NATIONAL WASTEWATER DRUG MONITORING PROGRAM

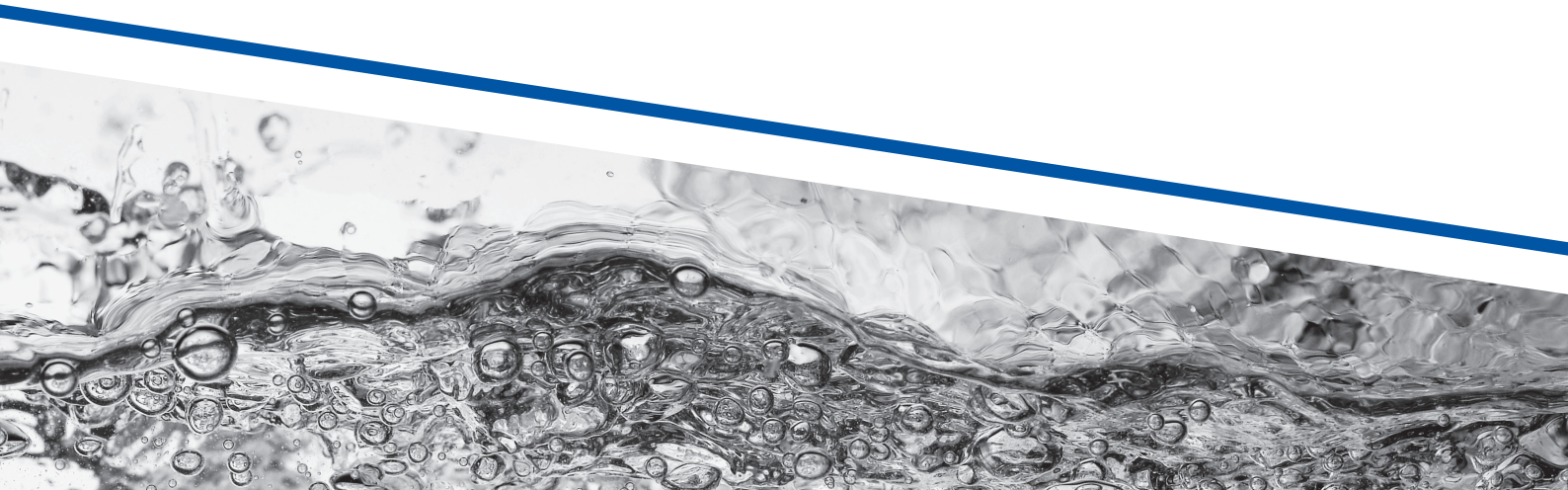
REPORT 15

AUSTRALIAN CRIMINAL INTELLIGENCE COMMISSION

THE UNIVERSITY OF QUEENSLAND AUSTRALIA

University of South Australia

CONTENTS



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) is an Australian Government funded initiative that continues to evolve. 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 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. This is because the level of community harm is directly related to the quantity of substances that are consumed. Understanding drug consumption at a population level supports effective allocation of resources to priority areas and assists to inform appropriate demand, supply and harm reduction strategies.

Wastewater analysis can be used to generate insights into jurisdictional and local drug markets. The ACIC has developed partnerships to merge wastewater data with other drug data in locations of interest to develop a more detailed picture of high-risk markets, including in regional settings. Per capita drug use in regional areas remains higher than capital city consumption for many drugs measured by the Program and harms generated by these markets are significant. Longitudinal data continue to demonstrate the challenges facing different regional areas and also the unique characteristics of local drug markets. For this reason, wastewater analysis can form a meaningful part of bespoke solutions for regional locations.

The ACIC funded 2 universities to concurrently conduct a targeted assessment of drug consumption and intensive wastewater analysis in a regional community, to develop understanding of the local market and inform relevant policy and responses aimed at reducing drug-related harms in regional Australia. This is an example of using wastewater data to aid understanding of a local drug market problem and designing a tailored response to local circumstances. This project provides an exemplar model for future, similar collaborative projects in Australia.

TRENDS IDENTIFIED DURING THIS REPORTING PERIOD

In August 2021, 58 wastewater sites were monitored nationally. Based on 2016 Census data, these sites cover approximately 57 per cent of the Australian population. This reporting period again demonstrated varying trends in drug consumption, both nationally and within jurisdictions. Consumption of methylamphetamine in capital cities and regional sites, and MDMA in capital cities, decreased to the lowest levels recorded by the Program, although in October 2021 consumption of methylamphetamine and cocaine increased in the capital cities, raising the prospect of a potential recovery in these 2 markets.

Consumption of oxycodone and fentanyl appeared to have stabilised, but at low levels. Conversely, consumption of heroin and cannabis increased, with capital city and regional cannabis consumption in August 2021 being the highest recorded by the Program.

THE IMPACT OF COVID-19 RESTRICTIONS ON DRUG MARKETS

COVID-related restrictions have not impacted drug markets uniformly, with differences across drugs and between and within jurisdictions. However, they almost certainly drove relatively sustained decreases in consumption. COVID restrictions did not cause immediate major interruption to Australia's drug markets due to inertia as existing supplies were consumed. The compounding impact of these restrictions over time led to some substantial market interruptions, particularly in Year 5 (2020–21) of the Program, which were complemented by law enforcement market suppression activity and normal market trends, including seasonal factors.

In Year 5 of the Program, total consumption of the 4 major illicit drugs decreased by 4.7 tonnes from Year 4, the first time a decrease in total annual consumption of the drugs had occurred over the life of the Program—this represents a 23 per cent decrease in total consumption in a single year.

For MDMA, consumption more than halved in Year 5, with the market showing no signs of recovery as at October 2021. Consumption of methylamphetamine fluctuated markedly since the commencement of COVID-19 restrictions, including a 21 per cent reduction in national consumption levels in Year 5 of the Program. Year-on-year increases in consumption of cocaine for the first 4 years of the Program ceased in Year 5, with national consumption levels decreasing 17 per cent. Consumption of heroin, which is the least consumed of the 4 drugs, also decreased in Year 5, but only by some 4 per cent.

The long duration of the COVID-19 pandemic, with its associated restrictions, constrained drug markets. However, while impacted by the pandemic for a portion of 2020 and 2021, cannabis consumption increased to record levels in capital cities and regional areas in August 2021. Consumption of fentanyl and oxycodone has likely been impacted by COVID-19 restrictions on elective surgery and the significant demands on medical and health professionals to treat COVID-19, but the data suggest consumption may be close to its lowest level and be largely reflective of legitimate use because consumption has remained relatively stable for the past 6 months.

TRENDS IDENTIFIED DURING THE 5 YEARS OF THE PROGRAM

The Australian drug market story over the past 5 years has some enduring characteristics. Over the 5 years, consumption of methylamphetamine (whether increasing or decreasing) has remained higher by some margin than the combined consumption of the other 3 major illicit drugs (cocaine, MDMA and heroin) for which we have dose data. Consumption of cocaine, MDMA and heroin has fluctuated within a relatively narrow range throughout the period.

The data also consistently evidenced the immense size and value of illicit drug markets and their harm potential. Despite COVID and law enforcement disruptions, an estimated 15.7 tonnes of the 4 major illicit drugs was consumed in Year 5 of the Program. The estimated street value of the 4 major drugs was $10.3 billion in Year 5, up from $8.9 billion in Year 4. This was due to increases in street prices for some illicit drugs. Similar to previous years, methylamphetamine accounted for 77 per cent of the total estimated expenditure on the 4 major illicit drug markets in Year 5 and 56 per cent of their total weight.

Wastewater analysis is important to the Australian people because it provides unique and regular insight into drug consumption and public health threats such as COVID-19. Through the application of science, research and analysis, we are improving our understanding of external factors that affect consumption and the resilience of the respective drug markets. Addressing harmful drug consumption requires improved knowledge about these influences so that tailored supply, demand and harm reduction efforts can be developed and implemented.

ACKNOWLEDGEMENT

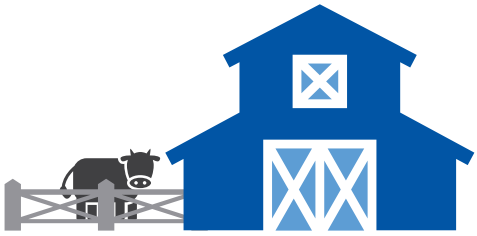
I would like to acknowledge the valuable support and expertise of the Universities of Queensland and South Australia, which undertook the data collection and analysis underpinning this report, and the ACIC officers who contributed to the project.

Michael Phelan APM
Chief Executive Officer
Australian Criminal Intelligence Commission

SNAPSHOT

The August 2021 collection covers around **57 per cent** of Australia's population—about **13.3 million Australians.**

Capital city **cocaine, MDA, heroin** and **ketamine** average consumption exceeded regional consumption.



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

August and October 2021 highlights

Record highs:

cannabis capital and regional (August)

Record lows:

methylamphetamine capital and regional (August)

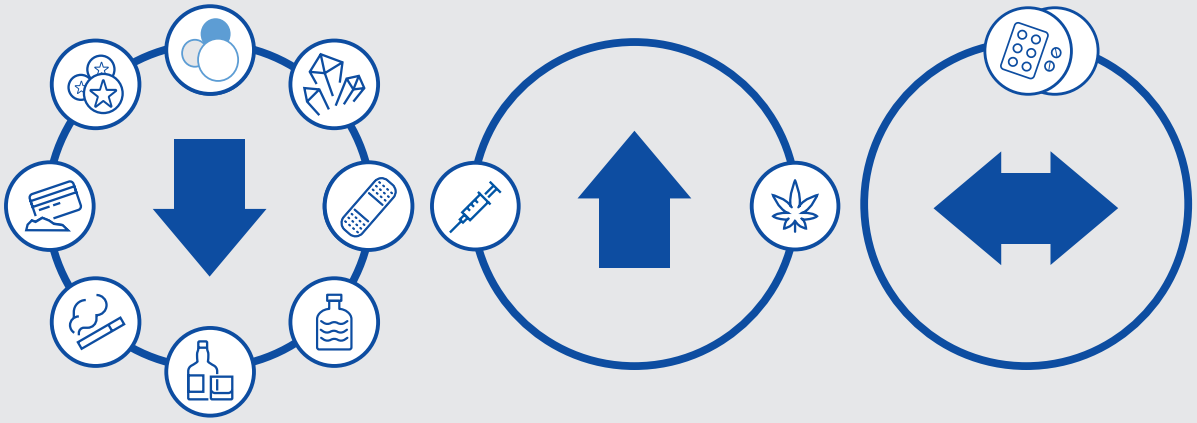
MDA capital and regional (August)

oxycodone regional (August)

MDMA capital (August)

fentanyl capital (October)

Between April and August 2021, the population-weighted average capital city consumption of:



alcohol, nicotine, methylamphetamine, cocaine, MDMA, MDA, fentanyl and ketamine **decreased**

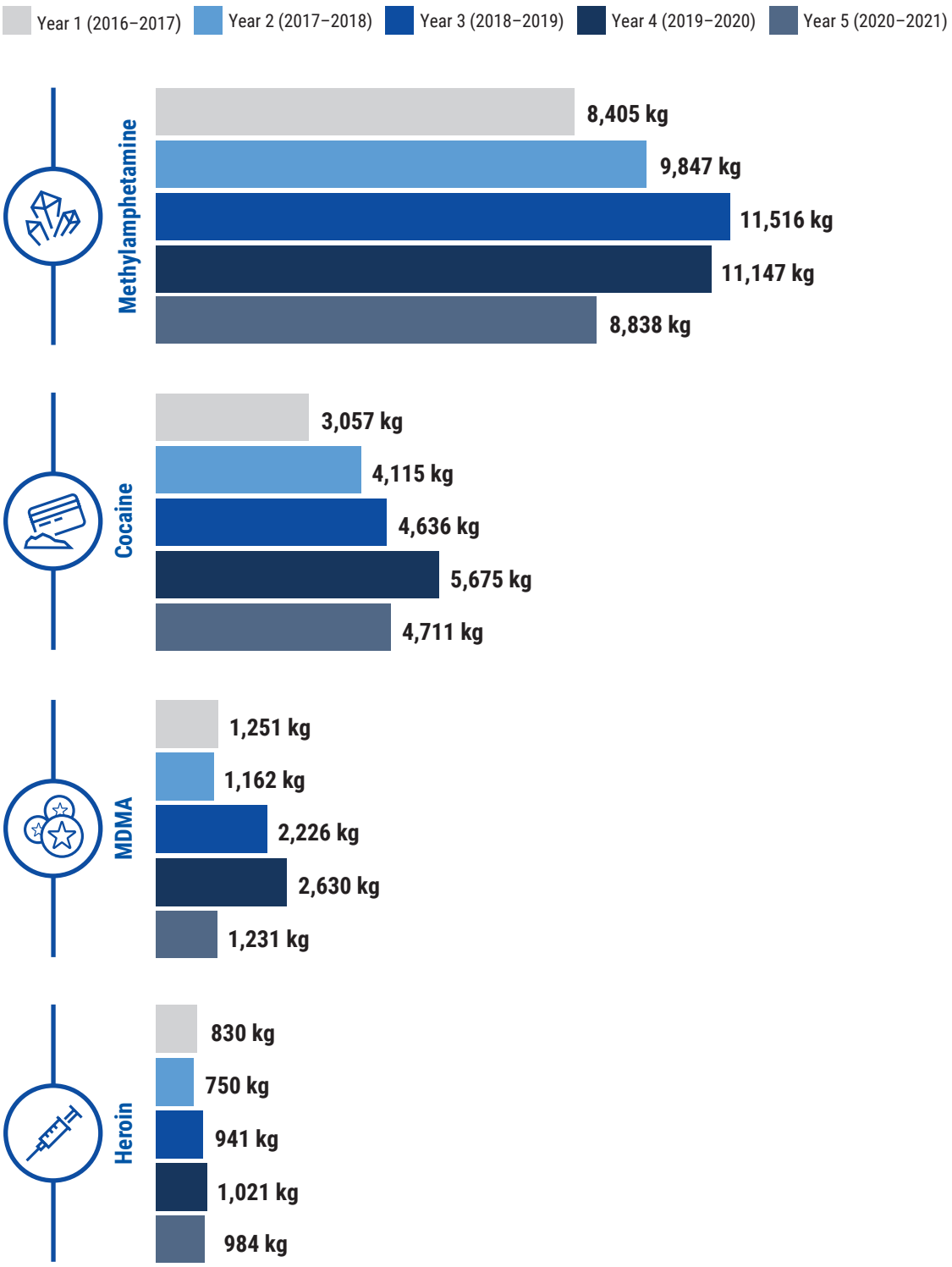
heroin and cannabis **increased**

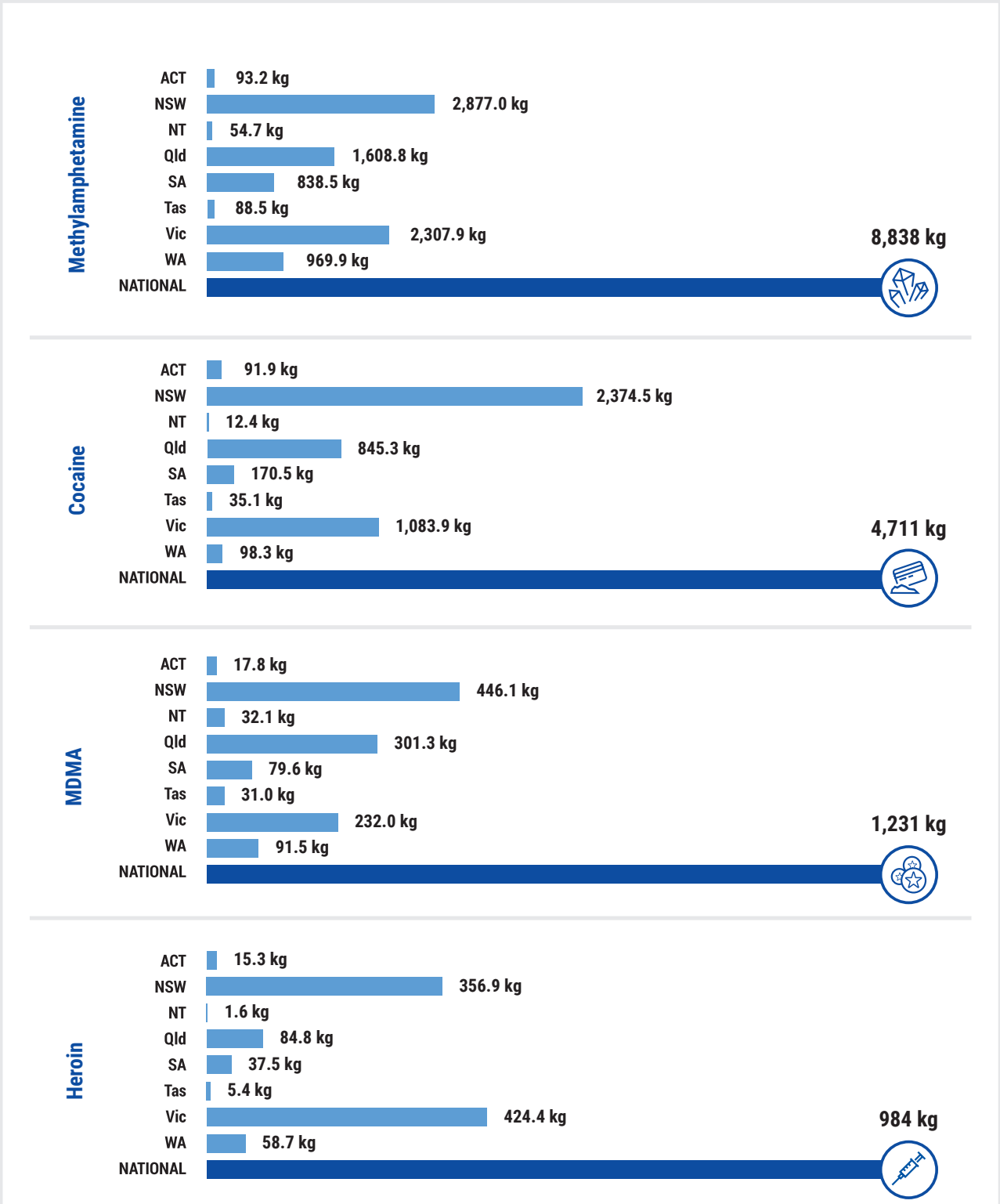
oxycodone remained **relatively stable**

Between April and August 2021, the population-weighted average regional consumption of:

methylamphetamine, cocaine, MDMA, MDA and oxycodone **decreased**

alcohol, nicotine, heroin, fentanyl, cannabis and ketamine **increased**


Year 1 (2016–2017)
Year 2 (2017–2018)
Year 3 (2018–2019)
Year 4 (2019–2020)
Year 5 (2020–2021)
Methylamphetamine
8,405 kg
9,847 kg
11,516 kg
11,147 kg
8,838 kg
Cocaine
3,057 kg
4,115 kg
4,636 kg
5,675 kg
4,711 kg
MDMA
1,251 kg
1,162 kg
2,226 kg
2,630 kg
1,231 kg
Heroin
830 kg
750 kg
941 kg
1,021 kg
984 kg

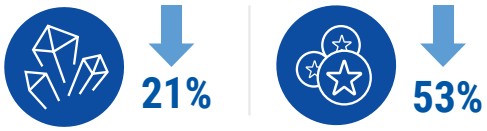


Estimated state and territory annual consumption of methylamphetamine, cocaine, MDMA and heroin for Year 5 of the Program.

Between Year 4 and Year 5 of the Program (August 2020 to August 2021) total estimated consumption of **methylamphetamine**, **cocaine**, **MDMA** and **heroin** decreased for the first time, by 4.7 tonnes, or 23 per cent of the combined total weight.

Market impacts:

The markets that were most impacted were **methylamphetamine** and **MDMA**. Methylamphetamine consumption decreased by 21 per cent between Year 4 and Year 5, while MDMA consumption decreased by 53 per cent.



Market values:

The estimated street value of the 4 drugs in Year 5 was **$10.3 billion**, up from $8.9 billion in Year 4, due to increasing drug prices.

INTRODUCTION

This is the 15th in a series of National Wastewater Drug Monitoring Program (the Program) reports to be publicly released by the Australian Criminal Intelligence Commission (ACIC) under budgetary arrangements that will see reports delivered until early 2024. The Program provides a measure of the consumption of key illicit drugs, as well as licit drugs including nicotine, alcohol and some pharmaceuticals. It provides valuable insight into trends and emerging issues in drug consumption across Australia and can identify new sources of risk.

The 15th report presents data on Australia's drug consumption for 12 substances and includes data for August (capital city and regional sites) and October 2021 (capital city sites). Longitudinal data captured by the Program increases our understanding of drug use nationally, in specific locations and over time. Wastewater analysis continues to provide us with unique insight into the impact of COVID-19 and related restrictions on drug markets across Australia since March 2020. Findings presented in the reports provide law enforcement, policy, regulatory and health agencies with additional, objective data on the use of 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 ACIC 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 Program measured the presence[1] of the following substances:

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

The ACIC continues to review the appropriateness of monitored substances with its partners, stakeholders and the universities.

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.

Both contracted universities monitor wastewater across Australia, covering all state and territory capital cities and a range of regional cities and towns. In August 2021, 58 wastewater treatment plants participated nationally (see Figure 1).[2] Sites were selected to permit the ACIC 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 2 universities.

Figure 1: The breakdown of sites by jurisdiction for August 2021.

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 ACIC, in consultation with the universities, 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, although the intention is to ensure as much continuity as possible in relation to site participation.

2 Sampling also occurred in October 2021 in capital city sites, with 20 participating wastewater sites nationally, covering approximately 48 per cent of the Australian population.

REPORTING

Program reports are completed 3 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 ACIC. 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, cannabis and ketamine (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 PROGRAM DATA

The Program is based on a well-established and internationally recognised methodology. The ACIC considers that 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. Report 15 of the Program measures the drug use of approximately 57 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 illustrate drug preference variations that exist 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. Wastewater analysis also permits the ACIC to gain insight into the priorities of serious and organised crime groups that supply illicit drug markets. Regular and near-real-time wastewater reporting enables the ACIC and partners to detect and respond to increasing drug threats in a timely way. The number and diversity of regional sites that participate in the Program permit 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 allows wastewater data to complement a number of other drug data sources in Australia that have very limited regional coverage, or are confined to capital cities. It also permits the ACIC and our partners to speak with greater confidence about local drug threats.

Wastewater data are used with other available data sources to develop a comprehensive and accurate understanding of drug markets nationally and in each state and territory. Program data have been used to estimate the street value of methylamphetamine, cocaine, MDMA and heroin consumed annually in Australia. The data are also used 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 ACIC 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 Program include 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.

