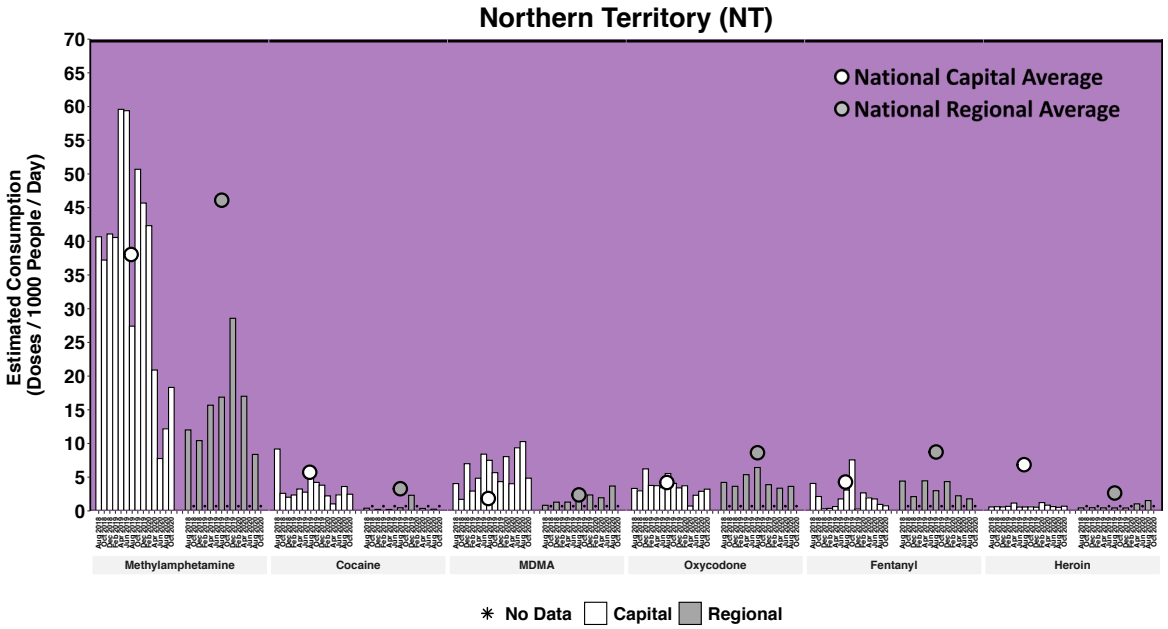


Figure 41 (continued): Profile of average drug consumption by state or territory, August 2018 to October 2020 for capital sites and to August 2020 for regional sites.