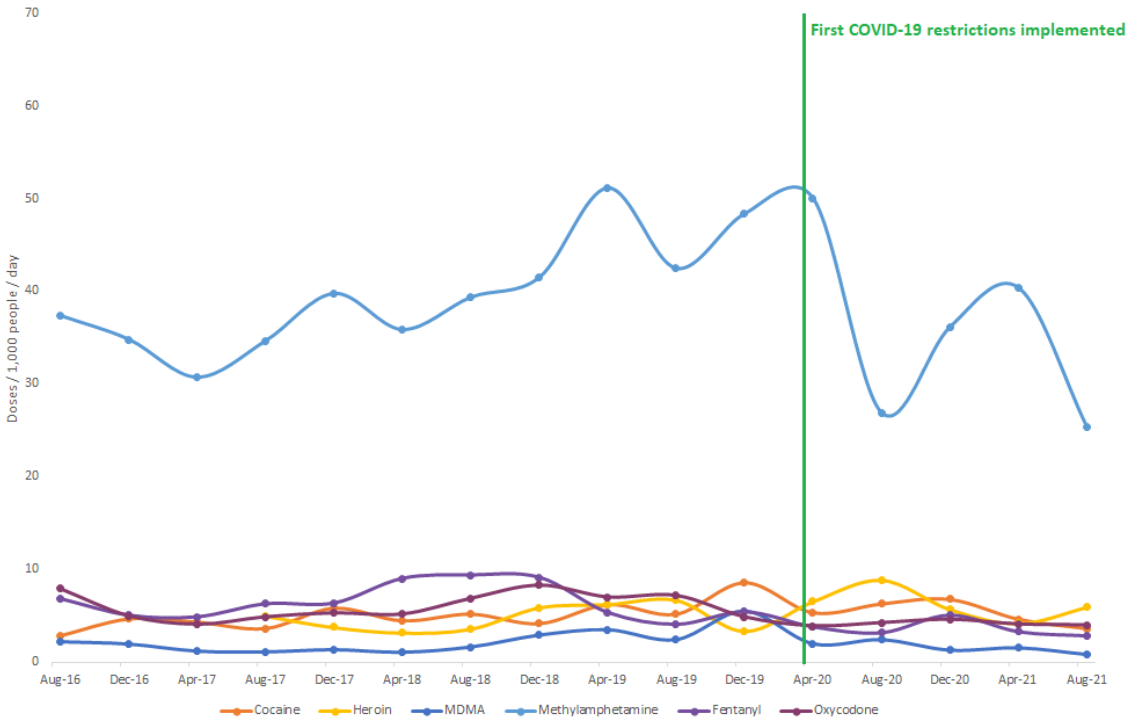
A 5 YEAR RETROSPECTIVE

With the passage of 5 years, sufficient data have now been collected by the Program to permit longitudinal analysis of consumption trends. Data are also being used in more sophisticated ways, including to understand the effect of law enforcement, policy and other external influences (such as the COVID-19 pandemic) on drug markets and the resilience of drug markets when faced with external 'shocks'. Moreover, Program data have proven amenable to analysis from a variety of perspectives, including highlighting differences at the national versus regional levels, and differences in consumption between city and regional settings.

DRUG CONSUMPTION SNAPSHOT

The data show that of the illicit drugs with available dose data, methylamphetamine remains the most consumed drug by a large margin, despite fluctuations across this market over time (Figure 2). Consumption of cocaine and heroin have also fluctuated throughout the life of the Program, albeit within a relatively narrow range. MDMA remains one of the lowest consumed drugs monitored by the Program. Dose data are unavailable for cannabis, but based on load data (mg of THC consumed/1,000 people/day) consumption of cannabis has fluctuated but remained relatively stable since it began being monitored by the Program in 2018. The high consumption points for fentanyl and oxycodone were in August and December 2018, respectively, and consumption of these 2 substances has declined since that time. Throughout the life of the Program, national consumption of nicotine and alcohol far exceeded consumption of all other substances monitored.

Figure 2: National average drug consumption of methylamphetamine, cocaine, MDMA, oxycodone, fentanyl and heroin.



The combined estimated national consumption of the 4 major illicit drugs of concern (methylamphetamine, cocaine, MDMA and heroin) increased annually in the first 4 years of the Program, followed by a marked reduction in total consumption in Year 5 of the Program. This drop, amounting to some 4.7 tonnes from Year 4 levels, is the first time a decrease in total annual consumption of the 4 drug types has been observed over the life of the NWDMP and represents a 23 per cent decrease in overall drug consumption across these markets. While the picture is far from uniform, ACIC intelligence demonstrates that some illicit drug wholesale and street prices increased during this period. There is also reporting, yet to be validated by forensic testing, that drug purity in some markets has also reduced, particularly in the cocaine market and components of the heroin market. Collectively, these data point to national drug market contraction over the last year, which was almost certainly primarily driven by COVID-19 movement and border restrictions, augmented by law enforcement interventions and normal market trends.

Notwithstanding the market impacts during the COVID-19 pandemic, NWDMP data continue to demonstrate the resilience of Australia's illicit drug markets. Noting the fluctuations across certain years and drug types, in Year 5 of the NWDMP (2020–21) total national consumption of all 4 drug types was still 15.7 tonnes, worth an estimated $10.3 billion at the street level:

- methylamphetamine—8.8 tonnes
- cocaine—4.7 tonnes
- MDMA—1.2 tonnes
- heroin—0.98 tonnes.

Organised crime groups continued to find ways to supply all 4 major illicit drug markets (and the cannabis market) during the pandemic and to generate significant illicit revenue through this activity, themes that are explored further below.

The data show fluctuating consumption over time, with record high and low consumption of various drugs at different times during the 5 year period of the Program. At a national level, when both capital city and regional sites are considered, 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 August (40 per cent of record lows)—the extent to which the December peaks and August troughs are a function of seasonal factors is currently being assessed. The Program recorded the highest number of record high consumption levels in 2019, while the highest number of record low consumption levels was recorded in 2021.

ESTIMATED NATIONAL CONSUMPTION BY WEIGHT

When comparing data from Year 4 (2019–20) and Year 5 (2020–21) of the Program, the estimated national consumption of methylamphetamine, cocaine, MDMA and heroin decreased, in particular MDMA, which more than halved. Methylamphetamine accounted for approximately 56 per cent of the combined estimated consumption of these 4 drugs in Year 5 of the Program (Table 1). Year-on-year increases in consumption of cocaine occurred in the first 4 years of the Program, but decreased by 21 per cent in the last year. Consumption of heroin, which is the smallest of the 4 drugs markets, decreased by around 4 per cent in the last year.

Table 1. Estimated annual methylamphetamine, cocaine, MDMA and heroin consumption, as total weight consumed nationally, Year 1 to Year 5 of the Program.

Drug	Estimated consumption (kilograms per annum)					% Change	
	Year 1 2016–17	Year 2 2017–18	Year 3 2018–19	Year 4 2019–20	Year 5 2020–21	Year 4 to Year 5	
Methylamphetamine	8,405	9,847	11,516	11,147	8,838	↓	-20.7
Cocaine	3,057	4,115	4,636	5,675	4,711	↓	-17.0
MDMA	1,251	1,162	2,226	2,630	1,231	↓	-53.2
Heroin	830[a]	750	941	1,021	984	↓	-3.6
Total	**13,543**	**15,874**	**19,319**	**20,473**	**15,764**	↓	**-23.0[b]**

[a] Heroin estimates for Year 1 are based on one collection period.
[b] This figure is not a summation of percentage change entries in this column, it represents the percentage difference in total consumption between Years 4 and 5 of the Program.

VALUE OF DRUGS CONSUMED

In Year 5 the total market value of the 4 major illicit drugs of concern increased, despite a decrease in the weight of drugs consumed. Using Program consumption data and the most recent available national median price data from the ACIC's Illicit Drug Data Report, the ACIC has calculated the overall worth of the 4 drugs (Table 2). Over the first 4 years of the Program the combined weight of consumption grew by some 6.93 tonnes (51 per cent), from 13.54 tonnes to 20.47 tonnes, but decreased in Year 5 by 4.7 tonnes (23 per cent, Table 1). However, due to increases in street prices the value of the 4 drug markets increased by 16 per cent to be worth a total of $10.3 billion.[4] Methylamphetamine accounted for the majority of that expenditure over time and in Year 5, this amounted to $7.95 billion (77 per cent of the total estimated expenditure).

Table 2. Estimated street value of annual methylamphetamine, cocaine, MDMA and heroin consumption for Year 1 to 5 of the Program.

Drug	Estimated street value				
	Year 1 (A$) 2016–17	Year 2 (A$) 2017–18	Year 3 (A$) 2018–19	Year 4 (A$) 2019–20	Year 5 (A$) 2020–21
Methylamphetamine	7.24 billion	7.38 billion	8.63 billion	6.96 billion	7.95 billion
Cocaine	1.06 billion	1.54 billion	2.08 billion	1.41 billion	1.88 billion
MDMA	145.59 million	114.19 million	211.08 million	226.72 million	95.50 million
Heroin	207.50 million	375.00 million	423.45 million	382.87 million	418.20 million
Total	**8.6 billion**	**9.4 billion**	**11.3 billion**	**8.9 billion**	**10.3 billion**

4 Caution should be taken in comparing market values across reporting periods as the market value each year is calculated using national median street prices that apply to the respective reporting periods.

ESTIMATED STATE AND TERRITORY CONSUMPTION

In line with national-level trends, at the state and territory level methylamphetamine, cocaine, MDMA and heroin consumption decreased considerably in Year 5 of the Program (see Tables 3 to 6). For methylamphetamine, the 3 largest decreases in the last year occurred in Tasmania (43 per cent), Queensland (28 per cent) and the Australian Capital Territory (24 per cent). For cocaine, the 3 largest falls were in the Northern Territory (41 per cent), Western Australia (33 per cent) and South Australia (30 per cent). For MDMA, there were large falls in consumption across all jurisdictions, ranging from a drop of 66 per cent in Western Australia to falls of 55 per cent and 54 percent (respectively) in New South Wales and the Australian Capital Territory. For heroin, the 3 largest decreases in the last year occurred in Western Australia (36 per cent), South Australia and the Australian Capital Territory (10 per cent each).

There were a small number of exceptions where drug consumption increased in the last year, including:

- a 31 per cent increase in cocaine and 26 per cent increase in heroin consumption in Tasmania
- 14 per cent, 10 percent and 9 percent increases in heroin consumption in the Northern Territory, New South Wales and Queensland (respectively).

Table 3. Estimated methylamphetamine consumption per jurisdiction in Year 1 to Year 5 of the Program.

Jurisdiction	Estimated consumption (kilograms per annum)					% Change	
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 4 to Year 5	
Australian Capital Territory	80.3	93.0	119.4	122.1	93.2	↓	-23.7
New South Wales	2,298.3	2,604.5	3,337.4	3,409.7	2,877.0	↓	-15.6
Northern Territory	65.5	75.5	84.8	66.6	54.7	↓	-17.9
Queensland	1,277.5	1,893.3	2,247.7	2,246.8	1,608.8	↓	-28.4
South Australia	1,005.3	1,159.5	943.2	980.5	838.5	↓	-14.5
Tasmania	92.0	127.1	177.1	155.0	88.5	↓	-42.9
Victoria	2,039.2	2,477.7	3,124.6	2,980.2	2,307.9	↓	-22.6
Western Australia	1,547.3	1,416.8	1,482.7	1,186.2	969.9	↓	-18.2

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

Jurisdiction	Estimated consumption (kilograms per annum)					% Change	
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 4 to Year 5	
Australian Capital Territory	67.8	81.2	83.4	113.9	91.9	↓	-19.3
New South Wales	1,812.3	2,397.8	2,548.0	2,988.2	2,374.5	↓	-20.5
Northern Territory	19.0	27.4	22.8	20.9	12.4	↓	-40.7
Queensland	319.4	576.6	714.1	918.5	845.3	↓	-8.0
South Australia	107.1	129.2	173.1	243.8	170.5	↓	-30.1
Tasmania	10.9	15.5	16.6	26.8	35.1	↑	31.0
Victoria	676.5	819.9	968.0	1,216.0	1,083.9	↓	-10.9
Western Australia	43.9	67.9	110.0	147.0	98.3	↓	-33.1

Table 5. Estimated MDMA consumption per jurisdiction in Year 1 to Year 5 of the Program.

Jurisdiction	Estimated consumption (kilograms per annum)					% Change	
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 4 to Year 5	
Australian Capital Territory	28.4	14.4	36.5	38.6	17.8	↓	-53.9
New South Wales	462.8	450.5	834.7	986.1	446.1	↓	-54.8
Northern Territory	37.8	24.1	32.4	46.4	32.1	↓	-30.8
Queensland	216.5	223.2	502.4	627.6	301.3	↓	-52.0
South Australia	56.5	66.6	70.8	127.8	79.6	↓	-37.7
Tasmania	30.6	16.7	54.9	54.1	31.0	↓	-42.7
Victoria	319.6	291.3	511.9	479.0	232.0	↓	-51.6
Western Australia	99.0	74.9	182.4	271.3	91.5	↓	-66.3

Table 6. Estimated heroin consumption per jurisdiction in Year 1 to Year 5 of the Program.

Jurisdiction	Estimated consumption (kilograms per annum)					% Change	
	Year 1[a]	Year 2	Year 3	Year 4	Year 5	Year 4 to Year 5	
Australian Capital Territory	14.7	15.3	10.3	16.9	15.3	↓	-9.5
New South Wales	264.6	222.2	307.0	323.9	356.9	↑	10.2
Northern Territory	1.0	1.0	1.0	1.4	1.6	↑	14.3
Queensland	65.5	66.2	66.4	77.7	84.8	↑	9.1
South Australia	47.8	34.8	30.5	41.8	37.5	↓	-10.3
Tasmania	3.3	4.5	2.8	4.3	5.4	↑	25.6
Victoria	402.1	359.4	469.7	464.4	424.4	↓	-8.6
Western Australia	31.1	46.8	53.8	91.4	58.7	↓	-35.8

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

What these patterns show is that domestic drug markets are complex and vary between jurisdictions, with external influences affecting markets in different ways at different time periods. Other Program data illustrated that consumption of the respective drugs also varied considerably at different sites within jurisdictions. Given that a relatively small proportion of the Australian population consumes illicit drugs, it is very important that datasets 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. It is also important that Australian drug datasets are constantly interpreted in a complementary manner.

CAPITAL CITY V REGIONAL COMPARISON

Over the life of the Program, consumption of most drugs has generally been higher per capita in regional sites. The exception is cocaine and heroin, where consumption is generally higher in the cities—these 2 drug types are distinguished from the other illicit drug markets because they are exclusively imported (that is, there is no domestic production). Figures 3 and 4 outline the consumption (doses) trends over the life of the Program for capital city and regional sites, respectively. The falls already described for national-level data are also evident across the capital city and regional locations, but particularly after April 2020 in regional areas. While dose data for cannabis are unavailable, and there is fluctuation, consumption by weight of the drug in capital cities and regional areas has remained relatively stable since 2018. The market fluctuation that did occur appears to be seasonal (especially in regional locations), peaking in around August each year.

Figure 3: Capital city average drug consumption of methylamphetamine, cocaine, MDMA, oxycodone, fentanyl and heroin.

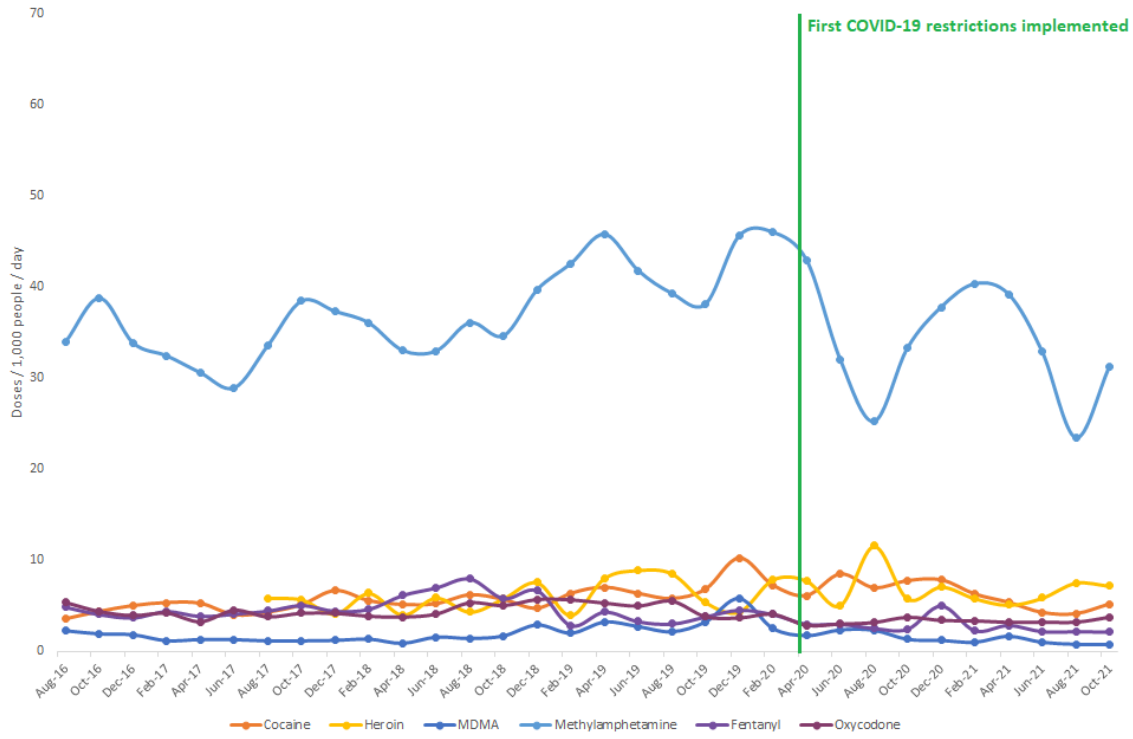
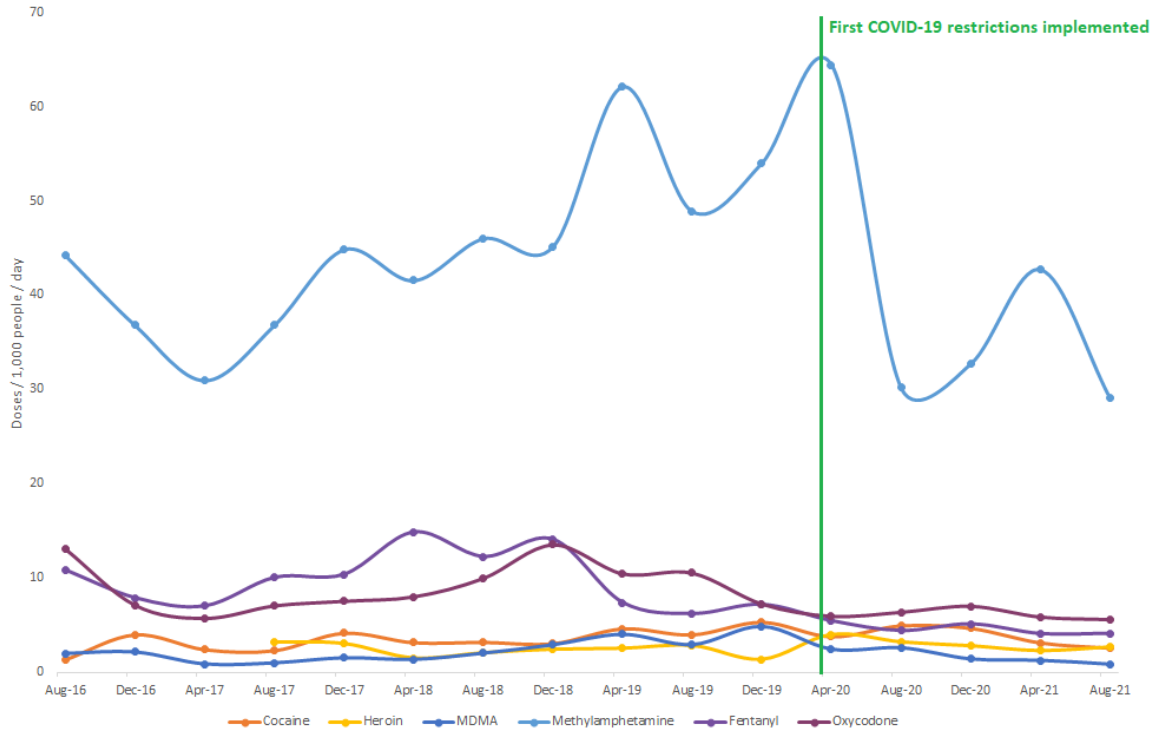


Figure 4: Regional average drug consumption of methylamphetamine, cocaine, MDMA, oxycodone, fentanyl and heroin.



THE IMPACT OF COVID-19 AND RELATED RESTRICTIONS ON THE WEIGHT OF DRUGS CONSUMED

Since March 2020 there have been COVID-related border, travel and association restrictions in all jurisdictions to varying extents and for varying periods of time. Some of these restrictions were broad-based approaches, introduced throughout the states and territories, while others applied to specific regions or cities/towns within a jurisdiction for various time periods. Key observations about the impact of these movement restrictions on Australia's drug markets include:

- COVID-related border restrictions did not cause immediate major interruption to Australia's drug markets, but NWDMP data strongly indicated that the compounding effect of these restrictions over time led to some substantial market interruptions, particularly in those markets where there is no, or only limited, domestic manufacture (MDMA, cocaine and heroin). Substantial suppression of all 4 major markets only became evident in mid-2021, although for MDMA and heroin this market suppression was observable from early 2020, and most evident from mid-2020.
- Although ACIC assessments demonstrate that law enforcement supply reduction activities can lead to short term falls in drug consumption, and likely contributed to some market changes in 2020–21, the magnitude, breadth and duration of the decreases in drug consumption between Year 4 and Year 5 of the NWDMP, coupled with the observed price increases, were almost certainly primarily driven by COVID-19 movement and border restrictions.
- There are early signs based on the October 2021 sampling period, yet to be confirmed by further wastewater testing, that there is some market recovery in the capital cities for methylamphetamine and cocaine.

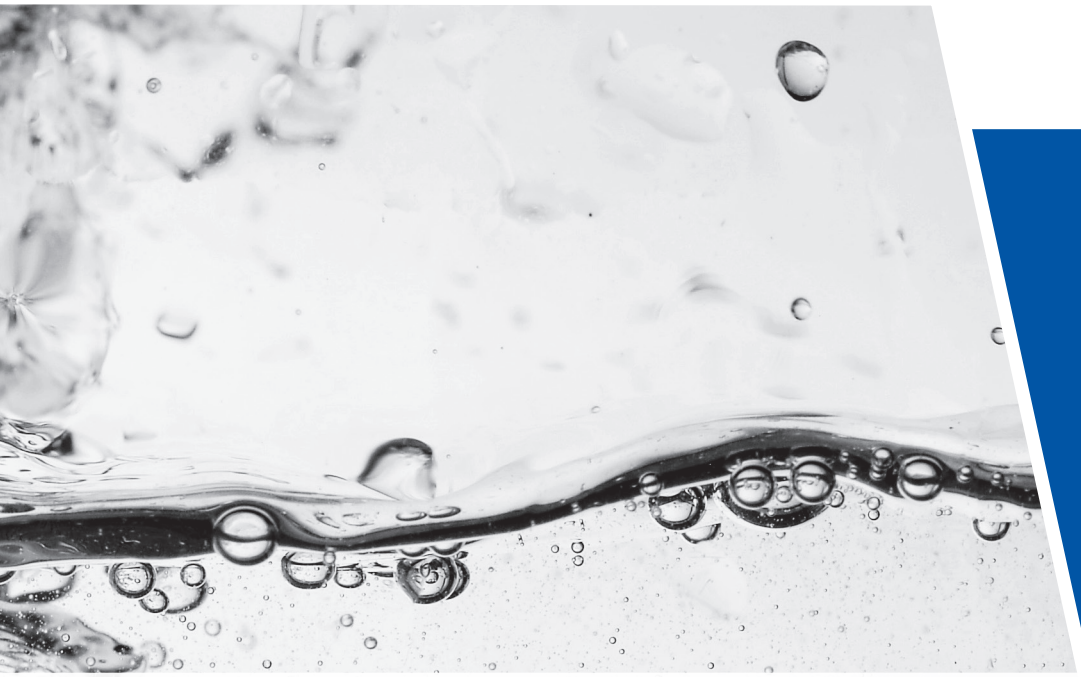
- The only illicit drug market relatively unaffected by COVID-19 related restrictions in 2020–21 was the cannabis market. Unlike the other 4 major illicit drug markets, the cannabis market is almost exclusively supplied via domestic production.
- As already noted, despite the significant overall fall in drug consumption between Years 4 and 5 of the NWDMP, the data already outlined above demonstrate that organised crime groups continued to find ways to supply all 4 major illicit drug markets (and the cannabis market) during the COVID-related restrictions, generating significant illicit revenue.

RESULTS FROM THE COLLECTION

The growing body of longitudinal data permits the ACIC and other stakeholders to closely monitor trends in drug consumption across Australia. A range of drug data available to the ACIC over almost 2 decades consistently underlines the strong demand for illicit drugs in Australia. While the shock posed to the markets by COVID-19 contributed to the largest decrease in national consumption of the 4 major illicit drugs to date, the data also continued to underscore the resilience of the Australian drug market. Report 16 data will confirm if the early signs of potential recovery in capital city locations for methylamphetamine and cocaine stretch to other drug markets and if they are sustained.

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 15th report of the Program builds on national drug consumption data contained in the preceding 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.

Whatever the future trajectory of drug consumption, 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 drug markets, including their resilience and points of vulnerability, and the potential for coordinated supply, demand and harm reduction strategies to reduce harm to the Australian community.



RESEARCH FINDINGS

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LIST OF ABBREVIATIONS

ABS	Australian Bureau of Statistics
ACIC	Australian Criminal Intelligence Commission
ACT	Australian Capital Territory
LC-MS/MS	Liquid chromatography tandem mass spectrometry
LOD	Limit of detection
LOQ	Limit of quantification
MDA	3,4-methylenedioxyamphetamine
MDMA	3,4-methylenedioxymethylamphetamine
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's (ACIC) National Wastewater Drug Monitoring Program (NWDMP) reports on selected substances of concern in most populated regions of Australia. The NWDMP commenced in August 2016. The current version of the NWDMP focuses on 12 licit and illicit drugs, including nicotine, alcohol, methylamphetamine, cocaine and MDMA (ecstasy), with heroin included from Report 3, cannabis from Report 6 and ketamine from Report 13. Estimates of drug usage in a population are being 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 across capital cities and regional Australia, covering all states and territories, have been invited 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 course of the Program.

For Report 15, wastewater samples were collected for up to 7 consecutive days during weeks in August and October 2021. The August 2021 collection involved regional and capital city sites, while October 2021 only covered capital city sites. A total of 58 sites participated in the Program for August 2021, consisting of 22 capital city WWTPs and a further 36 regional WWTPs, covering a population of 13.3 million Australians. Data from this report equates to coverage of approximately 57 per cent of Australia's population for August 2021 and 48 per cent for October 2021 (capital city sites only).

A total of 7,503 individual daily samples have been collected and analysed since the beginning of the Program, with new results from 535 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 2021 was compared with historical data included in previous reports. The August 2021 dataset was used for the spatial comparison as it was more comprehensive, including both capital city and regional sites. The temporal comparison includes the latest capital city collection data for October 2021.

The spatial trends in the current reporting period and longer-term temporal trends have likely been impacted by the COVID-19 pandemic. During the period covered by this Report, Victoria announced COVID-19 restrictions in early August 2021 which extended to late October 2021 to contain outbreaks in the state. The Australian Capital Territory and areas of New South Wales were also under various COVID-19 restrictions over the August to October 2021 period. These and other jurisdictions also introduced border restrictions and restrictions limiting travel to and from areas within their jurisdictions for differing periods during 2020 and 2021. The results outlined 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 August 2021. Cannabis was not included in the comparison but will be once better estimates of a typical dose are available. The consumption of nicotine was substantially higher in regional areas compared with capital cities and was variable between sites. Nicotine use was relatively stable over the course of the Program. Some jurisdictions observed an increase in nicotine consumption in August 2021 from June 2021, particularly the Australian Capital Territory, New South Wales, the Northern Territory and Queensland. However, these were consistent with previous variations observed over the Program. Overall, nicotine consumption remained highest in the Northern Territory and Tasmania.

Alcohol consumption in regional areas was higher than consumption in the capital cities in August 2021. Compared to nicotine, alcohol consumption was more consistent across regional parts of the country. The Northern Territory and Tasmania had the highest capital city use of alcohol. In a national context, alcohol consumption has been relatively steady since the start of the Program, averaging out short-term fluctuations, averaging between 1,000 and 1,400 standard drinks per day per 1,000 people. There were some differences in alcohol trends between states. The New South Wales and Western Australia capital city average alcohol consumption has shown a slow decline since the beginning of the Program, albeit with some level of variation, despite the regional averages remaining mostly stable there and nationwide. South Australia has been the most obvious exception, with a steeper longer-term decline in alcohol intake since mid-2017. The Northern Territory had some variations in alcohol consumption following the implementation of a minimum unit price on alcohol content from October 2018 (O'Brien 2021). Consumption trends for alcohol appear to be making a gradual, yet fluctuating, return to pre-intervention levels.

Several jurisdictions showed a short-term decline in alcohol consumption in April 2020, which was followed by a rebound in alcohol consumption in June 2020. For the current reporting period, alcohol consumption remained within the ranges observed prior to the introduction of the April 2020 COVID-19 restrictions. However, one exception was the Queensland capital, where alcohol consumption reached its highest level over the life of the Program in October 2021.

Methylamphetamine consumption declined significantly following the only national lockdown associated with the COVID-19 pandemic in April 2020, particularly in Western Australia, Tasmania, and the Northern Territory, with a trough observed nationwide to August 2020. The eastern seaboard capital cities in Queensland, New South Wales, Victoria, and the Australian Capital Territory had smaller impacts over this period compared to the aforementioned cities. Methylamphetamine consumption decreased across all jurisdictions in the current reporting period. This has narrowed differences in methylamphetamine consumption between jurisdictions on average, with specific sites in South Australia, Victoria, New South Wales and Queensland among the highest overall levels in the country. On a national level, methylamphetamine consumption in August 2021 was the lowest recorded in both capital cities and regional areas since the Program commenced, although consumption in capital city sites increased in October 2021. Notably, the difference between city and regional consumption has narrowed in recent reporting periods, which reflects a pattern of consumption that was noted in 2016 and 2017.

Cocaine consumption in Australia has mostly been a feature of eastern seaboard capital cities, with higher consumption in New South Wales, the Australian Capital Territory, Queensland and Victoria. Consistent with previous reports, cocaine consumption in regional areas of Australia is generally at much lower levels than in the capital cities. Cocaine consumption decreased from December 2020 to August 2021 in both capital city and regional areas, with average capital city consumption increasing in October 2021.

MDMA consumption remained relatively low compared to methylamphetamine and cocaine. The long-term pattern in MDMA consumption was a generally increasing trend to late 2019, followed by a decline to the current reporting period, albeit with some level of fluctuation. Consumption is now at historically low levels in many parts of the country.

The stimulant and metabolite of MDMA, MDA, was present at relatively low levels, with no evident consistent spatial patterns. While regional averages overall were slightly below the capital cities in August 2021, a regional site in Western Australia (Site 120) recorded the highest excretion levels in August 2021. MDA excretion declined almost everywhere and was at the lowest levels detected during the life of the Program in August 2021 in both capital city and regional areas.

Oxycodone and fentanyl are prescription pharmaceutical opioids with abuse potential. Consistent with previous findings, oxycodone and fentanyl consumption was substantially higher in regional parts of the country in August 2021, nearly double the consumption of the capital cities. Tasmania had the highest capital city consumption of both drugs in August 2021, while each state had regional sites with above average consumption. Nevertheless, when considered in the context of temporal data, oxycodone consumption remains at historically low levels, although consumption appeared to have stabilised since April 2021. Similarly, the average consumption of fentanyl has been decreasing for several years, although it appears that the rate of decrease has slowed since June 2021. That said, average capital city fentanyl consumption in October 2021 was the lowest level recorded by the Program.

Heroin consumption in August 2021 was highest in parts of New South Wales, capital city Queensland and Victoria. Consumption of heroin has been generally low in the Northern Territory, Tasmania and regional Queensland, South Australia, and Western Australia. Average consumption of the drug was lower in regional areas compared to the capital cities. The trends in heroin consumption are variable, amplified by relatively low dose amounts, and generally do not appear to follow common patterns between jurisdictions. For example, record high average capital city heroin consumption was recorded in South Australia in August 2021 and Queensland in October 2021.

The cannabis metabolite, 11-nor-9-carboxy-tetrahydrocannabinol (THC-COOH) is a specific marker for cannabis consumption. Regional cannabis consumption was high in most regional parts of the country compared to the respective capital cities. Nationally, record high average cannabis consumption was recorded in capital cities and regional areas in August 2021 in New South Wales (capital and regional), the Northern Territory (regional), Queensland (regional), South Australia (capital and regional) and Western Australia (regional). Capital city cannabis consumption in Queensland and the Australian Capital Territory reached record levels in October 2021.

Ketamine is a pharmaceutical compound of growing concern due to its abuse potential. With the drug being included for the first time in Report 13, results are only available for 6 collection periods of capital city wastewater (December 2020 and February, April, June, August and October 2021) and 3 regional collections (December 2020 and April and August 2021). Early indications are that ketamine use is low and relatively stable across the country, with the capital city average excretion higher than in regional Australia. There is a much wider spread of use over the collection week than might be expected for a substance with medical applications.

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 3 year program from 2016 to 2019, including 9 public reports. The universities have been re-commissioned to provide data for a further 4 years, including 12 public reports. Wastewater treatment sites have been assessed, bimonthly in the case of capital city sites and every 4 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 2021 and capital cities in October 2021. 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.

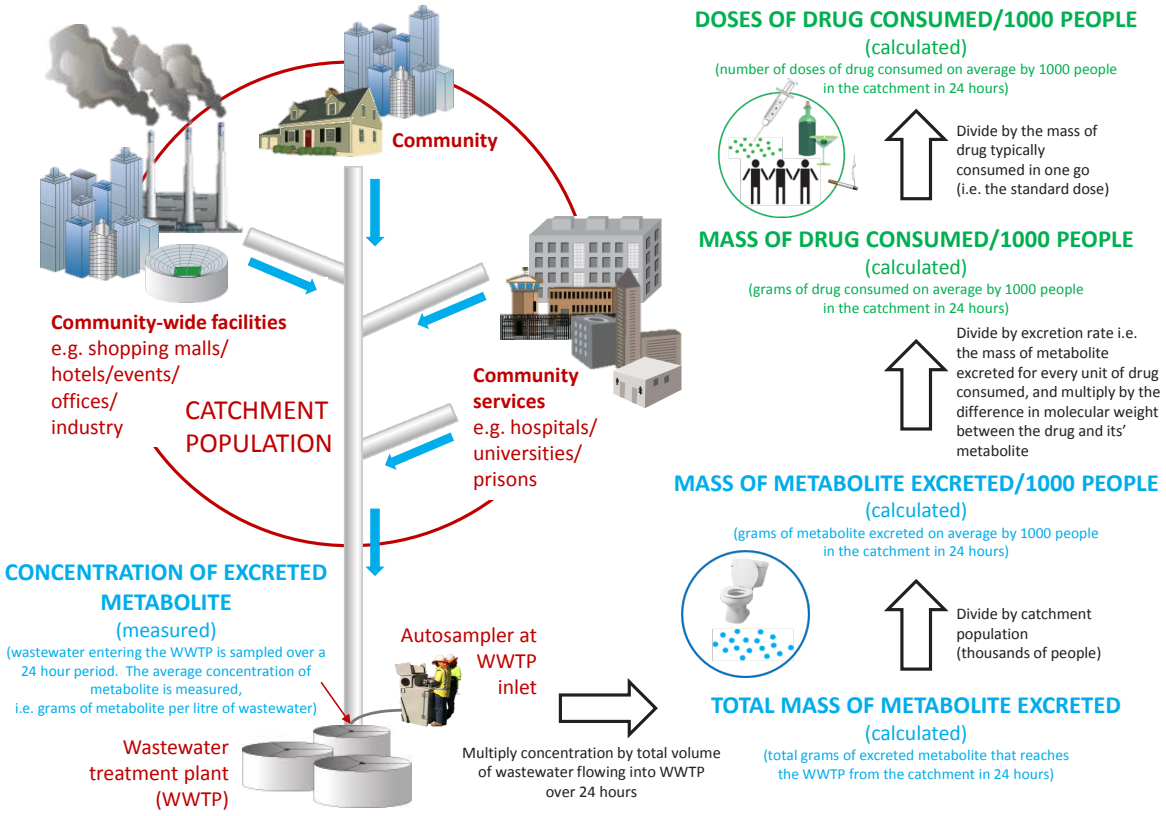
Compounds of concern include nicotine from nicotine intake (cigarettes, gum, patches, e-cigarettes, etc.), ethanol from alcohol consumption, pharmaceutical opioids with abuse potential such as oxycodone and fentanyl, illicit substances such as methylamphetamine, MDMA, cocaine, cannabis and heroin, as well as ketamine. Amphetamine and MDA were not included in the initial reports. Amphetamine is a by-product of methylamphetamine pyrolysis and is also one of its metabolites. It is also a prescribed drug but can be used as an illicit substance. However, levels of amphetamine generally correspond 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. 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. Ketamine is measured via its metabolite, norketamine. Ketamine results are reported as the amount (mg) of drug excreted per day per 1,000 people due to the absence of clear information in the scientific literature around suitable factors to estimate consumption of the substance in wastewater.

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.[5] 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 5). The method is non-invasive and is done on a population-scale level, so individuals are not targeted, and privacy is respected.

Figure 5: 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.



5 Information in relation to heroin appears in Report 3.

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. Apart from a few sites in regional Western Australia, operators have been collecting a second daily influent sample with sodium metabisulphite (0.5% m/v) as preservative from August 2018 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 these 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). 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 against catchment maps, together with excretion and dose data obtained from the scientific literature.

3.1 PARTICIPATING WASTEWATER TREATMENT PLANTS (WWTPs)

Fifty-eight WWTPs across Australia participated in the NWDMP for the August 2021 collection period (Figure 6). Of these, 22 sites were located in capital cities and a further 36 in regional areas, covering a wide range of catchment population sizes. Sites were selected in consultation with the ACIC. 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 7 and Appendix 2. To maintain the confidentiality of the participating sites, all sites were allocated a unique code to de-identify their results for the course of the Program. Only site codes are presented in the results.

Figure 6: Participating WWTPs in August 2021 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.

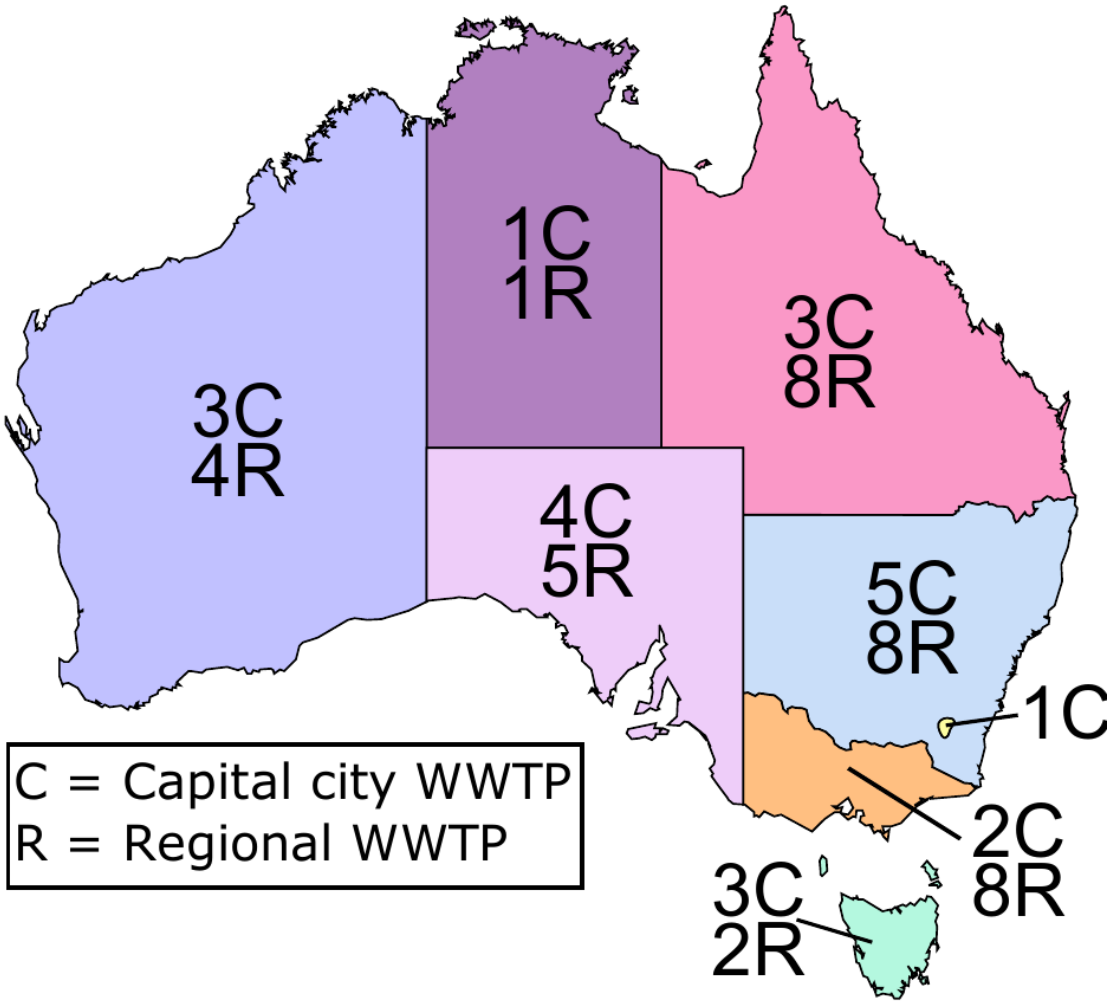


Table 7: Number of participating WWTPs for the periods covered in this report. One collection period aims to collect data from both capital city (C) and regional (R) sites, while the other collection period aims to collect data from capital city sites only.

State or territory	August 2021 Capital	August 2021 Regional	October 2021 Capital
ACT	1	0	1
NSW	5	8	3
NT	1	1	1
Qld	3	8	3
SA	4	5	4
Tas	3	2	3
Vic	2	8	2
WA	3	4	3
Sites	**22**	**36**	**20**
Population (millions) C & R	**11.5**	**1.8**	**11.2**
% of Australian population	**49.1**	**7.9**	**47.9**
Total population (millions)	**13.3**		**11.2**
% of Australian population	**57.0**		**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 7 consecutive days, or where 7 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 5—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, when updated flow measurements supplied by wastewater treatment authorities or population estimates become available. 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 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 7. 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. This is also similar for ketamine. For cannabis, the approximate dosage is not well defined, and results are expressed as mg consumed per 1,000 people per day.

Bubble charts are included to represent the relative extent of consumption in capital city and regional areas for each jurisdiction. See Figure 8 for a description of how to interpret the bubble charts.

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)[6] 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.

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

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 the maximum, minimum and average for individual sites (as illustrated in Figure 7) 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 substances such as cocaine, MDMA and alcohol 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).

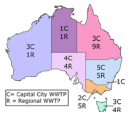
Figure 7: Explanation of the graphical representation of data for individual sites and bubble maps. General concepts relevant to all graphs in the report are also outlined (unique site codes, explanation of vertical axes, colour coding).

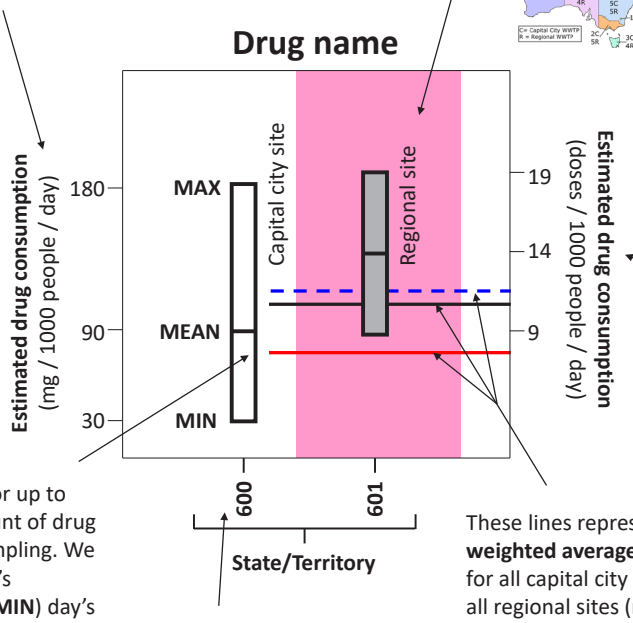
The **left hand axis** shows the estimated total mass consumed (in milligrams, mg) of a drug which is calculated by measuring the concentration of the drug's metabolite in a 24 hour wastewater composite sample, multiplying by the flow volume in the 24 hours, dividing by the population size and applying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

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.

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).

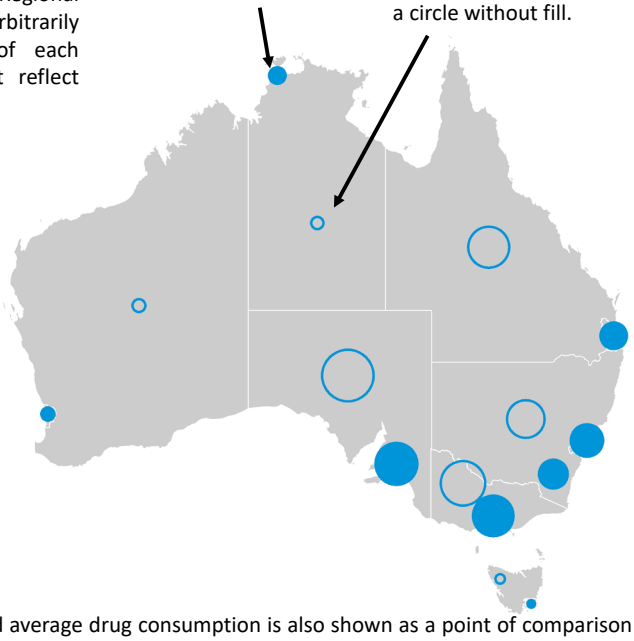
Figure 8: Explanation of the graphical representation of data for individual sites and bubble maps. General concepts relevant to all graphs in the report are also outlined (unique site codes, explanation of vertical axes, colour coding).

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.

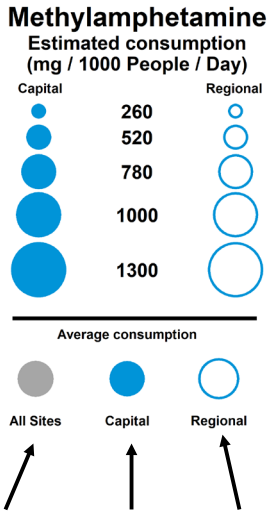
This type of plot gives a rough overview of drug consumption per jurisdiction. The other temporal and spatial comparison graphs give greater resolution to compare between locations and over time, and should be used for analysis.

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.