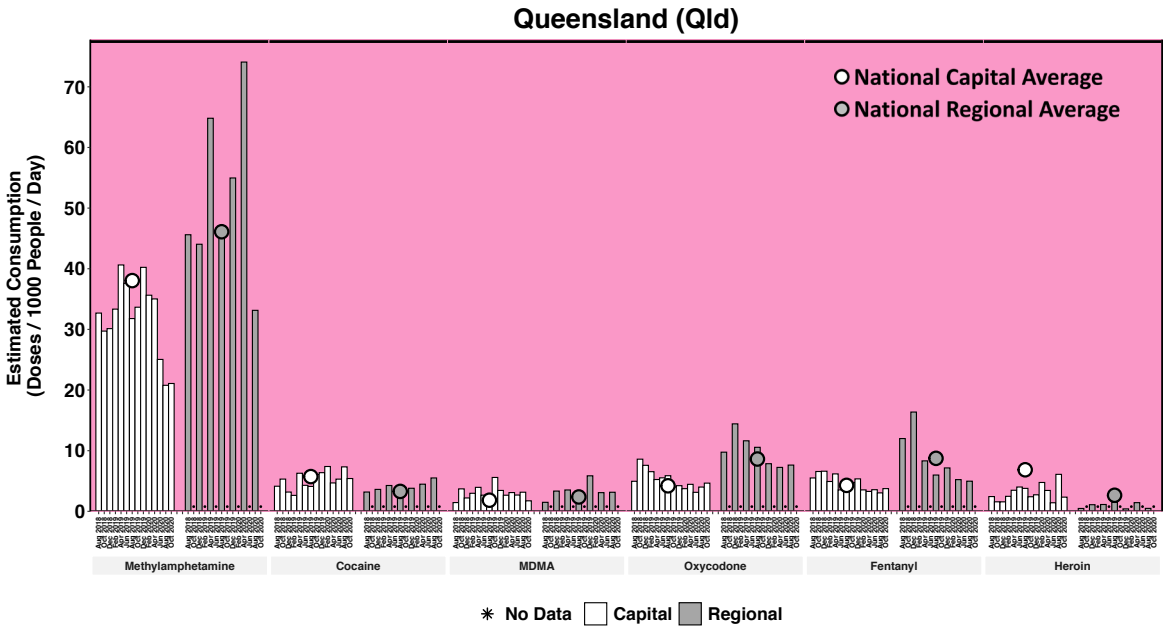
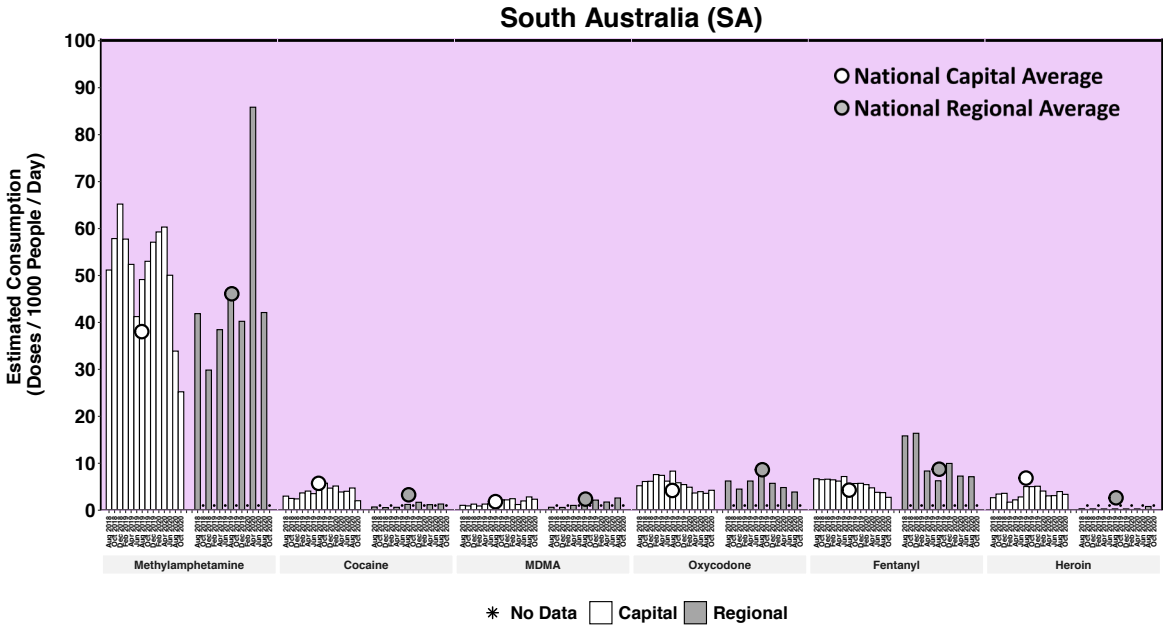


Figure 41 (continued): Profile of average drug consumption by state or territory, August 2018 to October 2020 for capital sites and to August 2020 for regional sites. Note: the y axes for South Australia is higher than the other jurisdictions.