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 2021 (section 4.1), temporal trends for states and territories for the past 2 years (section 4.2) and within each state and territory (section 4.3). August 2021 data were used for section 4.1, which compares the individual sites, 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 and the days of the month 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 2021

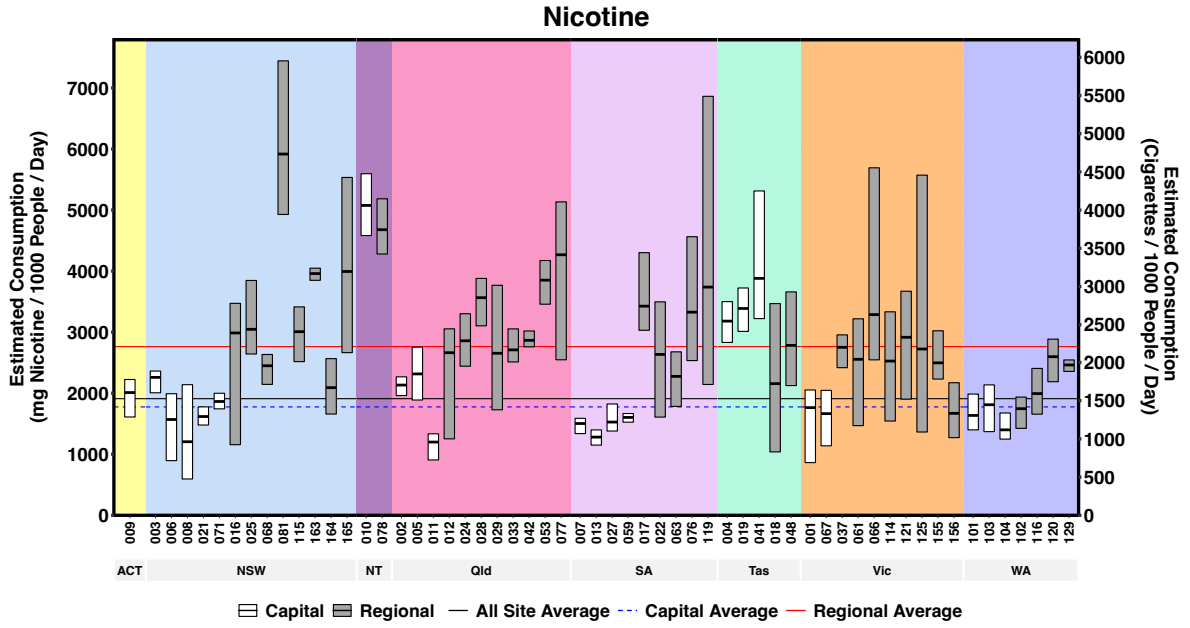
4.1.1 NICOTINE AND ALCOHOL

Nicotine is the main psychoactive substance present in tobacco products. Two nicotine metabolites, cotinine and hydroxycotinine, were used to represent 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 August 2021 results show that nicotine consumption varied widely between sites across the country (Figure 9). Average consumption in regional Australia was substantially higher than in the capital cities (red horizontal and dotted blue lines, respectively). The Northern Territory had the highest capital city and regional consumption of nicotine in August 2021. Nicotine consumption showed large fluctuations between different sites and over the sampling week, but no obvious patterns were evident across the country.

Alcohol consumption was measured using a specific metabolite of ethanol. In August 2021, average alcohol consumption was higher in regional areas (Figure 10). No clear spatial patterns were evident for the most part. The Northern Territory had the highest average capital city and regional consumption of alcohol in August 2021. Sites in South Australia generally had average or below average alcohol consumption compared to the national regional and capital city averages. Some capital city sites in Victoria, Western Australia and Queensland also had lower consumption than national levels.

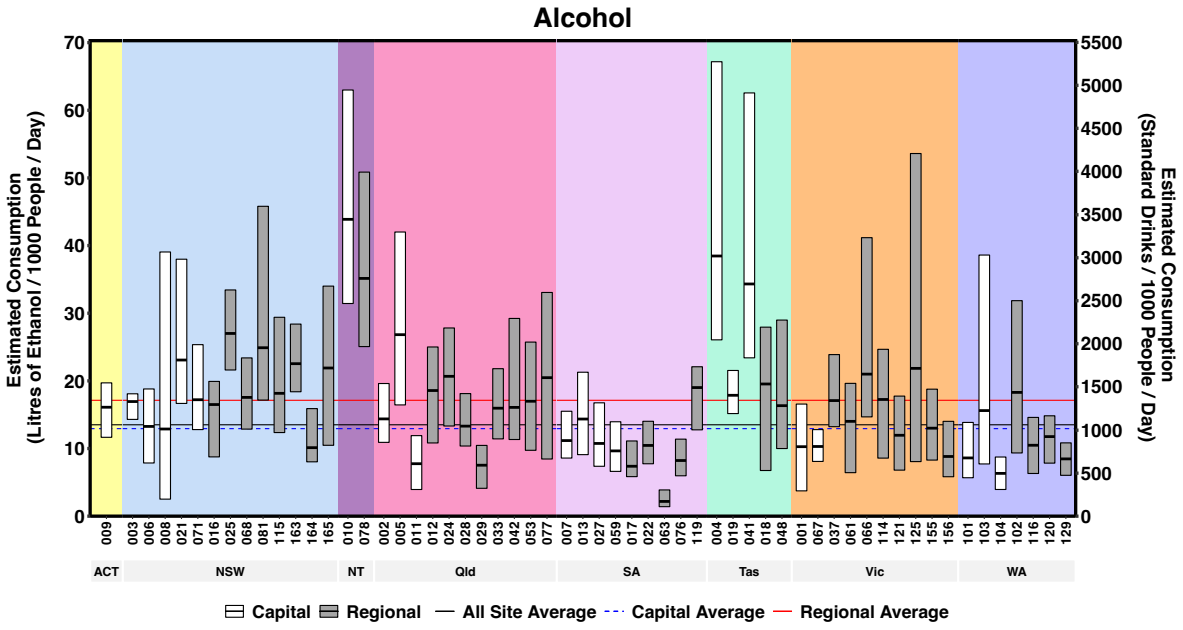
The relative consumption levels can be represented by showing the relative scale of use of nicotine (Figure 11) and alcohol (Figure 12) as capital city or regional ‘bubbles’ for each state and territory. The above average consumption of nicotine and alcohol in the Northern Territory is evident from the size of the bubbles in that region. These findings need to be understood in the knowledge that there is only one capital city site and one regional site included for this jurisdiction (however approximately 25 per cent of the population of the Northern Territory is covered by the 2 sites).

Figure 9: Estimated nicotine consumption for August 2021 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 10: Estimated alcohol consumption for August 2021 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
- Wide weekly spread a common feature

Figure 11: Estimated average nicotine consumption per jurisdiction for August 2021 in number of cigarettes per day per thousand people. The number of collection days varied from 5–7.

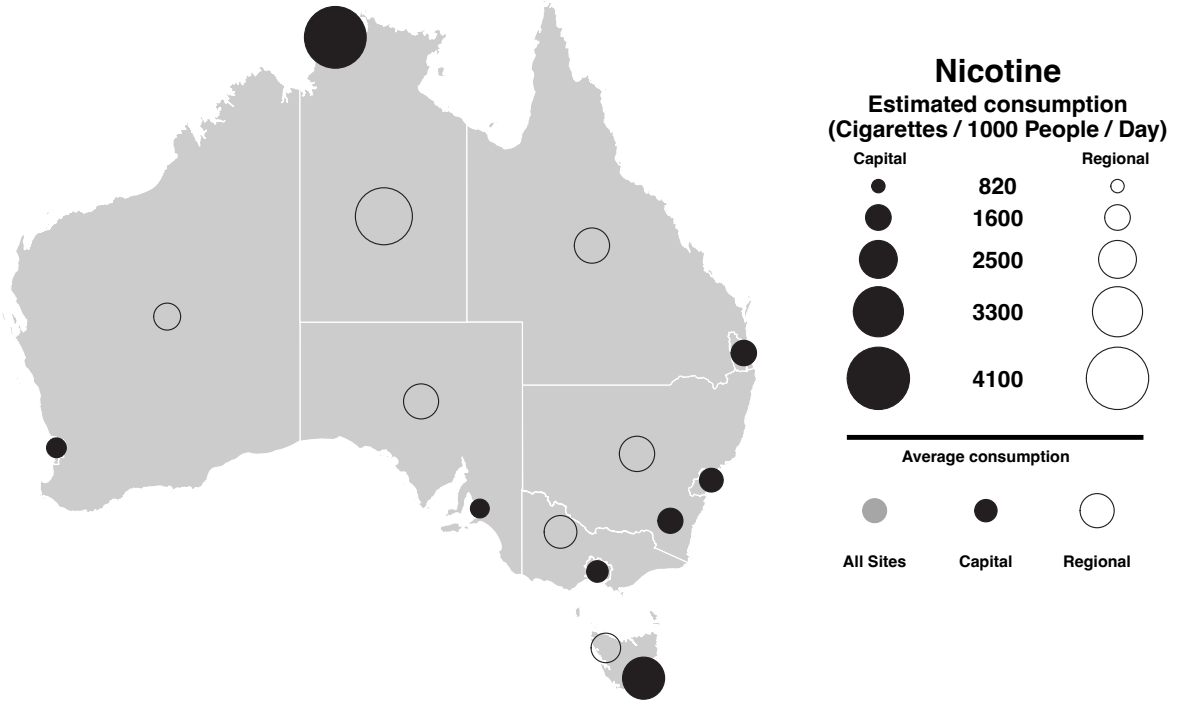
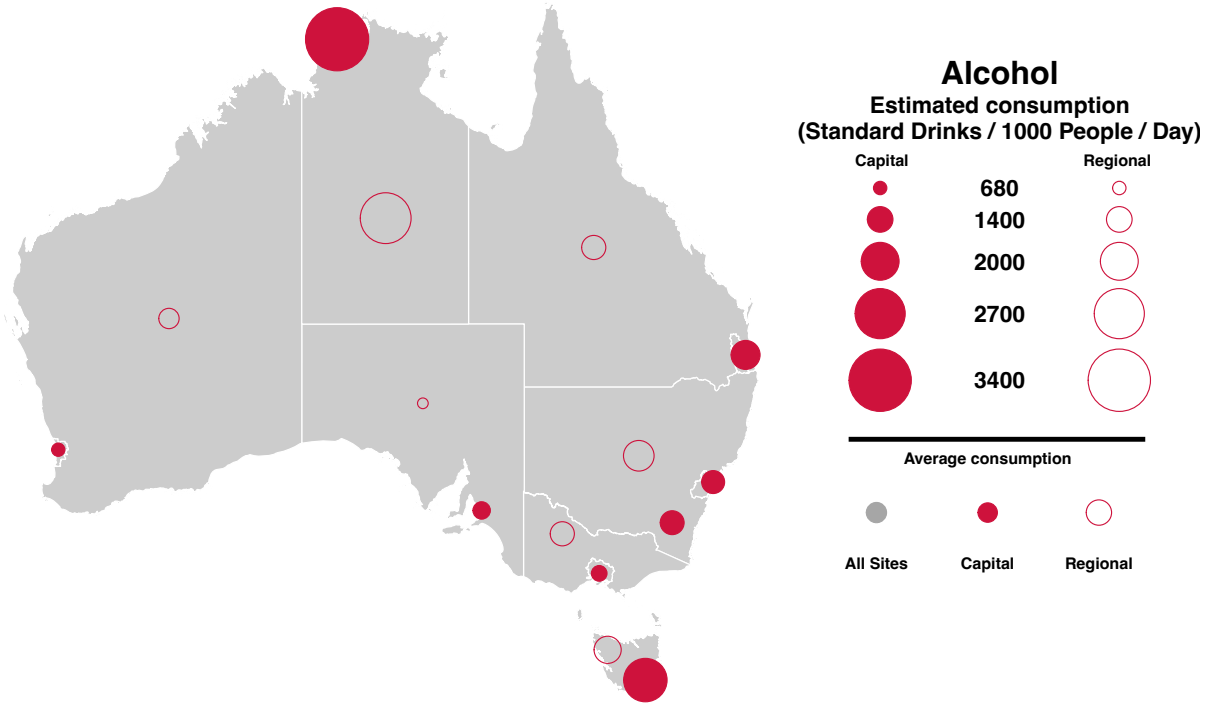


Figure 12: Estimated average alcohol consumption per jurisdiction for August 2021 in number of standard drinks per day per thousand people. The number of collection days varied from 5–7.



4.1.2 STIMULANTS

The relative estimated consumption levels across the participating sites for 4 stimulants—methylamphetamine, cocaine, MDMA and MDA—are described in more detail below.

4.1.2.1 METHYLAMPHETAMINE

Methylamphetamine consumption levels varied considerably across sites (Figure 13). Average methylamphetamine consumption in regional Australia was higher than in the capital cities in August 2021. The difference in consumption between days of the week was generally lower than the other stimulants, which is consistent with the habitual use associated with methylamphetamine compared with up to 10-fold higher consumption on weekends for MDMA and cocaine. Most capital city sites had smaller differences in methylamphetamine consumption over the August sampling period when compared to regional sites. South Australia had some of the highest average capital city consumption levels of the drug. Sites in New South Wales, the Northern Territory, Queensland, Tasmania, Victoria and Western Australia had consumption levels well below the national averages in August 2021.

4.1.2.2 AMPHETAMINE

The measured concentration of amphetamine in the August 2021 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 largely in agreement with our previous findings (see Appendix 4 of Report 1). Although the levels of amphetamine in wastewater samples can be largely attributed to the metabolism of methylamphetamine, the drug is prescribed for some behavioural disorders and the method cannot differentiate between medical and illicit use. The high levels of methylamphetamine in most parts of the country 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. Capital city cocaine consumption per capita is around twice that of regional areas (Figure 14). Compared to methylamphetamine, the average number of daily doses per 1,000 people in August 2021 was substantially lower for cocaine (approx. 4 vs 26) and the difference between days was wider (up to a 10-fold difference between days for cocaine, compared to less than a 4-fold difference for methylamphetamine). In general, New South Wales had the highest overall capital city consumption levels in the nation, while regional areas in the state varied from among the highest to the lowest levels. With the exception of one site in Queensland, cocaine consumption was generally low in most other regional parts of Australia.

4.1.2.4 MDMA (3,4-METHYLENEDIOXYMETHYLAMPHETAMINE)

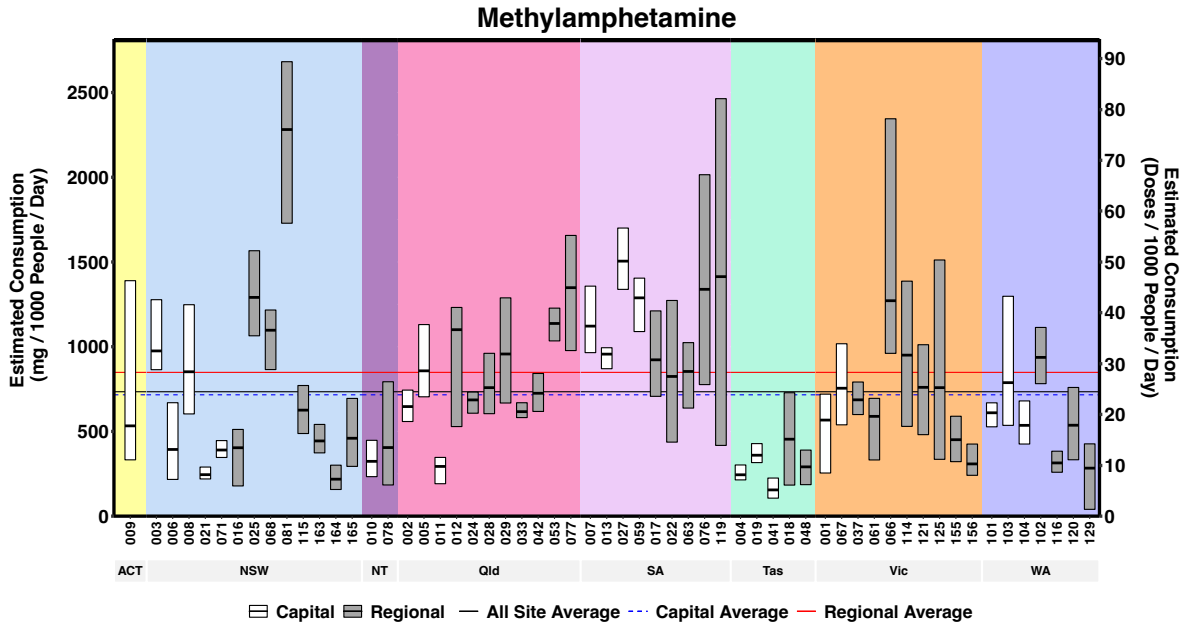
The average consumption of MDMA was lower than the previous 2 stimulants when expressed as doses per day per 1,000 people (Figure 15). Apart from capital city sites in the Northern Territory and Tasmania, consumption of the drug was relatively consistent across the country, with some regional areas having minimal levels detected. The regional Australian average was similar to the capital city average in August 2021. The Australian Capital Territory and most of South Australia and regional Western Australia had MDMA consumption levels well below the national average.

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, this 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. Excretion levels of the drug were mostly low across Australia (Figure 16). The national capital city average was marginally higher than the national regional average.

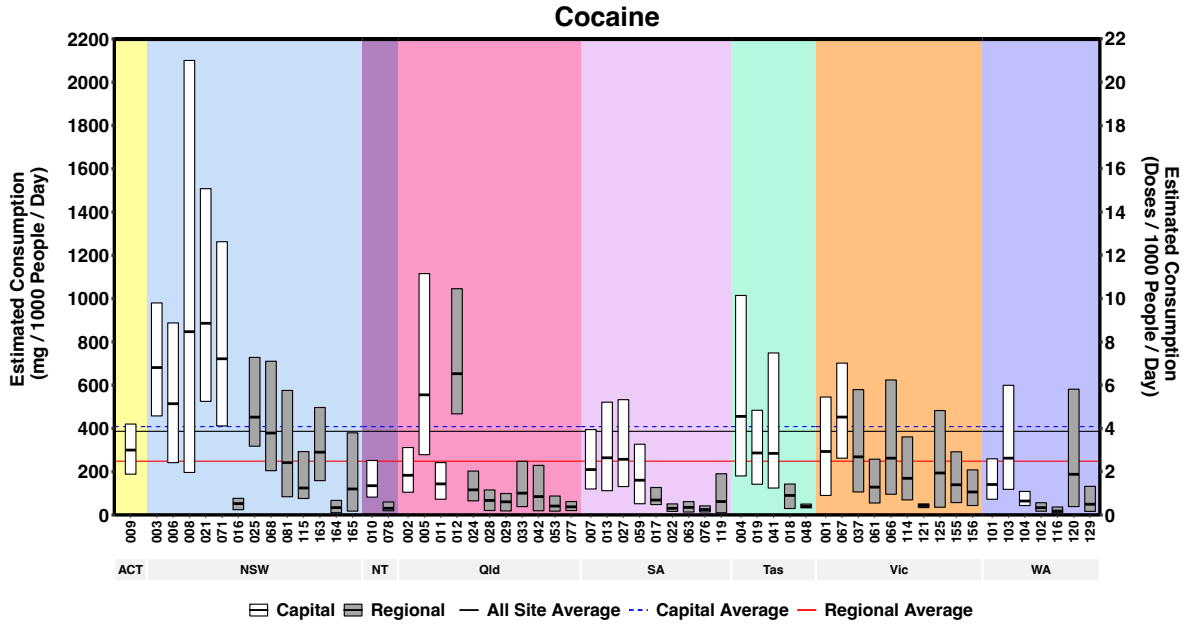
The scale of use of each stimulant is expressed as a bubble graph to compare regional and capital city use of methamphetamine (Figure 17), cocaine (Figure 18), MDMA (Figure 19) and MDA (Figure 20) across the country. Higher consumption of methylamphetamine in regional areas and cocaine on the eastern seaboard remains apparent.

Figure 13: Estimated methylamphetamine consumption for August 2021 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.



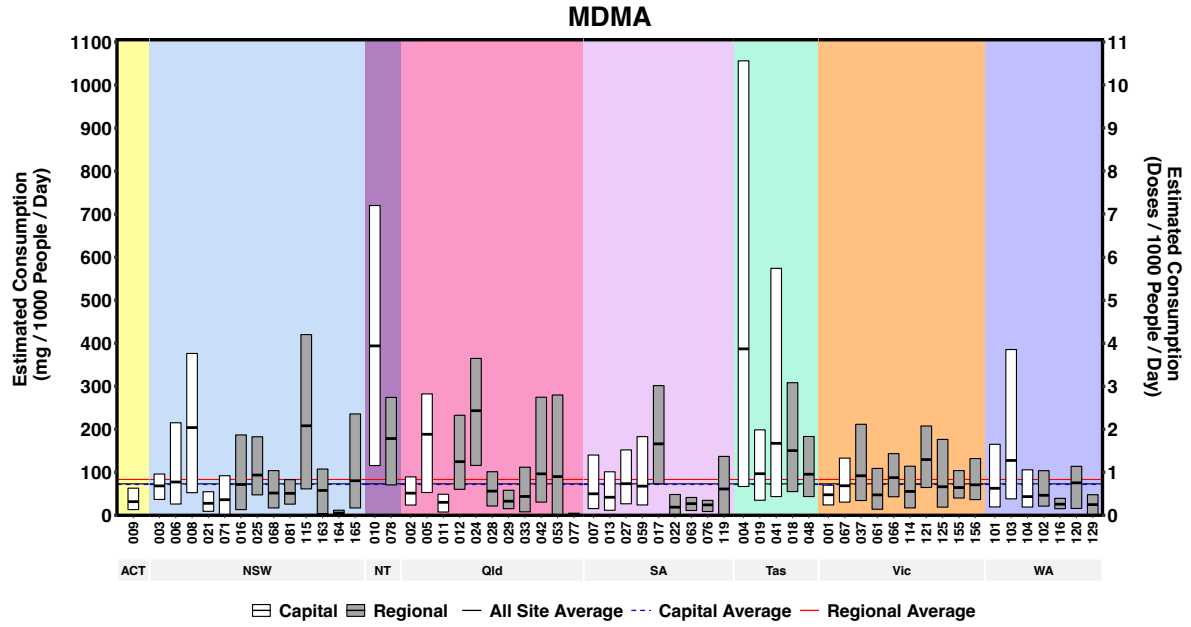
- Higher regional consumption
- High variability across the nation

Figure 14: Estimated cocaine consumption for August 2021 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.



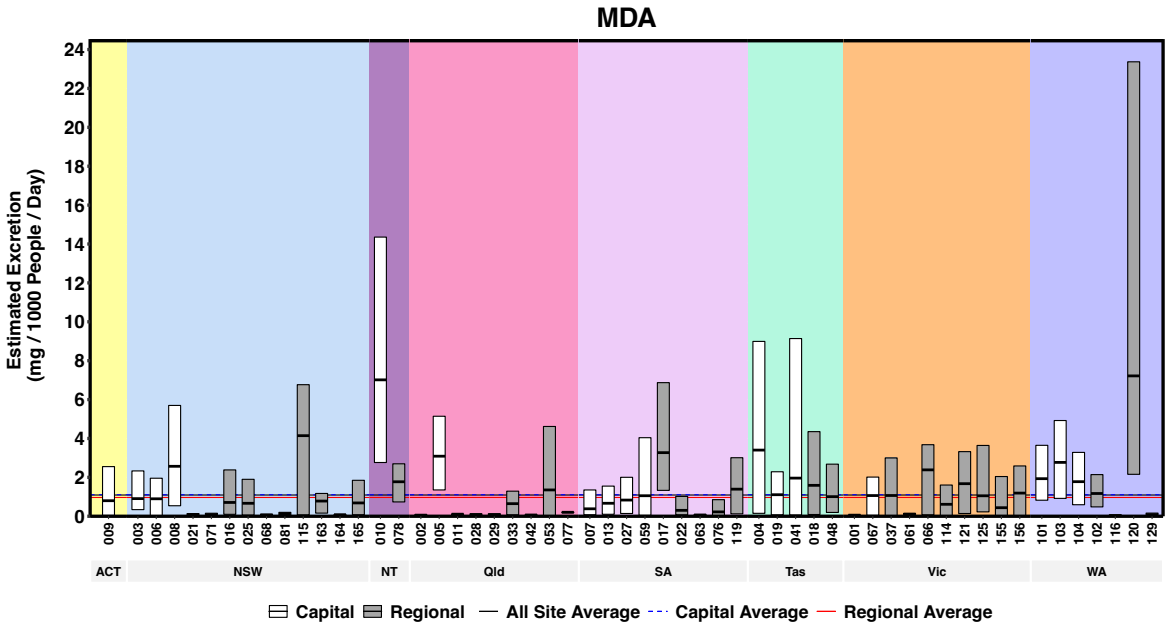
- Higher capital city consumption
- High overall consumption in New South Wales

Figure 15: Estimated MDMA consumption for August 2021 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.



- Mostly low consumption levels nationally
- Lower regional consumption

Figure 16: Estimated MDA excretion for August 2021 in mass excreted per day per thousand people. The number of collection days varied from 5–7.



- Relatively low consumption
- Lower regional averages

Figure 17: Estimated average methylamphetamine consumption per jurisdiction for August 2021 in mg consumed per day per thousand people. The number of collection days varied from 5–7.

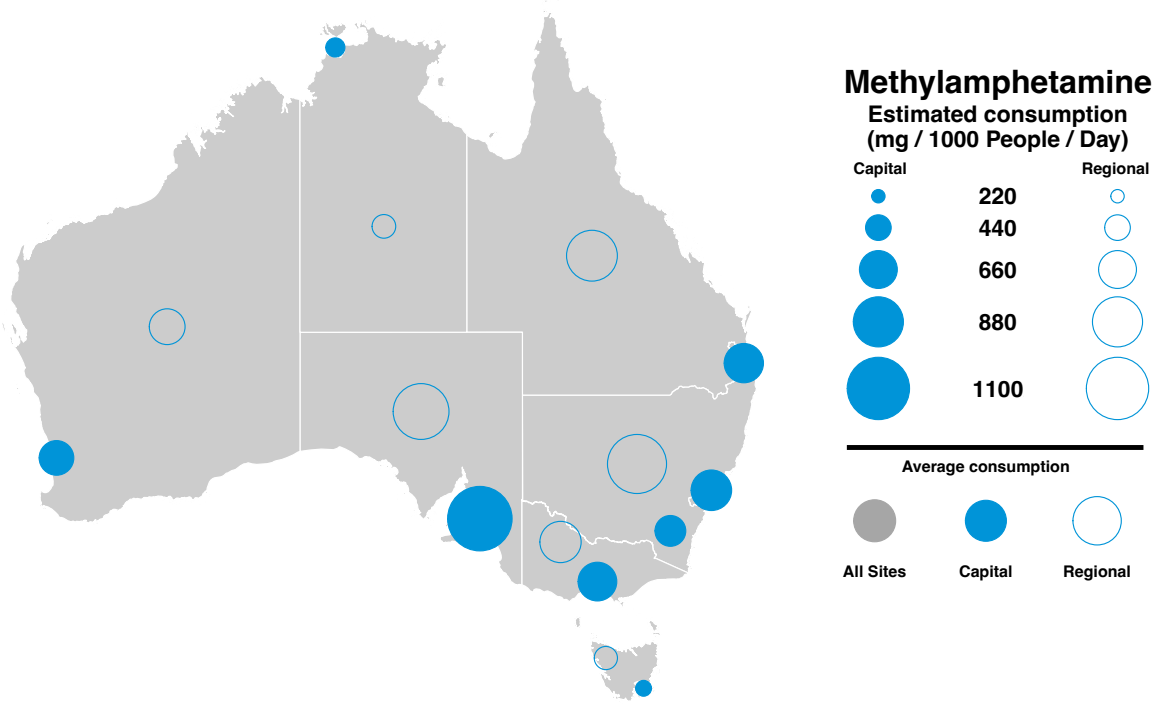


Figure 18: Estimated average cocaine consumption per jurisdiction for August 2021 in mg consumed per day per thousand people. The number of collection days varied from 5–7.

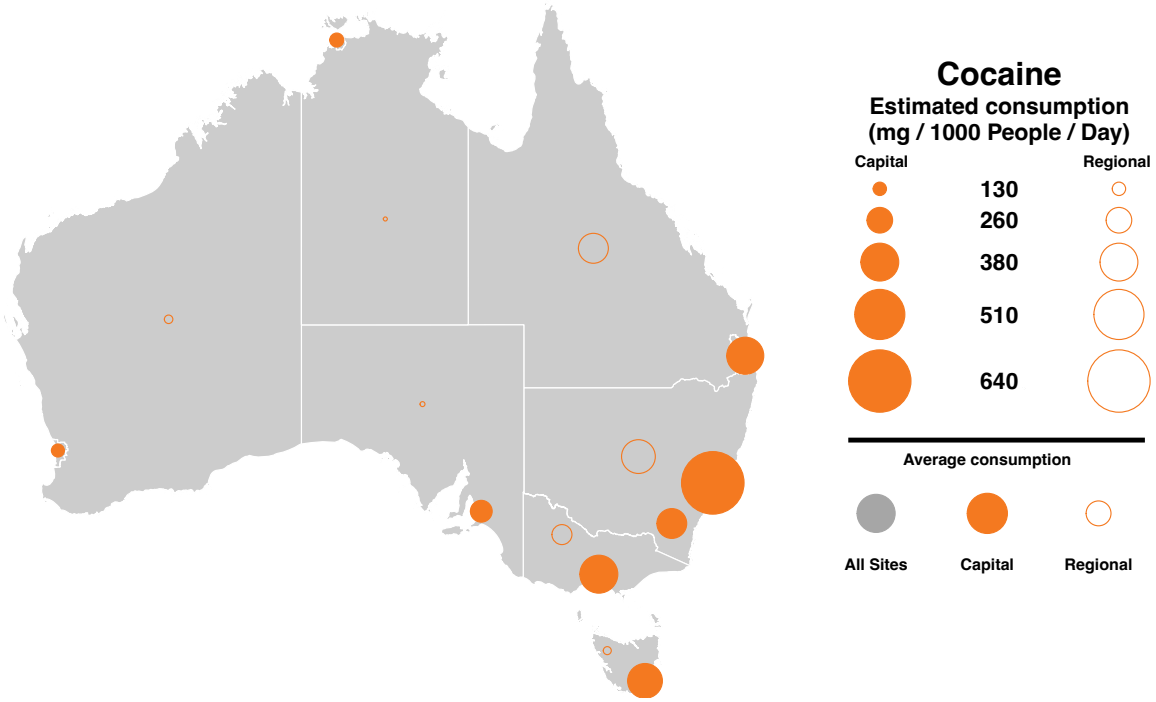


Figure 19: Estimated average MDMA consumption per jurisdiction for August 2021 in mg consumed per day per thousand people. The number of collection days varied from 5–7.

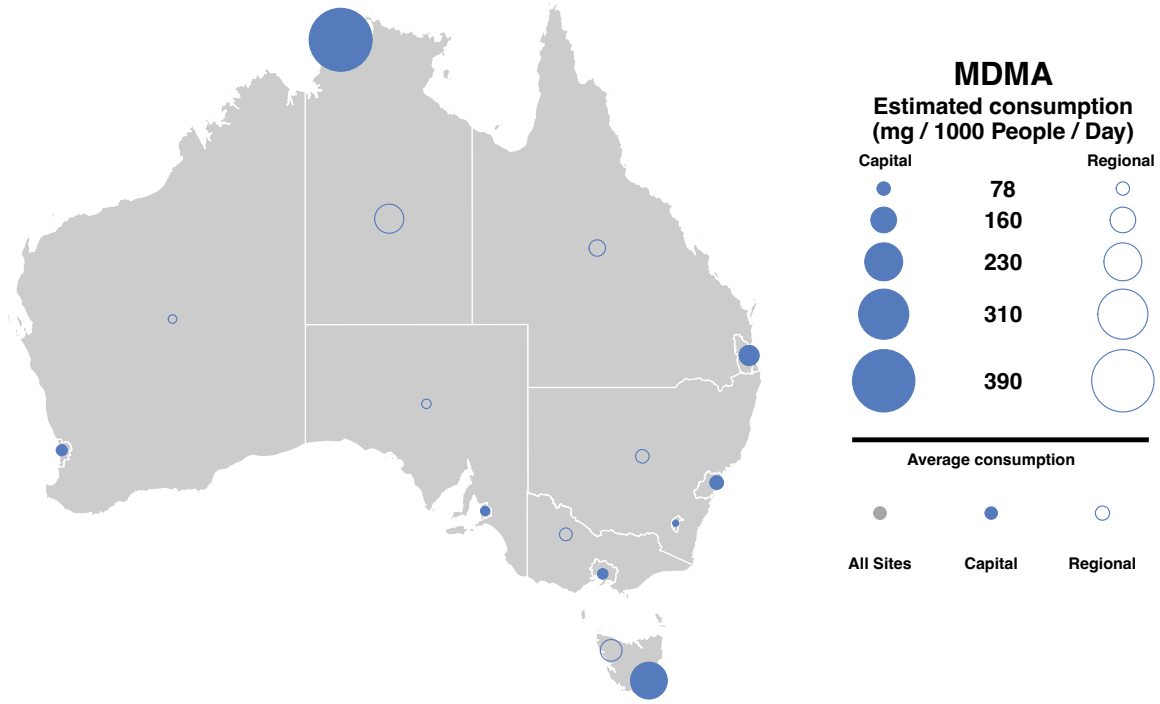
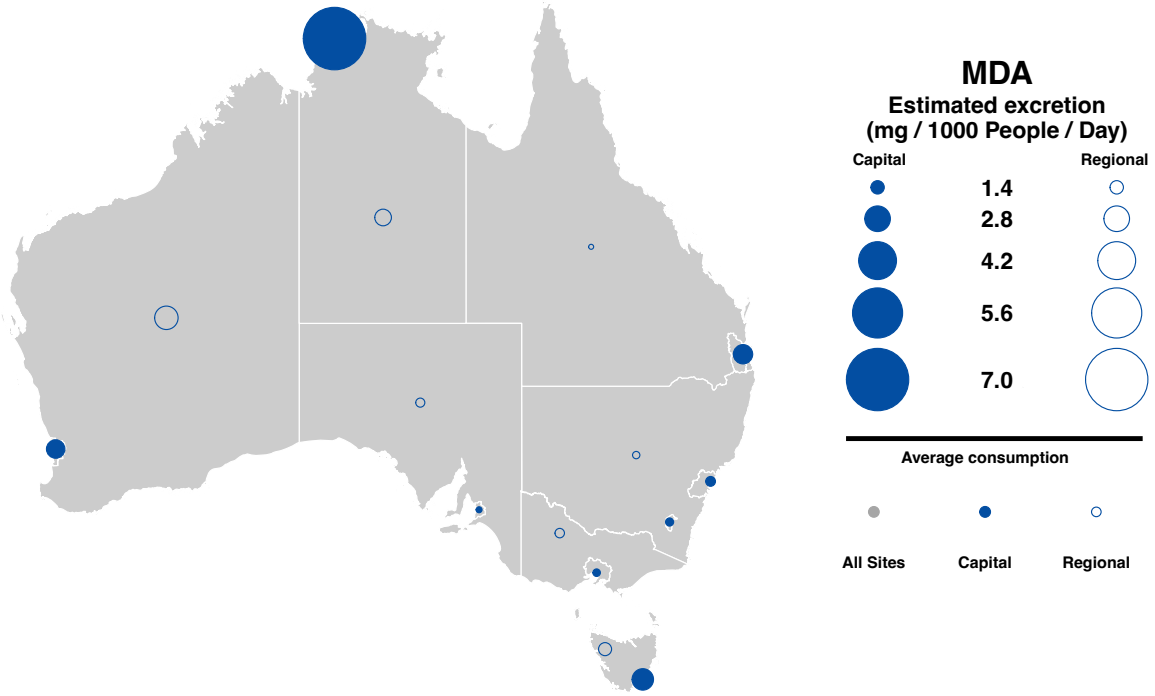


Figure 20: Estimated average MDA excretion per jurisdiction for August 2021 in mg excreted per day per thousand people. The number of collection days varied from 5–7.



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 misuse.

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 2021 was highly variable. A feature of the national use of oxycodone was the substantially higher average consumption occurring in regional areas compared with capital cities (Figure 21). Western Australia had relatively low overall consumption levels compared to the national averages, except Site 129 which was well above the regional average. Capital city sites in Tasmania and South Australia had above average oxycodone consumption in August 2021, with most other capital city sites hovering closer to the national average. The difference between days of the week was small for most capital cities except in Tasmania, with bigger variations evident in regional sites.

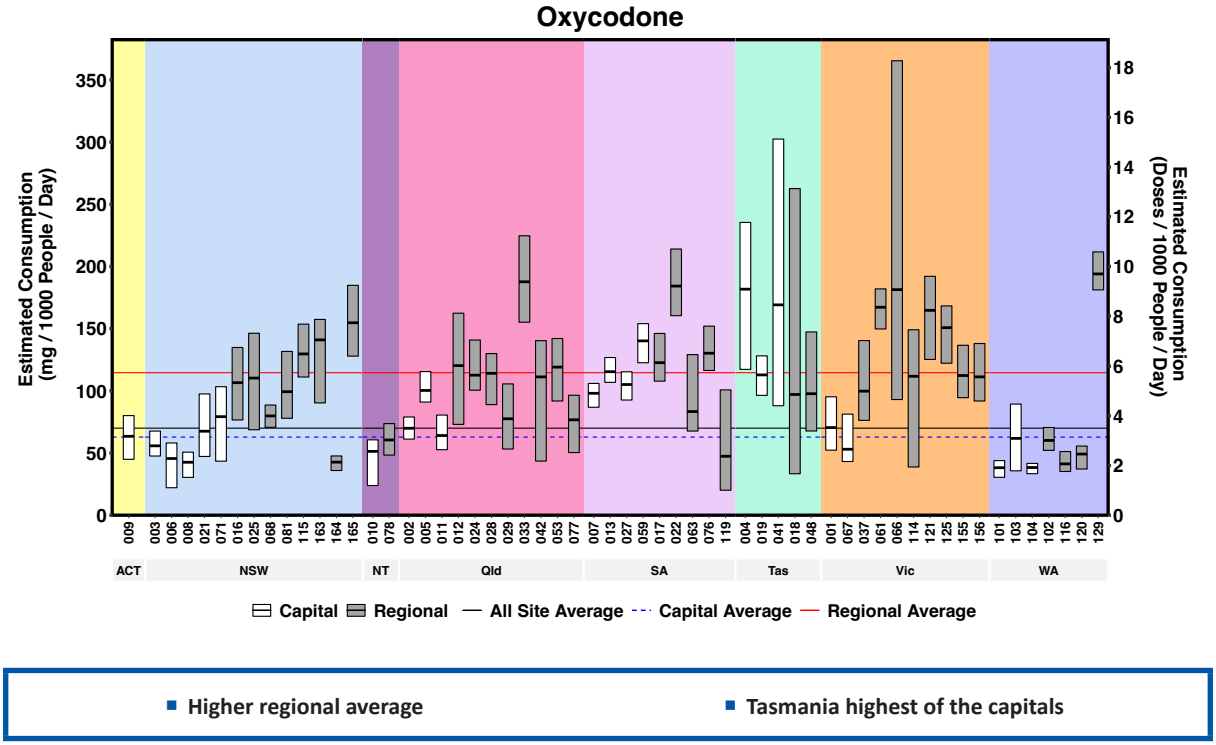
Fentanyl use was also characterised by higher average regional consumption, albeit not as distinct as oxycodone, with greater day-to-day variation evident in regional areas (Figure 22). A few regional sites in New South Wales had the highest consumption levels, with a large difference between collection days evident in one site (Site 81). This is unusual for treatment of medical conditions on a population scale. However, in smaller catchments, a more transient patient base could be the cause. Specific days at some sites had levels below the quantification limits of the method.

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 23). With the exception of Tasmania, average fentanyl consumption was relatively low in most capital cities compared to regional areas (Figure 24).

4.1.3.2 HEROIN

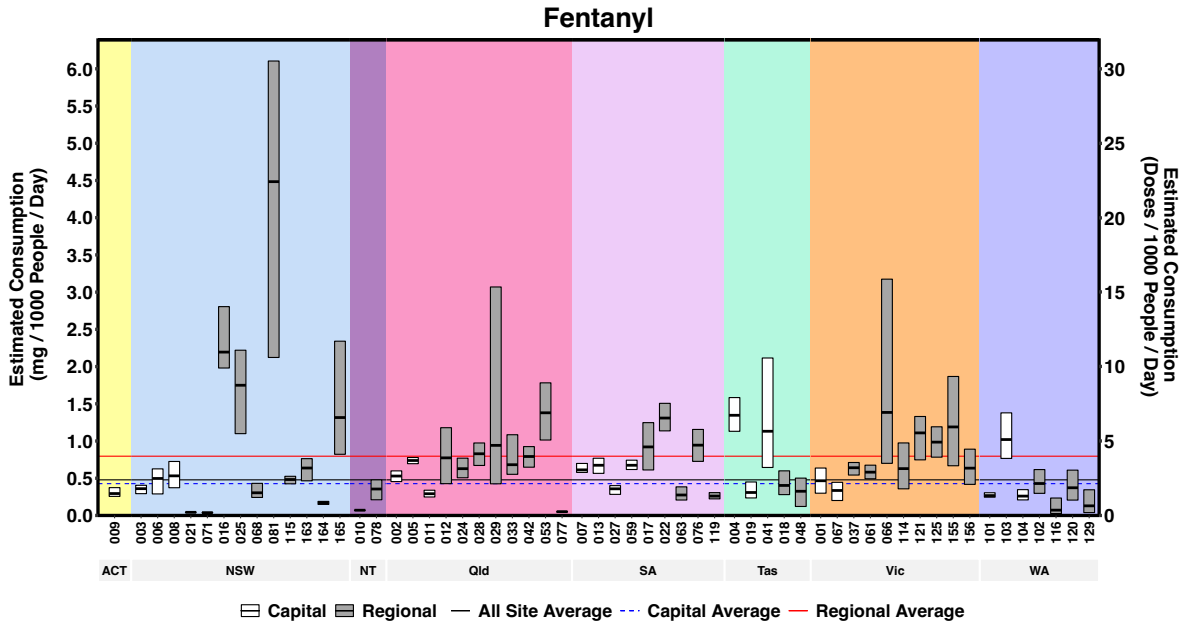
Heroin is metabolised in the body and excreted in low amounts as the unique metabolite, 6-monoacetylmorphine (6-MAM). Since the compound is characteristic of heroin metabolism, it can be used to distinguish heroin from other opioids such as morphine and codeine. Heroin consumption in regional areas was generally much less than in the capital cities, around 3 times lower (Figure 25). Capital city sites in New South Wales, Queensland and Victoria had the highest consumption levels in August 2021, well above most other sites, with Site 67 continuing to record the highest consumption level. Some regional sites in New South Wales and Victoria also had consumption levels well above the average. Regional heroin consumption tended to be too low to detect in other parts of the country, with Queensland, South Australia, and Western Australia having daily levels at or below limits of quantification in most places. The elevated heroin consumption in capital city Victoria is clearly evident from the bubble graph (Figure 26).

Figure 21: Estimated oxycodone consumption for August 2021 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 capitals

Figure 22: Estimated fentanyl consumption for August 2021 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 averages
- Highest consumption in regional New South Wales

Figure 23: Estimated average oxycodone consumption per jurisdiction for August 2021 in mg consumed per day per thousand people. The number of collection days varied from 5–7.

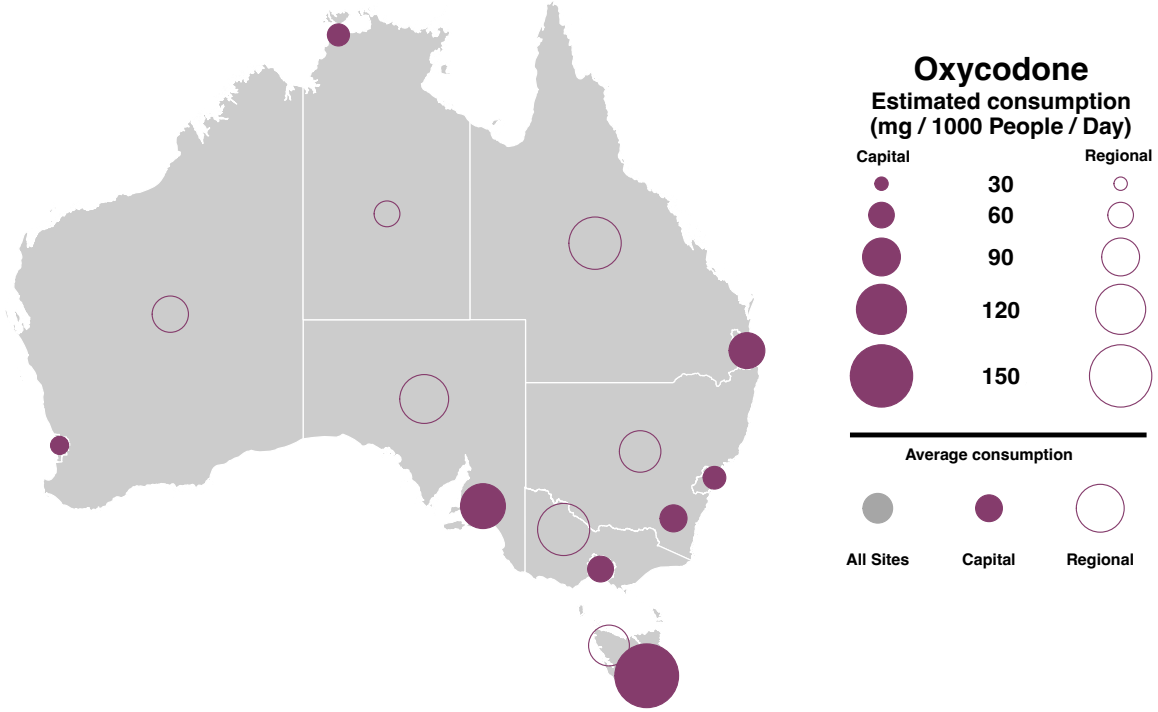


Figure 24: Estimated average fentanyl consumption per jurisdiction for August 2021 in mg consumed per day per thousand people. The number of collection days varied from 5–7.