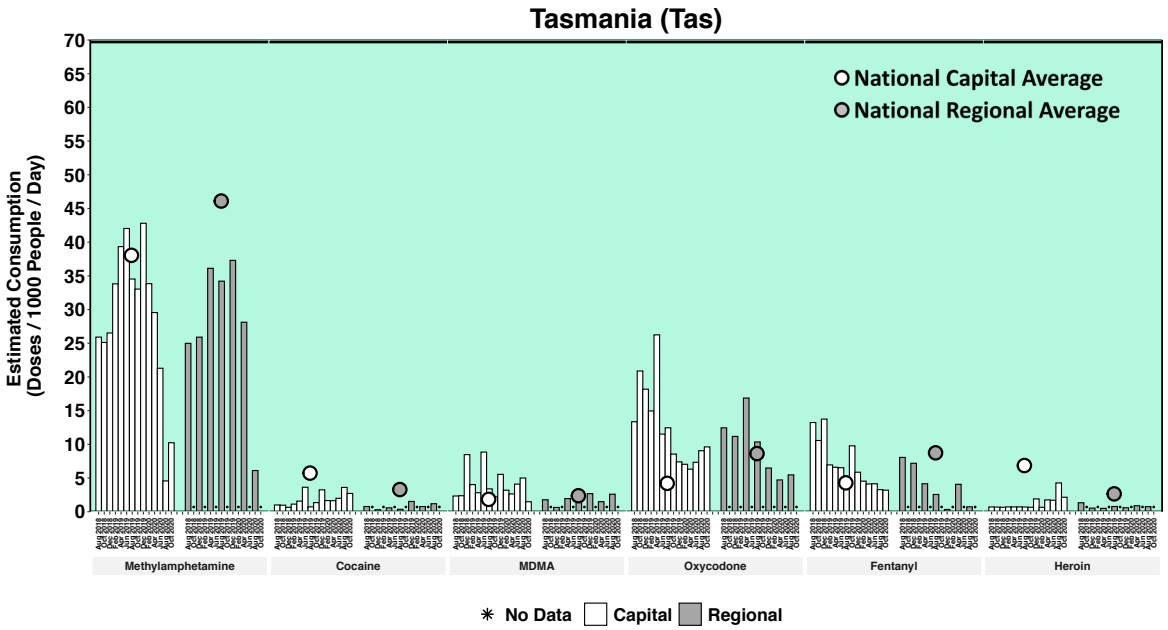
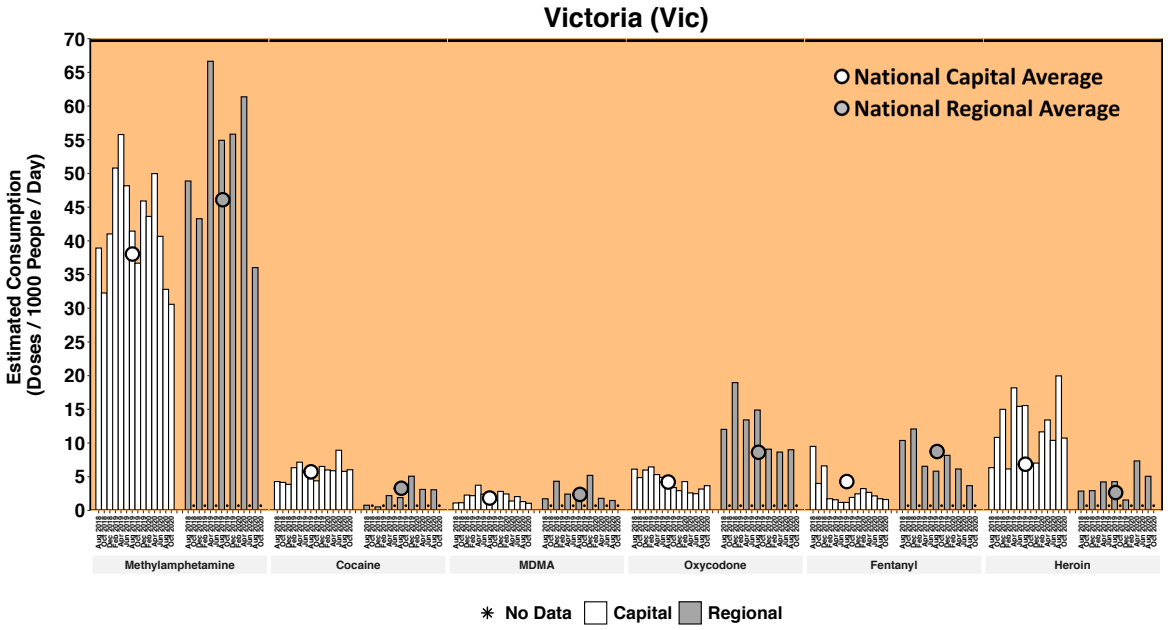
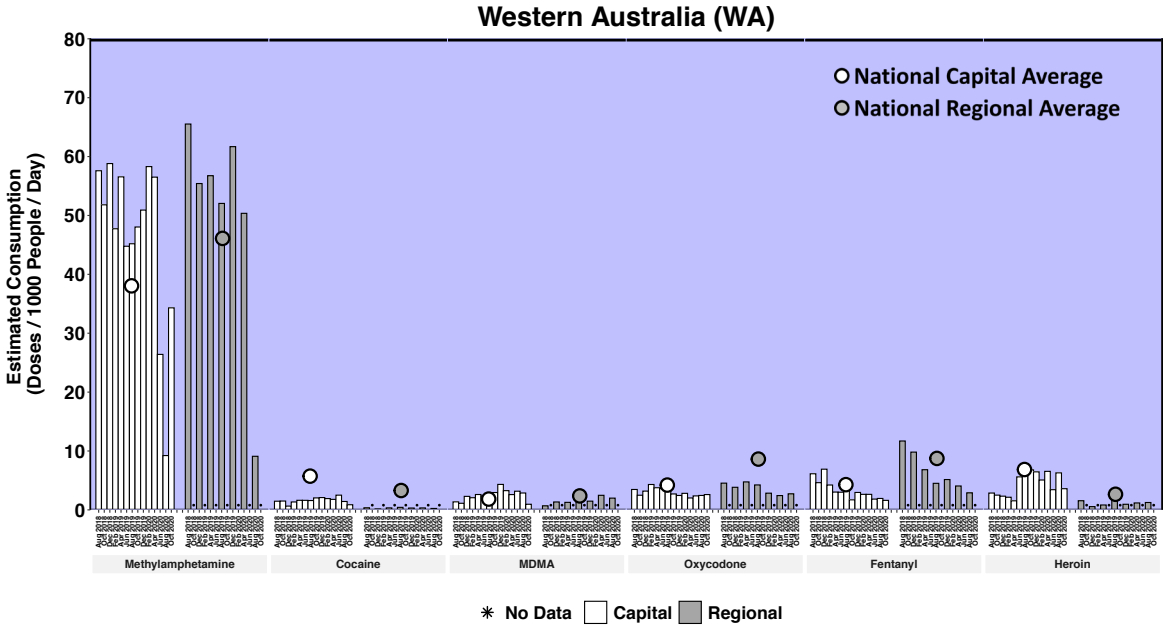