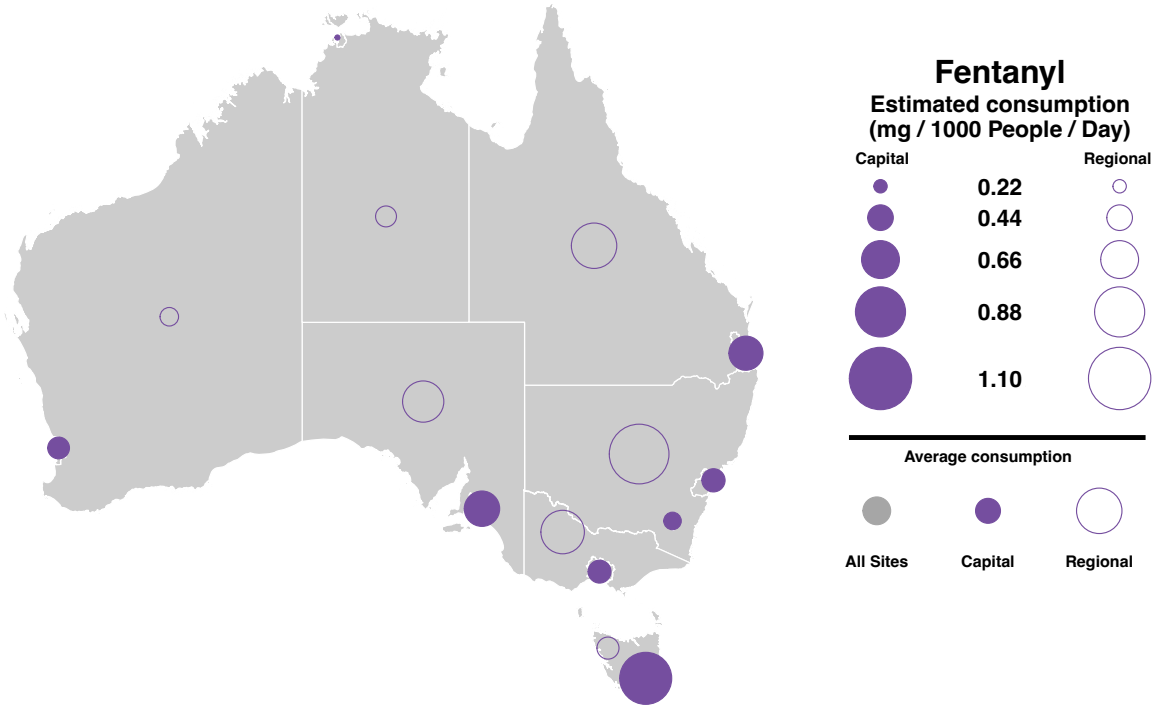
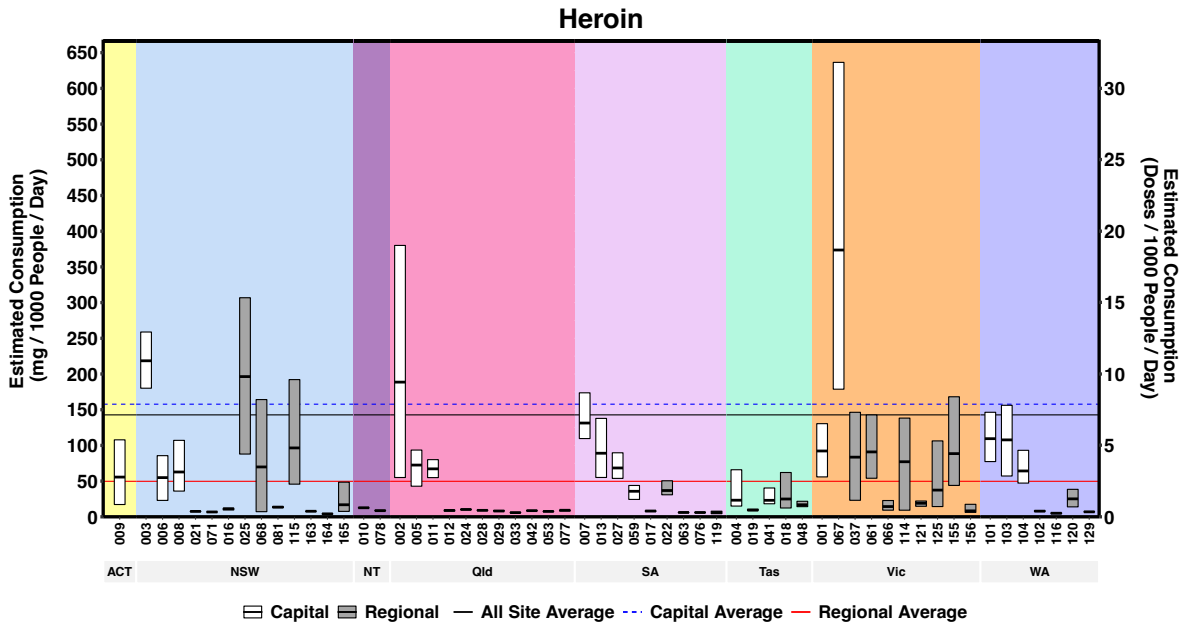
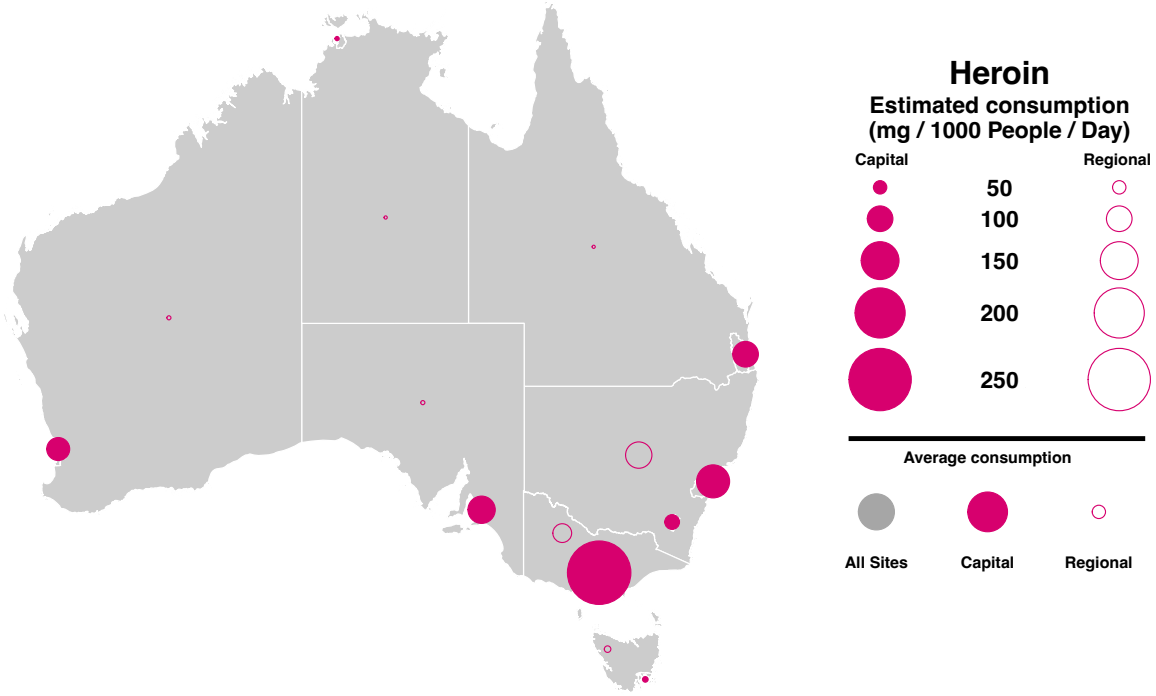


Figure 25: Estimated heroin consumption for August 2021 in mass consumed per day (left axis) and doses per day (right axis) per thousand people. The number of collection days varied from 5–7.



- Lower regional consumption, often not detected
- Highest consumption generally in Victoria and New South Wales

Figure 26: Estimated average heroin consumption per jurisdiction for August 2021 in mg consumed per day per thousand people. The number of collection days varied from 5–7.



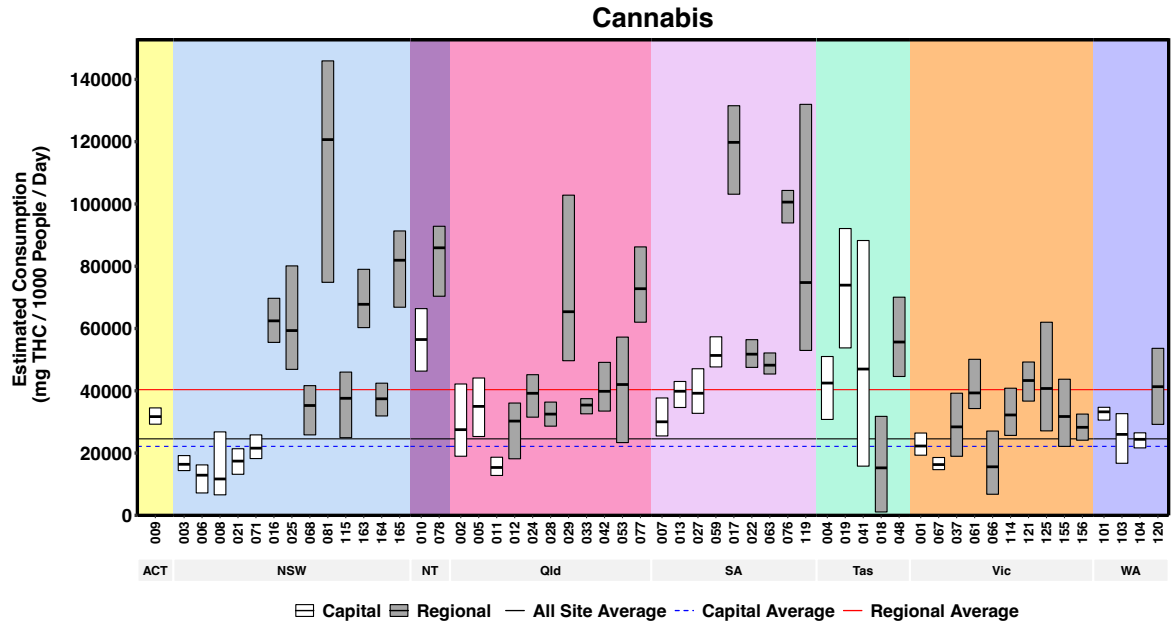
4.1.4 CANNABIS

Tetrahydrocannabinol (THC) is the main psychoactive compound found in cannabis. The compound is metabolised and largely cleared through the intestine. A small proportion (0.6 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 need 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, except for some sites in regional Western Australia.

Cannabis consumption was expressed as the daily mass load (mg) of active ingredient (THC) consumed per 1,000 people. An average dose was not defined as for most 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.

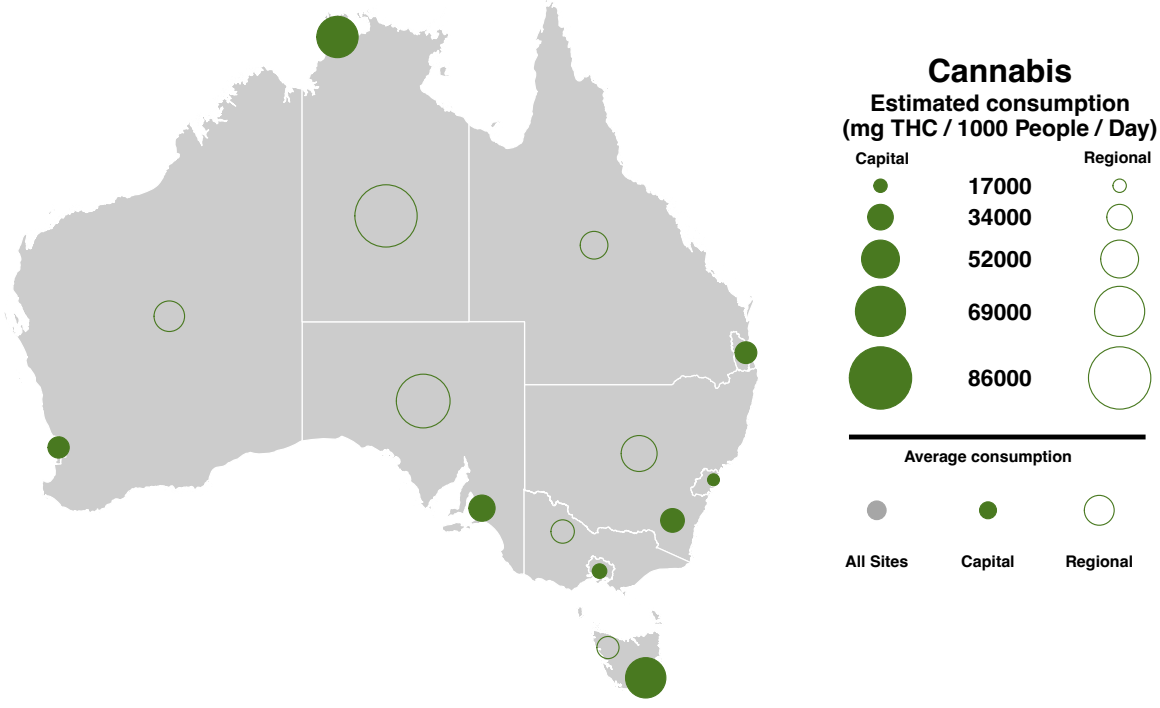
Very large spatial differences were evident across Australia (Figure 27). Average regional consumption in August 2021 exceeded capital city consumption. The highest average values were mostly observed in regional New South Wales, Northern Territory, Queensland, and South Australia; while sites in the Northern Territory, South Australia and Tasmania recorded the highest levels of consumption in capital cities. In contrast, capital city New South Wales, parts of Queensland and Victoria mostly had very low cannabis consumption levels. The bubble plot and jurisdictional differences for cannabis use across Australia show the generally higher consumption in regional areas (Figure 28).

Figure 27: Estimated cannabis consumption for August 2021 in mass consumed per day (left axis). The number of collection days varied from 5–7.



- High regional consumption
- Variable use across the country

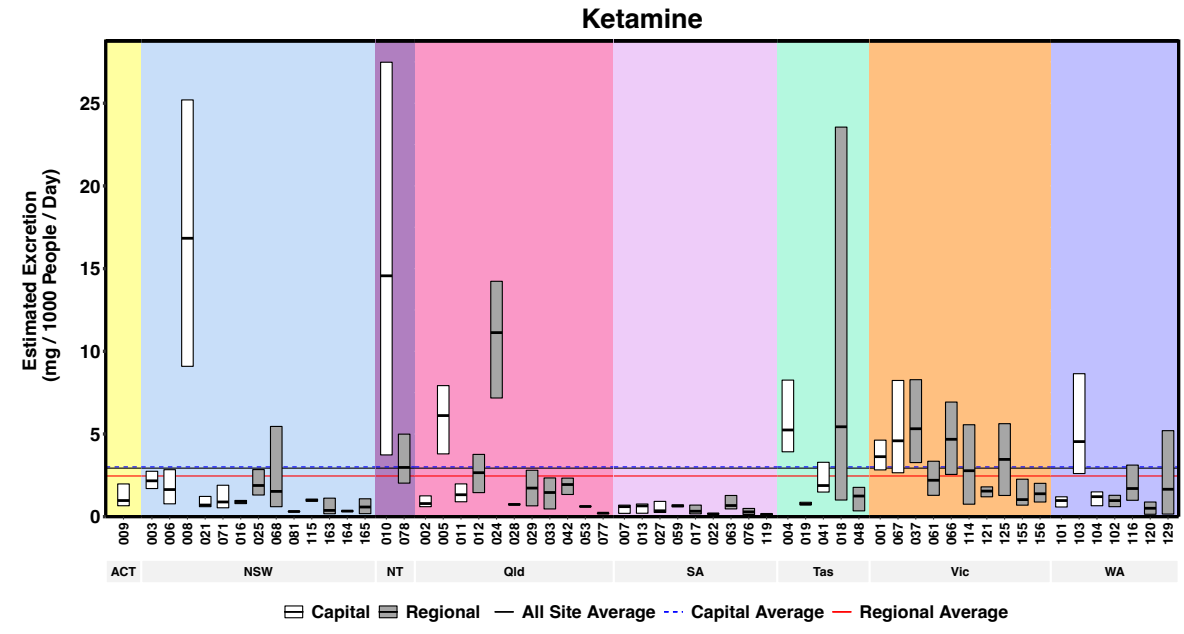
Figure 28: Estimated average cannabis consumption per jurisdiction for August 2021 in mg consumed per day per thousand people. The number of collection days varied from 5–7.



4.1.5 KETAMINE

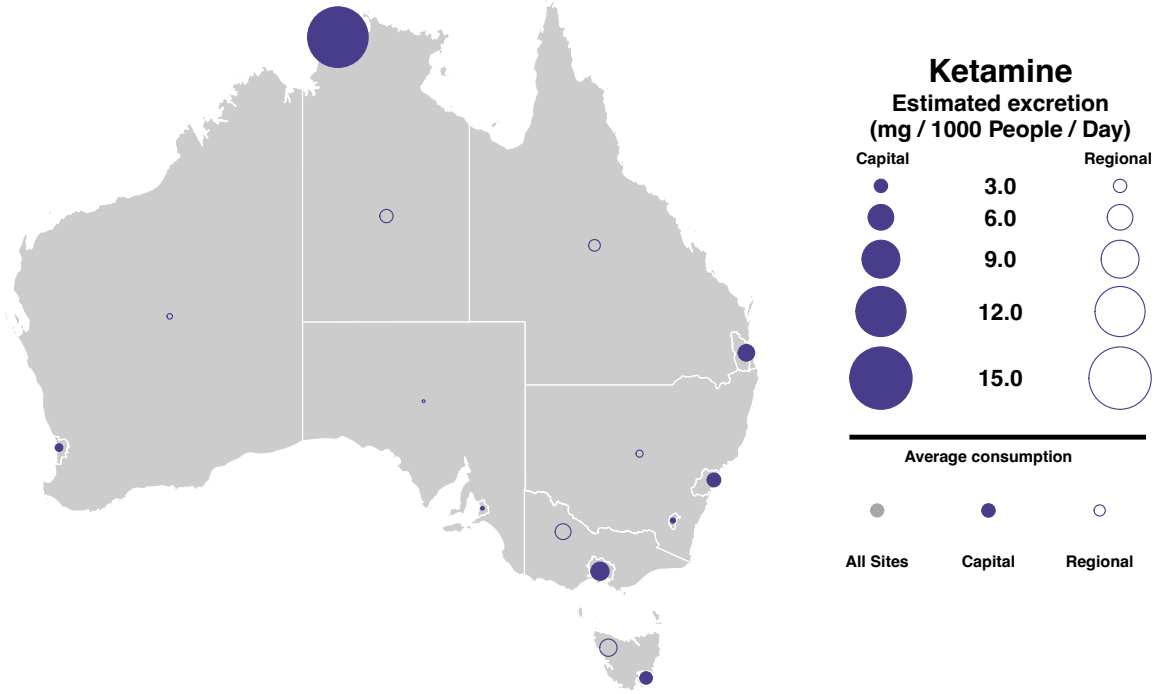
Ketamine, measured as its metabolite norketamine, is used medically for the management of acute pain often associated with surgery or trauma. It has veterinary applications as well, although this may have less relevance in terms of wastewater monitoring due to the separation of stormwater and agricultural run-off and the sewer network in most Australian catchments. Due to its sedative and hallucinogenic effects, the drug has been associated with illicit substance abuse and is listed as a new psychoactive substance by the United Nations Office on Drugs and Crime. The reported proportion of ketamine and its metabolites in wastewater leaves some doubt as to an appropriate factor to convert excreted amounts to consumed amounts. Therefore, measured levels are being shown here as excreted daily mass loads, similar to the case of the stimulant, MDA. The regional average was lower than the capital cities, partly because values fell below the method detection limits on certain days at various sites. On a spatial level, excretion was only well above the averages at a few sites, particularly in parts of New South Wales, the Northern Territory, Queensland and Tasmania (Figure 29). Although the larger difference between days of the week at these sites appears to be inconsistent with medical use on a population scale, the low overall values may distort the scale of the variations to some extent. A bubble plot shows the relative scale of ketamine excretion across Australia (Figure 30).

Figure 29: Estimated ketamine excretion for August 2021 in mass excreted per day (left axis) per thousand people. The number of collection days varied from 5–7.



- Lower regional average
- Higher excretion levels in specific sites

Figure 30: Estimated average ketamine excretion per jurisdiction for August 2021 in mg excreted per day per thousand people. The number of collection days varied from 5–7.



4.2 TEMPORAL CHANGES IN DRUG CONSUMPTION ESTIMATES BY JURISDICTION

The per capita consumption of each drug outlined in the following figures compares data acquired in this report to previous collection periods on a state or territory basis. The data relating to capital cities in this section have been updated to include both the August 2021 and October 2021 collections, while regional areas were updated for August 2021. This needs to be considered when comparing results between sections 4.1 and 4.2. Ketamine was included in the Program for the first time in Report 13 and so has less data points than the other substances.

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 report presents data since August 2019. Prior data dating back to 2016 for each substance of interest is 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

Trends in nicotine consumption tended to change across Australia over the past year (Figure 31). The period leading up to mid-2020 was associated with an increase in nicotine consumption in many parts of the country, peaking in mid-2020 after the only national lockdown of the COVID-19 pandemic. This was followed by a decreasing trend to mid-2021. The current reporting period shows some small increases in the Northern Territory, New South Wales, Queensland, Tasmania, and Victoria. Capital city South Australia was the only location with consistently declining consumption of the substance over the period. Regional average nicotine consumption (red line) is well above capital city levels (blue dashed line) and suggests a greater per capita consumption of the substance in regional areas.

No consistent patterns in alcohol consumption are evident across the country, although a short-term decrease in April 2020 following the national COVID-19 lockdown was observed in many jurisdictions (Figure 32). The decrease in consumption was largely reversed in June and August 2020, with consumption returning to levels close to those in February 2020. Alcohol trends may have been influenced by the implementation of different COVID-19 restrictions such as lockdowns and reduced venue capacities, which varied by jurisdiction. Alcohol consumption in most jurisdictions has remained relatively consistent over the past 2 years, with variations in consumption less than 30 per cent, apart from the Northern Territory which had larger variations. Alcohol consumption in the Australian Capital Territory, regional Tasmania and capital city Western Australia over the past year was lower than 2 years ago. The decline in South Australia since late 2017 ceased after the emergence of the pandemic and consumption levels have since stabilised. Alcohol consumption in August and October 2021 largely reflects recent trends, with no obvious changes emerging. One exception may be the higher consumption estimates observed in capital city Queensland in October 2021, which are the highest recorded in that jurisdiction since the Program commenced. The Northern Territory continues to have the highest overall consumption of alcohol. South Australia and Western Australia have the lowest alcohol consumption in the country, with significantly lower consumption observed in the regional areas of South Australia. The difference in average alcohol consumption in regional areas compared to the cities was less pronounced than for nicotine, but consumption of both substances was higher in regional areas.

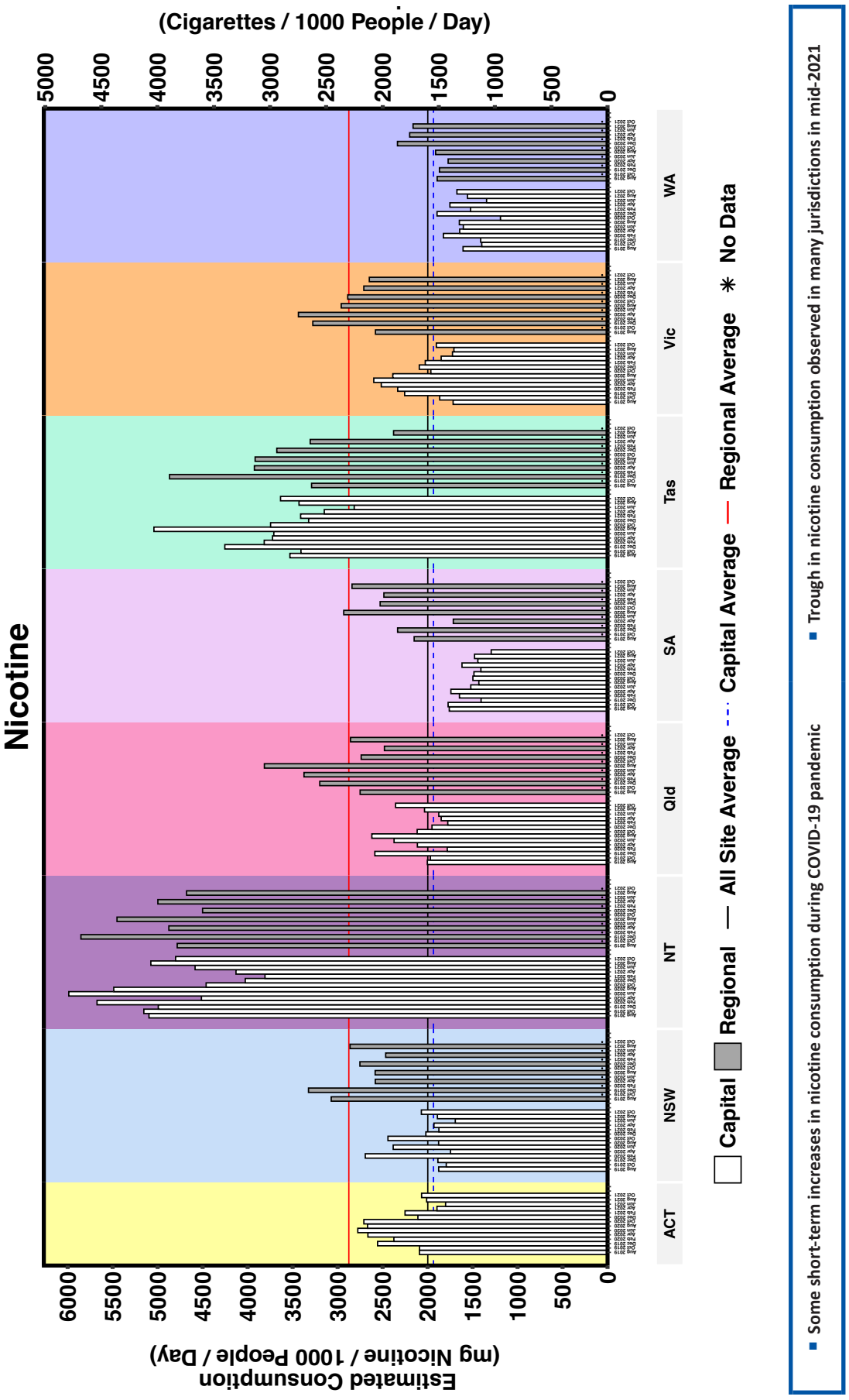


Figure 31: Estimated average consumption of nicotine by state/territory, August 2019 to October 2021, where 1 cigarette provides 1.25 mg of nicotine.

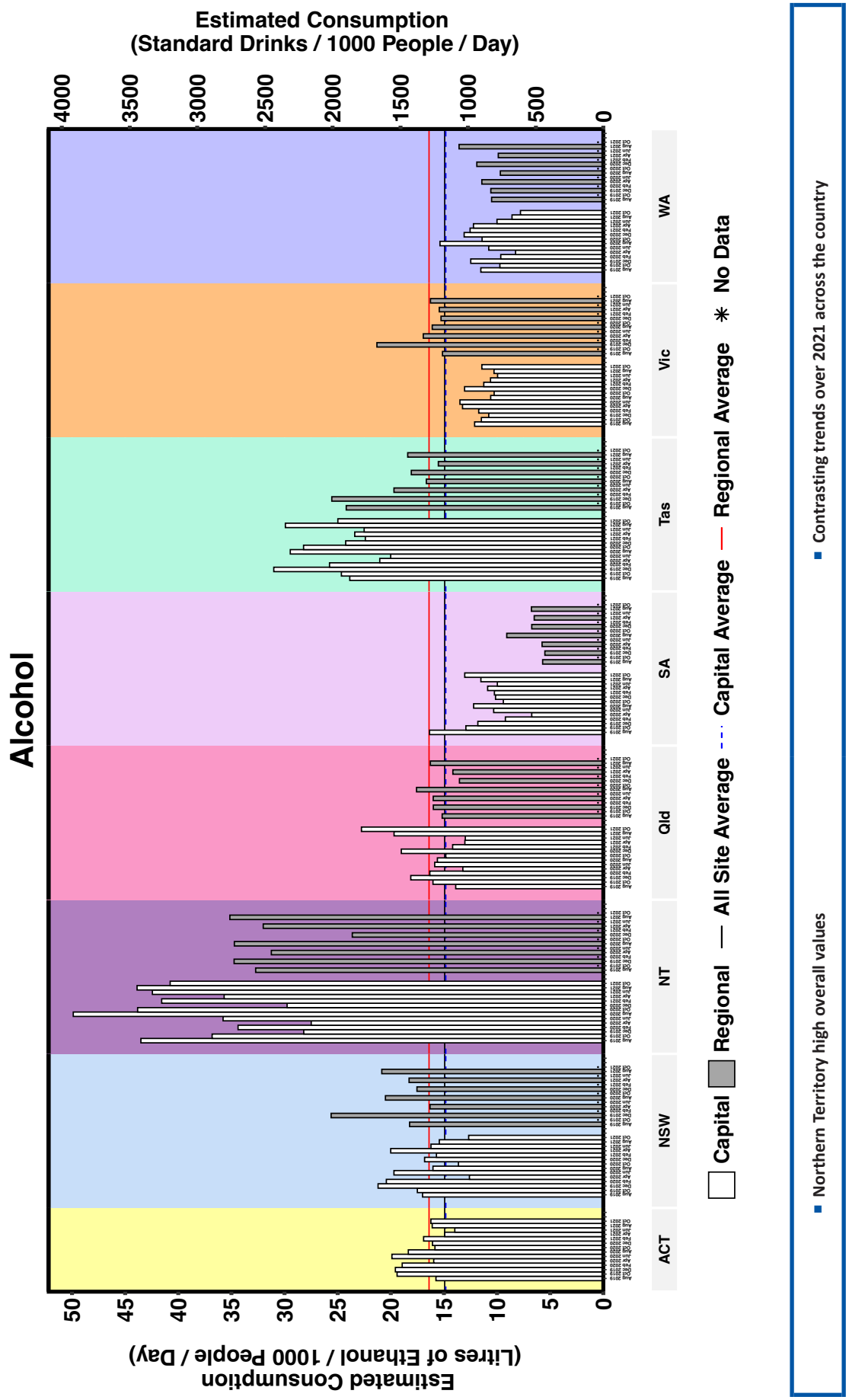


Figure 32: Estimated average consumption of alcohol by state/territory, August 2019 to October 2021. A standard drink is 10.0 g, or 12.6 mL.

4.2.2 STIMULANTS

The apparent impact of the COVID-19 pandemic on methylamphetamine consumption is evident across almost all the jurisdictions, with a substantial reduction in consumption visible in mid-2020 and mid-2021 (Figure 33). However, it is possible that other market factors may also be at play, as methylamphetamine consumption has reduced at capital city and regional sites in August 2019, 2020 and 2021, before rebounding in the subsequent recording period. The reasons for this are being considered, but more than one factor would appear to be responsible for the changes in consumption. Methylamphetamine use in the Northern Territory, Tasmania and Western Australia appear to have been significantly impacted in mid-2020 during the first and only national lockdown, with up to 80 per cent decreases in consumption compared with previous periods. Pre-pandemic emerging upward trends in consumption in states such as New South Wales, Tasmania and the Australian Capital Territory were interrupted in mid-2020. This was particularly the case in regional areas, where consumption decreased sharply from record high to record low levels over a period of 4 months. In most capital cities and regional areas, methylamphetamine consumption increased after mid-2020, then declined again in the current reporting period. Methylamphetamine consumption since mid-2021 has decreased again to levels around one-half to one-third of baseline consumption levels recorded in the pre-pandemic years (varying mostly between 50–70 doses per day per 1,000 people between 2016–20). South Australia and New South Wales had the highest consumption levels in August 2021.

Several sites have data available from before the start of the NWDMP showing long-term changes in use of methylamphetamine (Figures 34 and 35). Consumption levels of the substance increased many-fold since the start of wastewater monitoring studies from 2009. The amounts of methylamphetamine in South Australia should be considered in the context of historical data for this state. It shows that methylamphetamine levels in South Australia in October 2021 were almost one-third of that in February 2018, and also lower than that observed in 2014. In Western Australia, the decrease in methylamphetamine consumption in the middle of 2020 was unprecedented in the context of the NWDMP.

Cocaine consumption had been steadily increasing in almost all capital cities and many regional parts of Australia for the years leading up to the start of COVID-19 restrictions (Figure 36). New South Wales remains the jurisdiction with the highest cocaine consumption levels. Cocaine consumption remains low in Western Australia and the Northern Territory.

The end of 2020 saw some of the lowest MDMA consumption levels recorded across Australia since the NWDMP commenced. Consumption remained relatively stable or further decreased in the current reporting period. Use of the drug remains low in virtually every state and territory, with the exception of the Northern Territory capital city site (Figure 37). Long-term trends in MDMA consumption over the life of the Program show that MDMA consumption was increasing from August 2016, before peaking in mid-late 2019 in most places, followed by a gradual decline which commenced prior to the introduction of COVID-19 restrictions. The Northern Territory and Tasmania capital cities have historically been 2 locations where MDMA consumption tends to be the highest in the nation. Average regional MDMA consumption exceeds capital city consumption.

MDA use, corrected for the proportion derived from MDMA (Khan & Nicell 2011), showed a similar decline as MDMA for the last few years (Figure 38). Parts of regional Queensland have shown sporadic spikes in use, but generally the pattern across most jurisdictions is a decreasing trend. Spikes in use in regional areas have driven up the cumulative regional average higher than the capital average, mostly due to larger regional centres in Queensland, Victoria and New South Wales. Apart from that, for the most part regional levels were generally at or slightly below those in capital cities. Consumption of the drug in this reporting period was generally at the lowest levels since the beginning of the Program in most jurisdictions.

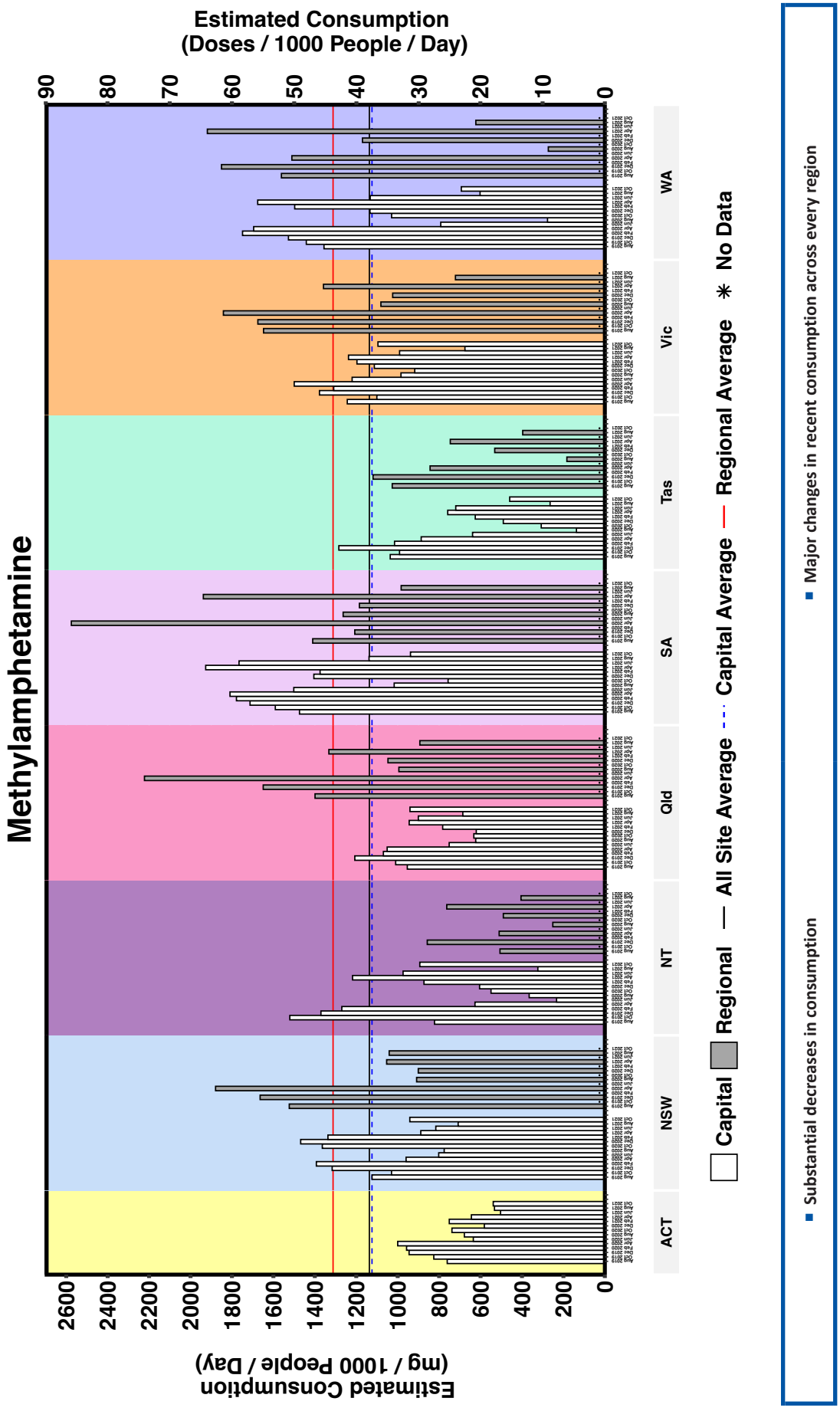


Figure 33: Estimated average consumption of methylamphetamine by state/territory, August 2019 to October 2021.

Figure 34: Change in methylamphetamine consumption for sites in Queensland and South Australia with historical data.

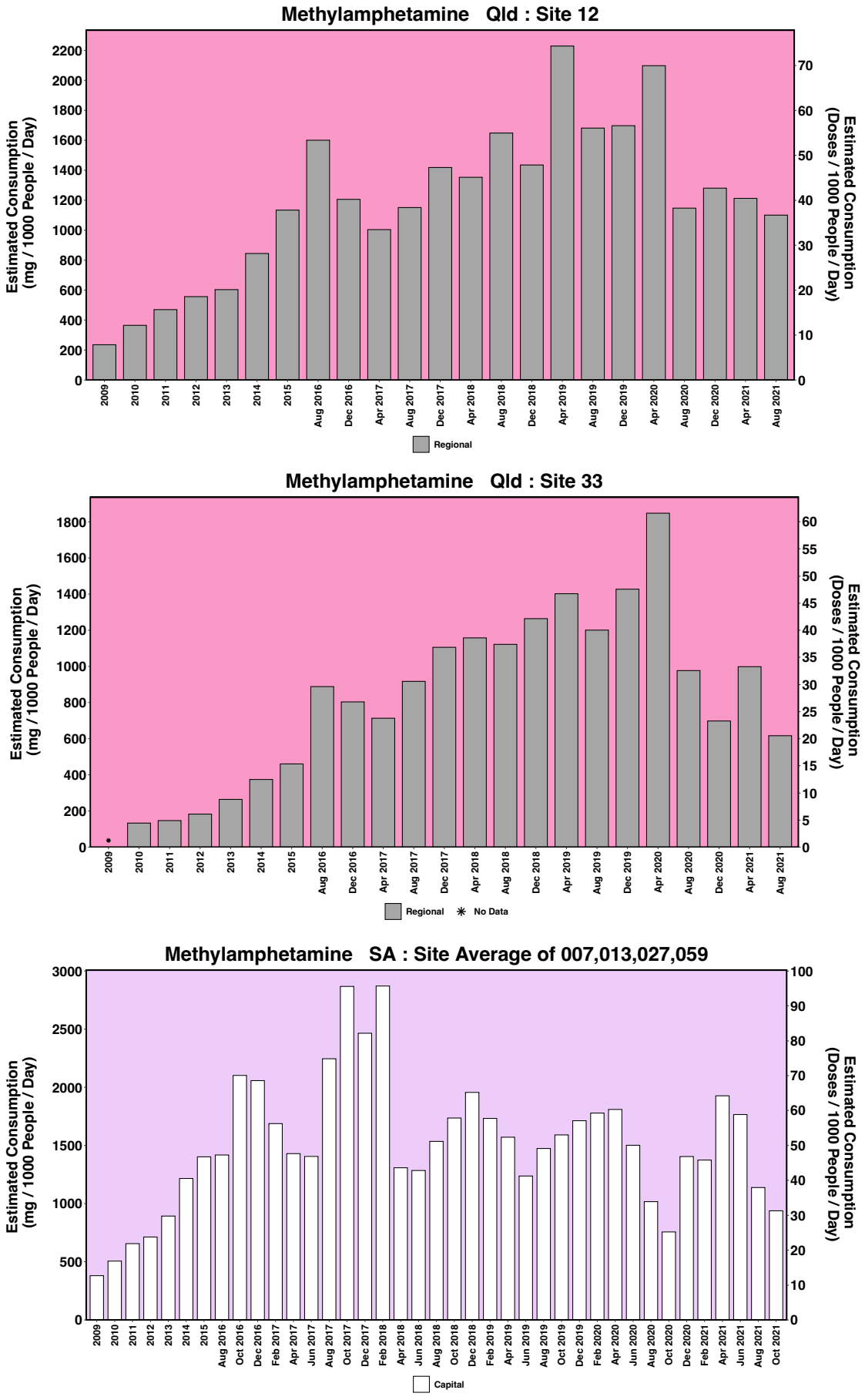
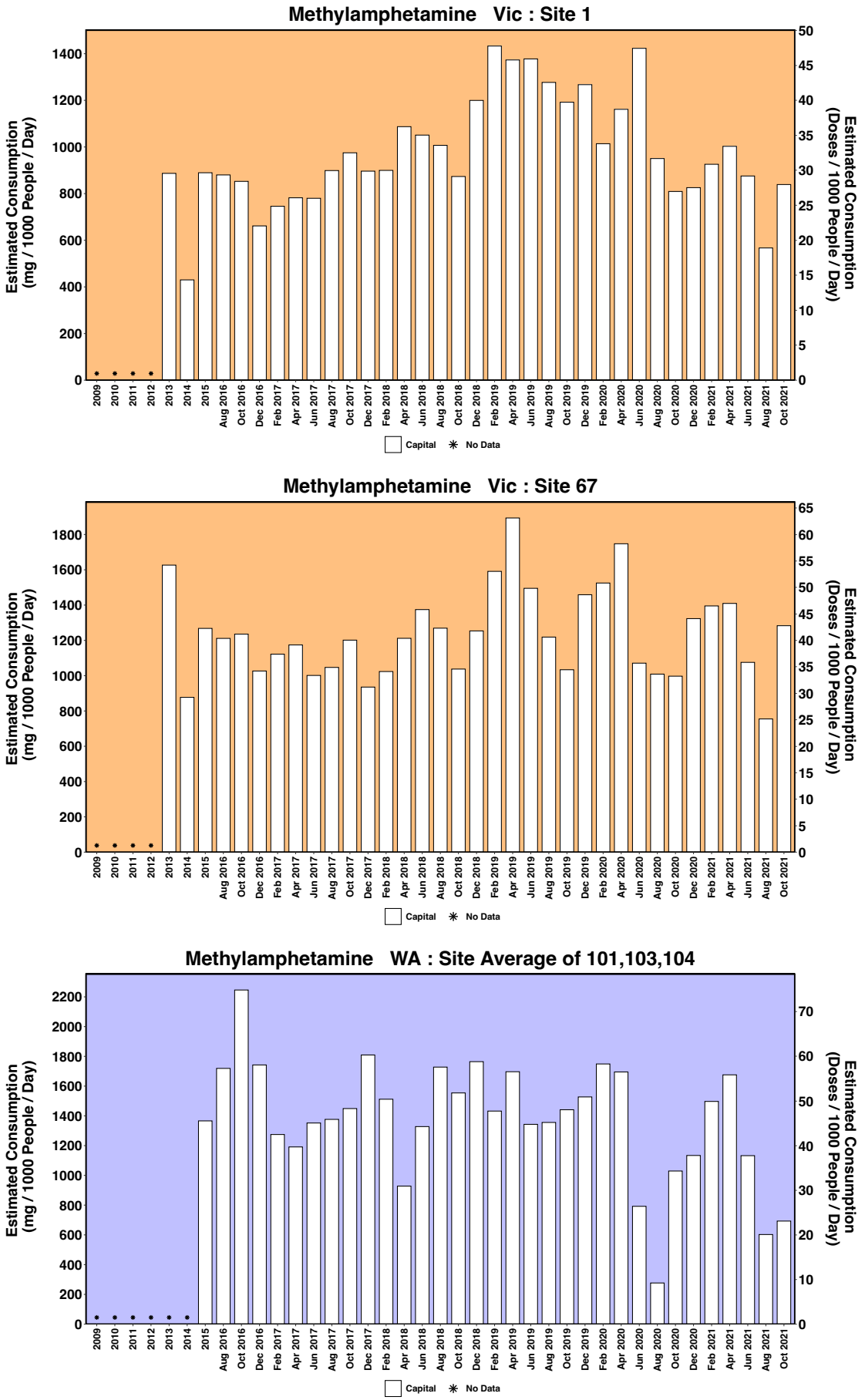


Figure 35: Change in methylamphetamine consumption for sites in Victoria and Western Australia with historical data. Both Victorian sites were the average of one week per year in 2013, 2014 and 2015.



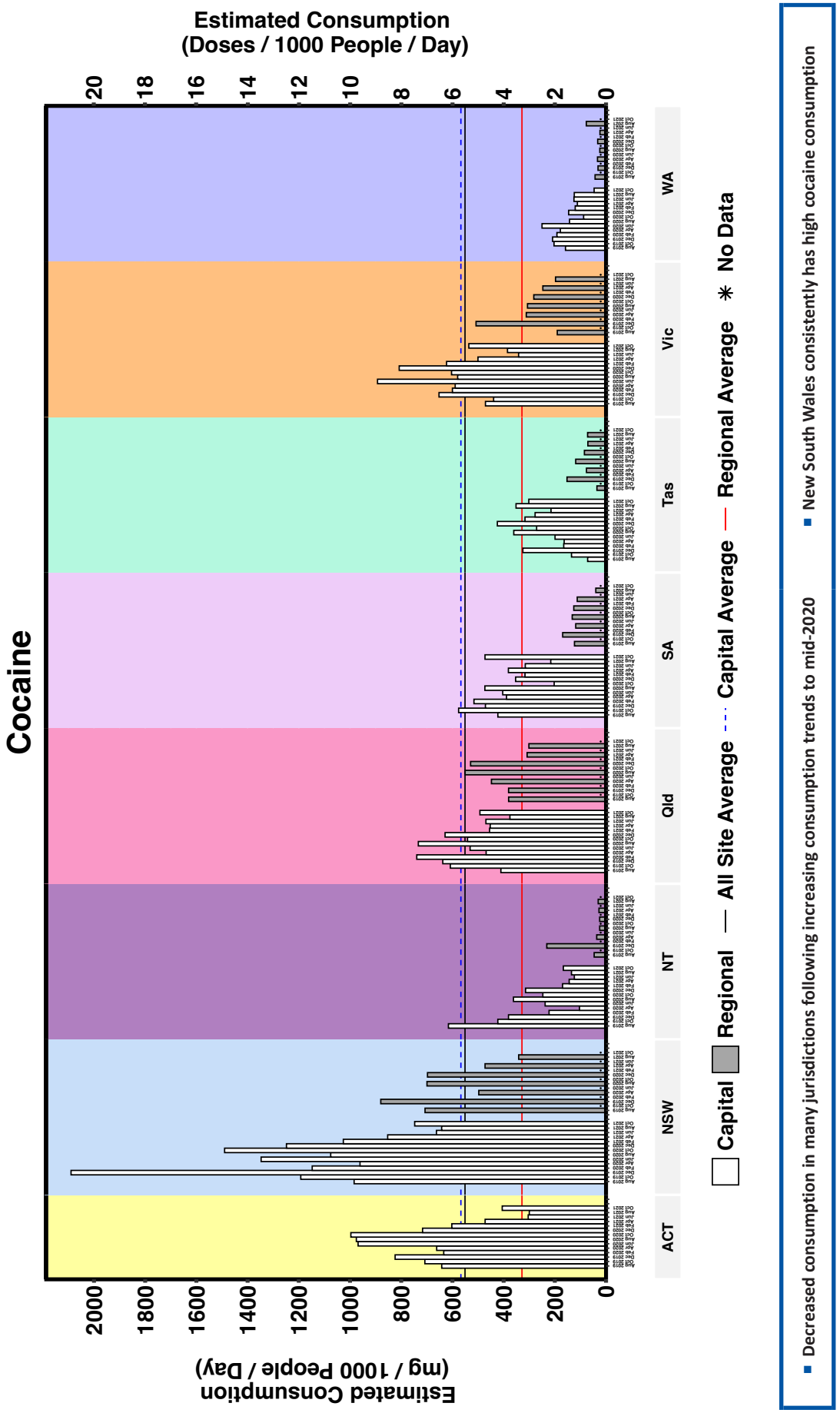


Figure 36: Estimated average consumption of cocaine by state/territory, August 2019 to October 2021.