Figure 41 (continued): Profile of average drug consumption by state or territory, August 2018 to October 2020 for capital sites and to August 2020 for regional sites. Note: the y axes for Western Australia is higher than the other jurisdictions.





5: ACKNOWLEDGMENTS

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We also thank the members of the Emerging Environmental Health Risks research group at QAEHS (incorporating the former Entox) for assistance with preparing and shipping 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 advisors 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/).

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7: APPENDICES

APPENDIX 1: DRUG-SPECIFIC PARAMETERS FOR ANALYTICAL REPORTING AND USAGE CALCULATIONS

Analyte levels of detection, levels of reporting, highest detection, excretion factors and standard doses from the literature.

Analyte/metabolite	Drug	Limit of detection (LOD) [ng/L]	Limit of quantification (LOQ) [ng/L]	Excretion factor	Standard dose pure drug (mg)
Amphetamine	Amphetamine	12	16	0.394[a]	30[b]
Cocaine	Cocaine	17	50	0.075[b]	100[b]
Cotinine	Nicotine	33	100	0.3[c]	1.25[c]
Norfentanyl	Fentanyl	0.1	0.1	0.3[d]	0.2[d]
MDA *	MDA	1	4	n.a.	n.a.[#]
MDMA	MDMA	1.5	2	0.225[b]	100[b]
Mephedrone	Mephedrone	0.4	0.8	n.a.	n.a.
Methylamphetamine	Methylamphetamine	33	100	0.39[g]	30[b]
Methylone	Methylone	0.01	0.1	n.a.	n.a.
Hydroxycotinine	Nicotine	17	50	0.44[c]	1.25[c]
Noroxycodone	Oxycodone	0.1	1	0.22[f]	20[d]
Ethyl Sulphate	Alcohol (ethanol)	167	500	0.00012[e]	10g[e]
Benzoylecgonine	Cocaine	33	100	0.35[g]	100[b]
6-Monoacetylmorphine	Heroin	0.5	1.0	0.013[h]	20[i]
THC-COOH	THC (Cannabis)	30	180	0.006[b]	n.a.

n.a. = data not available; a = (Khan and Nicell 2012); b = (Zuccato et al. 2008); c = (Castiglioni et al. 2015); d = (Rossi 2016); e = (Ryu et al. 2016); f = (Lalovic et al. 2006); g = (Lai et al. 2011); h = (Boerner et al. 1975); i = (Sullivan et al. 2006).

*Data is not available in the scientific literature for the proportion of MDA that is eliminated after MDA consumption. However, data is available detailing the proportion of MDA eliminated after MDMA consumption. Therefore, our MDA estimate of mg excreted per day per 1,000 people is the amount of MDA excreted from the population after considering the metabolic fraction excreted from MDMA.

#It is likely that the dose for MDA is similar to that of MDMA, or 100 mg.

APPENDIX 2: SAMPLING DETAILS OF EACH SITE FOR AUGUST AND OCTOBER 2020[10]

Sites	Capital or Regional	Aug 2020	Oct 2020	Population category
ACT: 009	Capital	7	7	> 150,000
NSW: 003	Capital	7	7	> 150,000
NSW: 006	Capital	7	7	> 150,000
NSW: 008	Capital	7	7	> 150,000
NSW: 021	Capital	7	–	30,000 to 150,000
NSW: 071	Capital	–	–	> 150,000
NSW: 016	Regional	5	–	30,000 to 150,000
NSW: 025	Regional	7	–	30,000 to 150,000
NSW: 040	Regional	–	–	< 30,000
NSW: 051	Regional	–	–	< 30,000
NSW: 068	Regional	7	–	> 150,000
NSW: 081	Regional	7	–	< 30,000
NSW: 115	Regional	7	–	30,000 to 150,000
NT: 010	Capital	7	7	30,000 to 150,000
NT: 078	Regional	7	–	< 30,000
Qld: 002	Capital	7	7	> 150,000
Qld: 005	Capital	7	7	> 150,000
Qld: 011	Capital	7	7	> 150,000
Qld: 012	Regional	5	–	> 150,000
Qld: 020	Regional	7	–	< 30,000
Qld: 024	Regional	7	–	30,000 to 150,000
Qld: 028	Regional	7	–	30,000 to 150,000
Qld: 029	Regional	7	–	30,000 to 150,000
Qld: 033	Regional	7	–	30,000 to 150,000
Qld: 039	Regional	–	–	< 30,000
Qld: 042	Regional	5	–	30,000 to 150,000
Qld: 053	Regional	7	–	< 30,000
Qld: 077	Regional	7	–	< 30,000
Qld: 092	Regional	–	–	< 30,000
SA: 007	Capital	7	7	> 150,000
SA: 013	Capital	7	7	> 150,000
SA: 027	Capital	7	7	30,000 to 150,000
SA: 059	Capital	7	7	> 150,000
SA: 017	Regional	7	–	< 30,000
SA: 022	Regional	7	–	< 30,000
SA: 063	Regional	7	–	< 30,000
SA: 076	Regional	7	–	< 30,000
SA: 119	Regional	7	0	< 30,000

10 Sampling details of each wastewater treatment plant for the previous collection periods are available in Report 7, 8, 9, 10, 11, Appendix 2 and Report 6, Appendix 3.

APPENDIX 2 (CONTINUED)

Sites	Capital or Regional	Aug 2020	Oct 2020	Population category
Tas: 004	Capital	5	5	< 30,000
Tas: 019	Capital	5	5	< 30,000
Tas: 041	Capital	5	5	< 30,000
Tas: 018	Regional	5	–	< 30,000
Tas: 038	Regional	0	–	< 30,000
Tas: 048	Regional	5	–	< 30,000
Tas: 058	Regional	–	–	< 30,000
Vic: 001	Capital	7	7	> 150,000
Vic: 067	Capital	7	7	> 150,000
Vic: 037	Regional	7	–	> 150,000
Vic: 046	Regional	–	–	30,000 to 150,000
Vic: 061	Regional	7	–	30,000 to 150,000
Vic: 062	Regional	–	–	< 30,000
Vic: 066	Regional	7	–	30,000 to 150,000
Vic: 114	Regional	7	–	30,000 to 150,000
Vic: 121	Regional	7	–	< 30,000
Vic: 122	Regional	7	–	< 30,000
Vic: 123	Regional	–	–	< 30,000
Vic: 124	Regional	–	–	< 30,000
Vic: 125	Regional	7	–	30,000 to 150,000
Vic: 155	Regional	7	–	30,000 to 150,000
Vic: 156	Regional	7	–	< 30,000
WA: 101	Capital	7	7	> 150,000
WA: 103	Capital	7	6	> 150,000
WA: 104	Capital	7	7	> 150,000
WA: 102	Regional	7	–	30,000 to 150,000
WA: 116	Regional	7	–	< 30,000
WA: 118	Regional	–	–	< 30,000
WA: 120	Regional	7	–	30,000 to 150,000
WA: 129	Regional	7	–	< 30,000
Regional Sites	Regional Sites	35	–	
Capital Sites	Capital Sites	21	20	
Total Sites	**Total Sites**	**56**	**20**	
Regional Samples	Regional Samples	235	–	
Capital Samples	Capital Samples	141	133	
Total Samples	Total Samples	376	133	
Cumulative Samples	**Cumulative Samples**	**5,799**	**5,932**	

APPENDIX 3: PROPORTION OF SAMPLES ABOVE LOD (%) FOR EACH DRUG AND PERIOD ASSESSED[11]

Drug	Capital or Regional	Aug 2020	Oct 2020
Alcohol	Capital	100	100
Alcohol	Regional	100	–
Cannabis	Capital	100	100
Cannabis	Regional	100	–
Cocaine	Capital	100	100
Cocaine	Regional	88	–
Fentanyl	Capital	90	96
Fentanyl	Regional	91	–
Heroin	Capital	89	86
Heroin	Regional	64	–
MDA	Capital	100	88
MDA	Regional	96	–
MDMA	Capital	100	100
MDMA	Regional	100	–
Mephedrone	Capital	18	9
Mephedrone	Regional	3	–
Methylamphetamine	Capital	100	100
Methylamphetamine	Regional	100	–
Methylone	Capital	11	7
Methylone	Regional	20	–
Nicotine	Capital	100	100
Nicotine	Regional	100	–
Oxycodone	Capital	100	100
Oxycodone	Regional	100	–

11 Percentage detection for previous collection periods are available in Report 7, 8, 9, 10, 11, Appendix 3 and Report 6, Appendix 4.

CONCLUSIONS

CONCLUSIONS

For the twelfth report of the National Wastewater Drug Monitoring Program, wastewater analysis was conducted in August (capital city and regional sites) and October (capital city sites only) 2020. The Program has identified variations in patterns of drug consumption, both over time and within and between jurisdictions. Consistent with previous reports, findings show that of the substances monitored with known doses, nicotine and alcohol are the most consumed drugs in Australia, while methylamphetamine remains the most consumed illicit drug.[12]

METHYLAMPHETAMINE

When comparing data for April and August 2020, the population-weighted average consumption of methylamphetamine decreased in both capital city and regional sites to the lowest levels recorded by the Program, with capital city methylamphetamine consumption increasing from August to October 2020. Regional average methylamphetamine consumption continues to exceed capital city average consumption. South Australia had the highest estimated average methylamphetamine consumption in both capital city and regional sites in August 2020.

COCAINE

When comparing data for April and August 2020, the population-weighted average consumption of cocaine increased in both capital city and regional sites, with capital city cocaine consumption further increasing in October 2020. Capital city average cocaine consumption continues to exceed regional average consumption. New South Wales had the highest estimated average cocaine consumption in both capital city and regional sites in August 2020.

3,4-METHYLENEDIOXYMETHYLAMPHETAMINE (MDMA)

When comparing data for April and August 2020, the population-weighted average consumption of MDMA increased in capital city sites and remained relatively stable in regional sites, with capital city MDMA consumption decreasing from August to October 2020. Regional average MDMA consumption continues to exceed capital city average consumption. The Northern Territory[13] had the highest estimated average MDMA consumption in both capital city and regional sites in August 2020.

3,4-METHYLENEDIOXYAMPHETAMINE (MDA)

MDA is a metabolite of MDMA. When comparing data for April and August 2020, MDA excretion decreased in capital city sites and increased in regional sites. MDA excretion further decreased in capital city sites in October 2020 to the lowest level recorded by the Program. Regional average MDA excretion continues to exceed capital city average excretion. Tasmania had the highest estimated average MDA excretion in capital city sites, while Queensland had the highest excretion in regional sites in August 2020.

12 Throughout this report, unless otherwise stated, all comparisons on the consumption of different drugs are based on doses consumed rather than drug mass.

13 As the Northern Territory only had two participating sites, results may not be representative of the Territory as a whole.

HEROIN

When comparing data for April and August 2020, the population-weighted average consumption of heroin increased in capital city sites and decreased in regional sites, with average capital city consumption in August 2020 increasing to the highest level recorded by the Program, before decreasing in October 2020. Capital city average heroin consumption continues to exceed regional average consumption. Victoria had the highest estimated average capital city consumption of heroin in August 2020, while New South Wales had the highest estimated average regional consumption.

CANNABIS

The Program began measuring cannabis consumption in August 2018. When comparing data for April and August 2020, the population-weighted average consumption of cannabis increased in both capital city and regional sites, with average regional consumption in August 2020 the highest level recorded by the Program. Capital city cannabis consumption decreased from August to October 2020. Regional average cannabis consumption continues to exceed capital city average consumption. Tasmania had the highest estimated average capital city consumption of cannabis in August 2020, while South Australia had the highest estimated average regional consumption.

OXYCODONE

When comparing data for April and August 2020, the population-weighted average consumption of oxycodone increased in both capital city and regional sites, with capital city oxycodone consumption further increasing in October 2020. Regional average oxycodone consumption continues to exceed capital city average consumption. Tasmania had the highest estimated average capital city consumption of oxycodone in August 2020, while Victoria had the highest estimated average regional consumption.

FENTANYL

When comparing data for April and August 2020, the population-weighted average consumption of fentanyl decreased in both capital city and regional sites, with average regional consumption in August 2020 the lowest level recorded by the Program. Average capital city consumption further decreased in October 2020 to the lowest level recorded by the Program. Regional average fentanyl consumption continues to exceed capital city average consumption. South Australia had the highest estimated average fentanyl consumption in both capital city and regional sites in August 2020.

NICOTINE

When comparing data for April and August 2020, the population-weighted average consumption of nicotine increased in both capital city and regional sites, with capital city consumption decreasing from August to October 2020. Regional average nicotine consumption continues to exceed capital city average consumption. The Northern Territory[14] had the highest estimated average nicotine consumption in both capital city and regional sites in August 2020.

14 As the Northern Territory only had two participating sites, results may not be representative of the Territory as a whole.

ALCOHOL

When comparing data for April and August 2020, the population-weighted average consumption of alcohol increased in both capital city and regional sites, with capital city alcohol consumption decreasing from August to October 2020. Regional average alcohol consumption exceeded capital city average consumption. The Northern Territory[15] had the highest estimated average alcohol consumption in both capital city and regional sites in August 2020.

MEPHEDRONE

Consistent with previous reporting periods, mephedrone was mostly detected below the level at which it could be reliably quantified. The number of national detections of mephedrone increased, from 32 in April to 56 in August 2020, with the number of detections in capital city sites exceeding the number of detections in regional sites. The number of sites where mephedrone was detected increased, from 7 in April to 11 in August 2020. Mephedrone was detected in the Australian Capital Territory, New South Wales, Queensland, Victoria and Western Australia, with New South Wales reporting the highest number of detections in August 2020.

METHYLONE

Consistent with previous reporting periods, methylone was mostly detected below the level at which it could be reliably quantified. The number of national detections of methylone increased, from 30 in April to 61 in August 2020, with the number of detections in regional sites exceeding the number of detections in capital city sites. The number of sites where methylone was detected increased, from 11 in April 2020 to 16 in August 2020. Methylone was detected in New South Wales, the Northern Territory, Queensland, South Australia and Western Australia, with Queensland reporting the highest number of detections in August 2020.

NEXT REPORT

The thirteenth report of the National Wastewater Drug Monitoring Program is scheduled for public release in June 2021.

15 As the Northern Territory only had two participating sites, results may not be representative of the Territory as a whole.