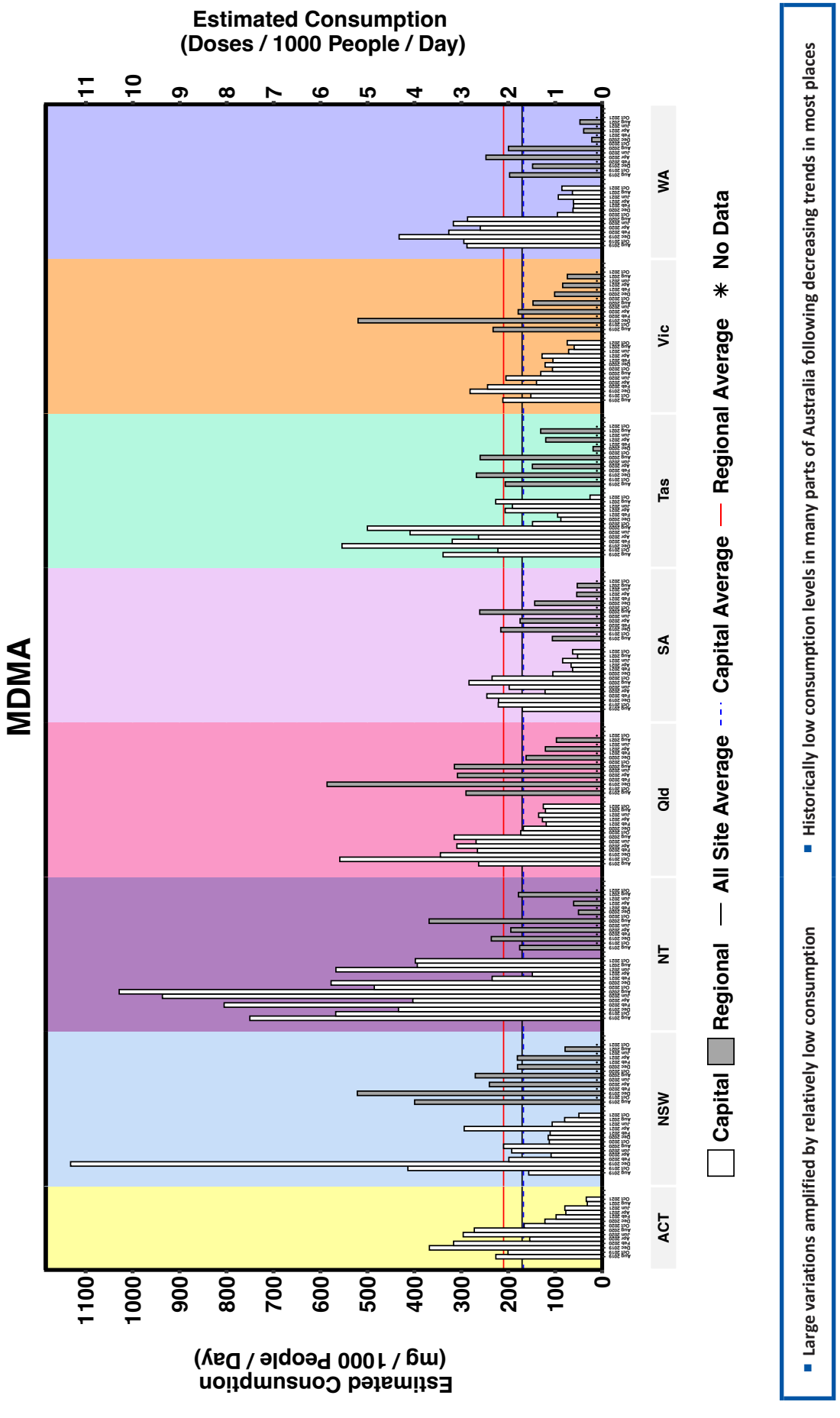


Figure 37: Estimated average consumption of MDMA by state/territory, August 2019 to October 2021.

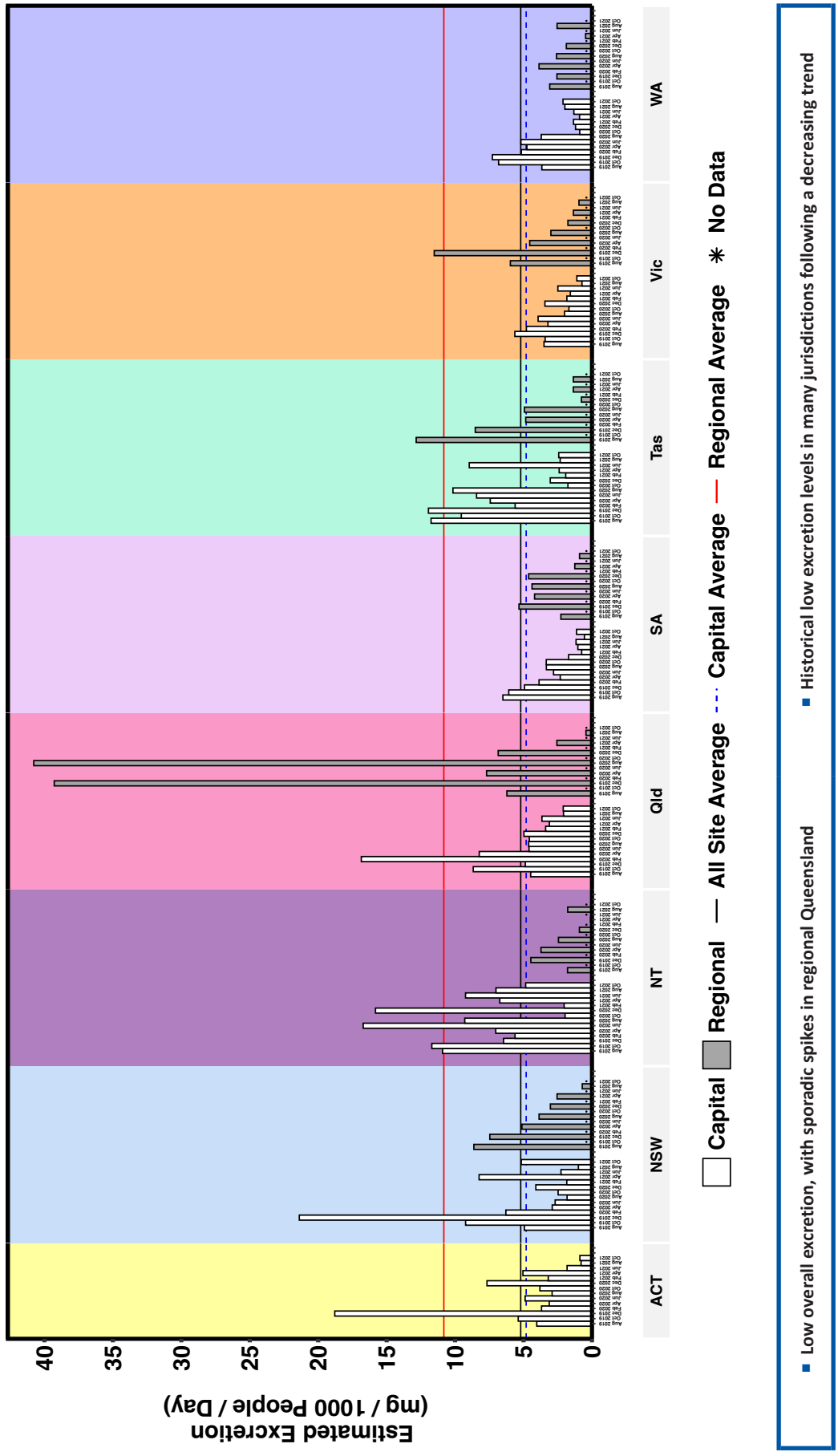


Figure 38: Estimated average excretion of MDA by state/territory, August 2019 to October 2021.

4.2.3 OPIOIDS

Oxycodone consumption over the past 2 years has been characterised by a period of general decreases (Figure 39). General trends showed an increasing consumption rate from 2016 to the end of 2018,[7] followed by a gradual decline to late 2019, after which there has been a period of relative stability in most places. Some jurisdictions saw a small single-timepoint decrease in April 2020, a time during the COVID-19 pandemic when elective surgeries were delayed and medical treatment postponed due to COVID-19 restrictions. Oxycodone is a strong pain reliever which is commonly prescribed for post-surgery pain treatment. The decrease in consumption in April 2020 was most evident in the Australian Capital Territory, South Australia, and the Northern Territory. Findings from the current reporting period are largely consistent with the recent flattening in oxycodone consumption. Average per capita regional oxycodone consumption is nearly double that of the capital cities. Capital city Tasmania, the Australian Capital Territory and regional parts of Queensland, New South Wales and Victoria tend to be among the highest consumers of oxycodone on a population basis.

The trend relating to fentanyl consumption has been downward in the past few years, even though some sporadic increases have been evident in parts of the country (Figure 40). In many jurisdictions, consumption has reached the lowest levels measured to date by the Program. This is most obvious when comparing the current reporting period with long-term cumulative averages. The long-term fentanyl trend shows a general increase from 2016 before consumption peaked in mid to late 2018, and then a slow decrease to the present time, although since June 2021 there has been a level of stability in consumption. Fentanyl consumption in capital city Victoria was increasing prior to the COVID-19 lockdown, but has since decreased and stabilised as the state subsequently went through several rounds of restrictions. The initial COVID-19 lockdowns appear to have had an impact on fentanyl consumption, with consumption decreasing across the country in April 2020. Regional use of fentanyl has tended to be higher than in the capital cities. However, these differences in consumption have narrowed.

In contrast to the pharmaceutical opioids, heroin is mostly consumed in the capital cities (Figure 41). Heroin consumption is lowest on a population basis in the Northern Territory, Tasmania and regional Queensland and South Australia. Capital city Victoria has consistently recorded high heroin consumption levels, but over the past year New South Wales has reached similar levels in some sampling periods. Heroin consumption appeared to peak in late 2019 to mid-2020 in many jurisdictions. Capital city South Australia and Queensland are the exception, with the highest consumption levels recorded by the Program for those jurisdictions reported in August and October 2021 respectively. Trends in heroin consumption appear to be volatile, with some relatively large fluctuations observed across reporting periods. Heroin consumption has been measured in capital city South Australia since 2013 (Figure 42). A gradual, long-term decrease in heroin consumption 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 undergone relatively large fluctuations in the capital city.

7 For figures containing the full time series per state and territory please visit the ACIC website <https://www.acic.gov.au/publications/national-wastewater-drug-monitoring-program-reports>.

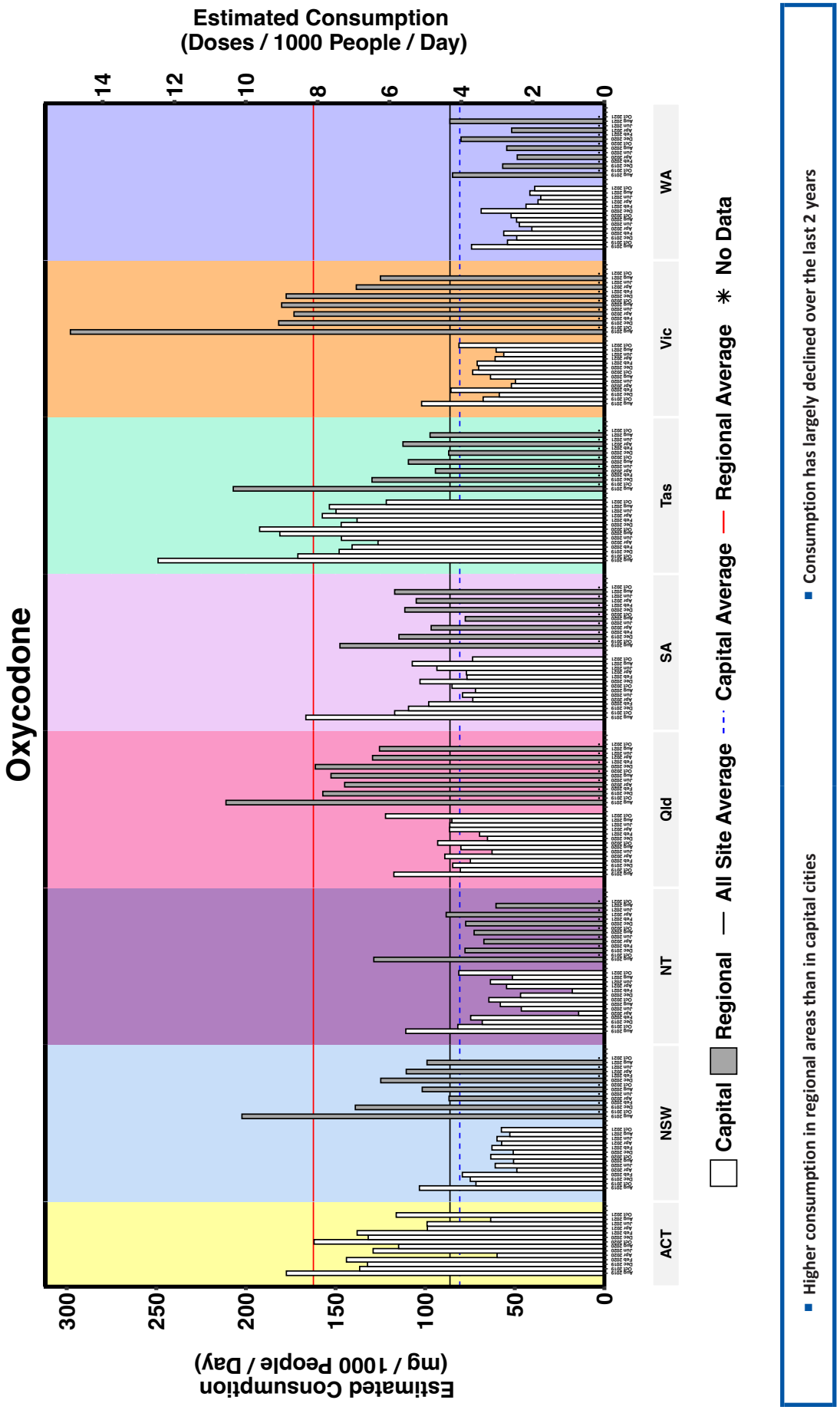


Figure 39: Estimated average consumption of oxycodone by state/territory, August 2019 to October 2021.

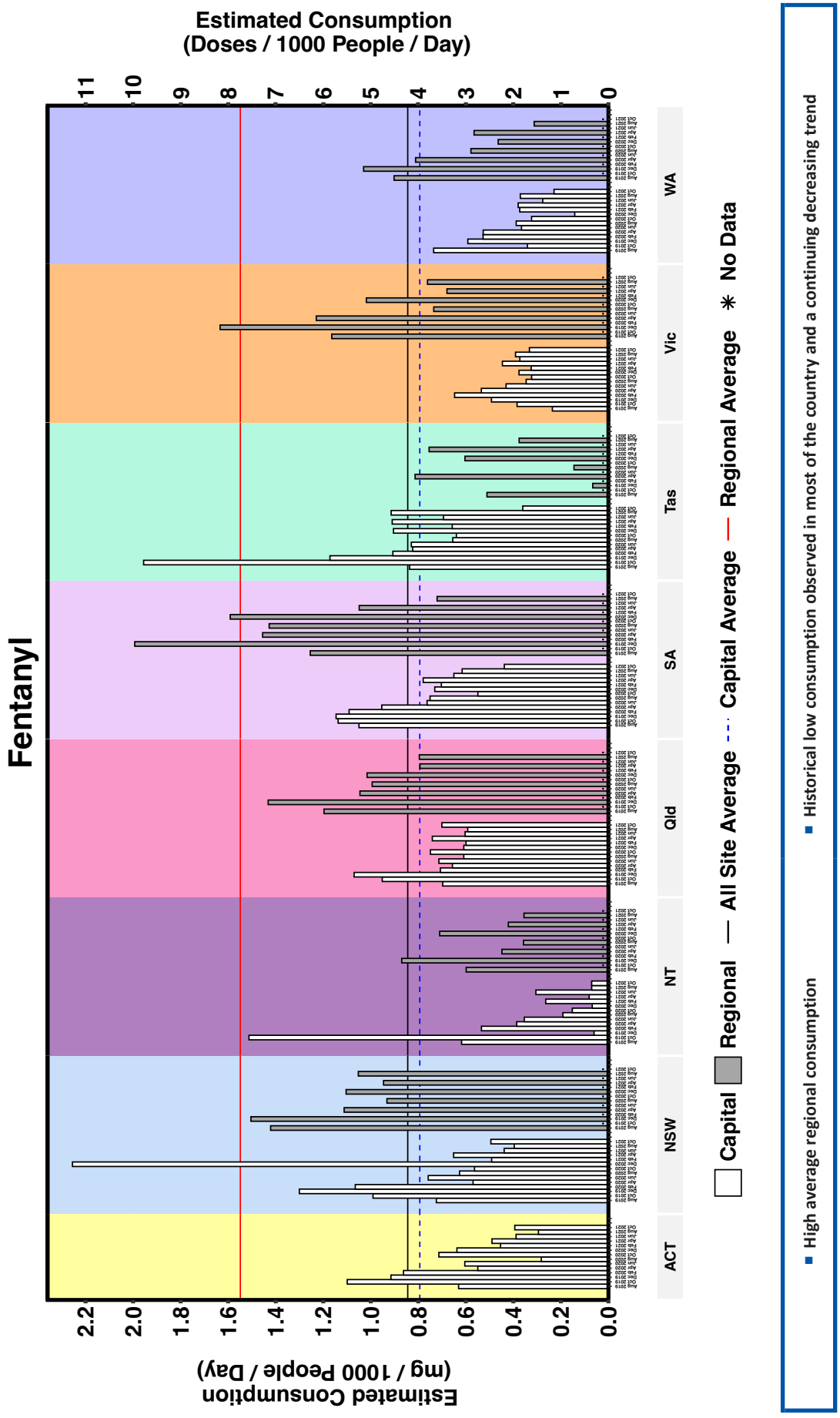


Figure 40: Estimated average consumption of fentanyl by state/territory, August 2019 to October 2021.

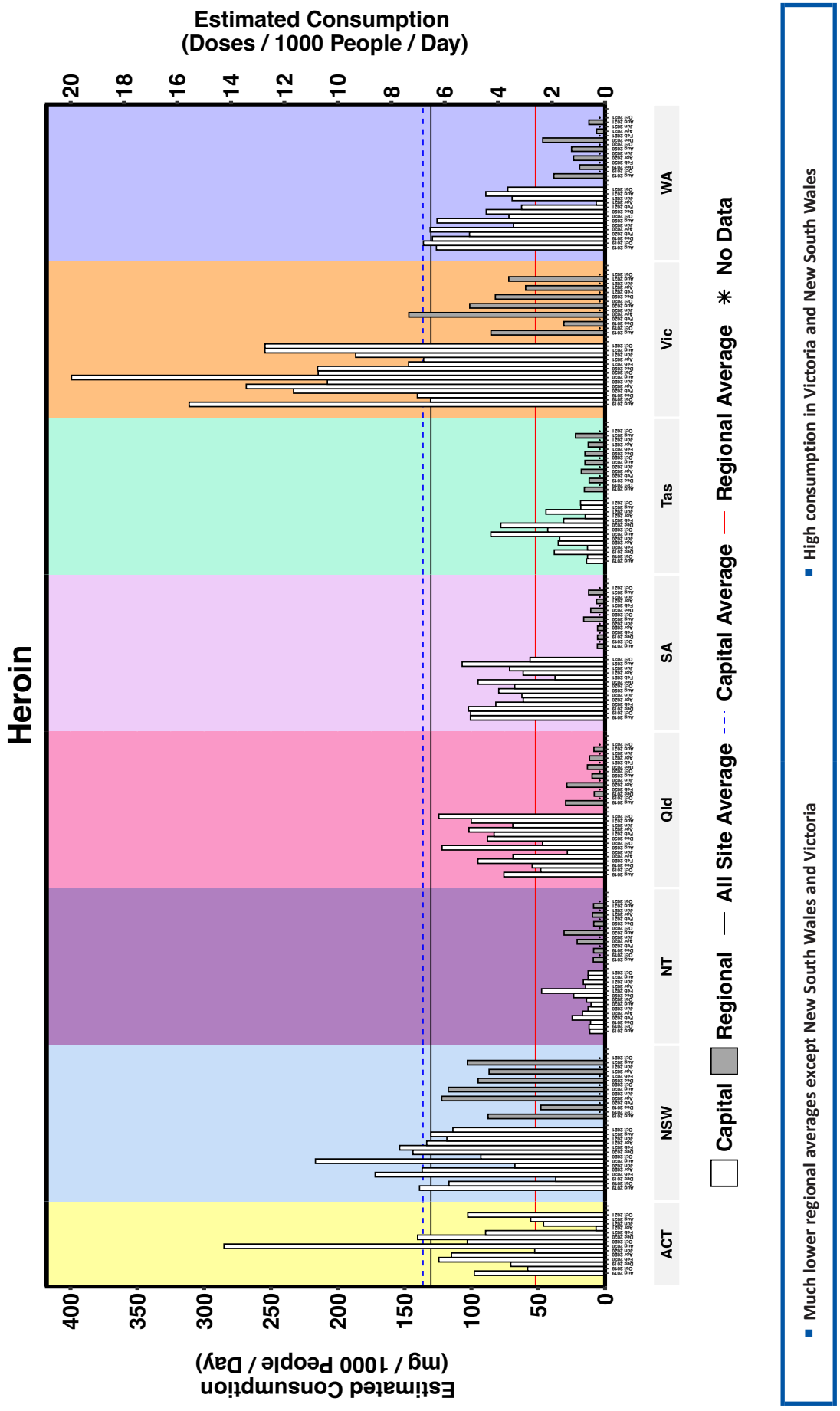
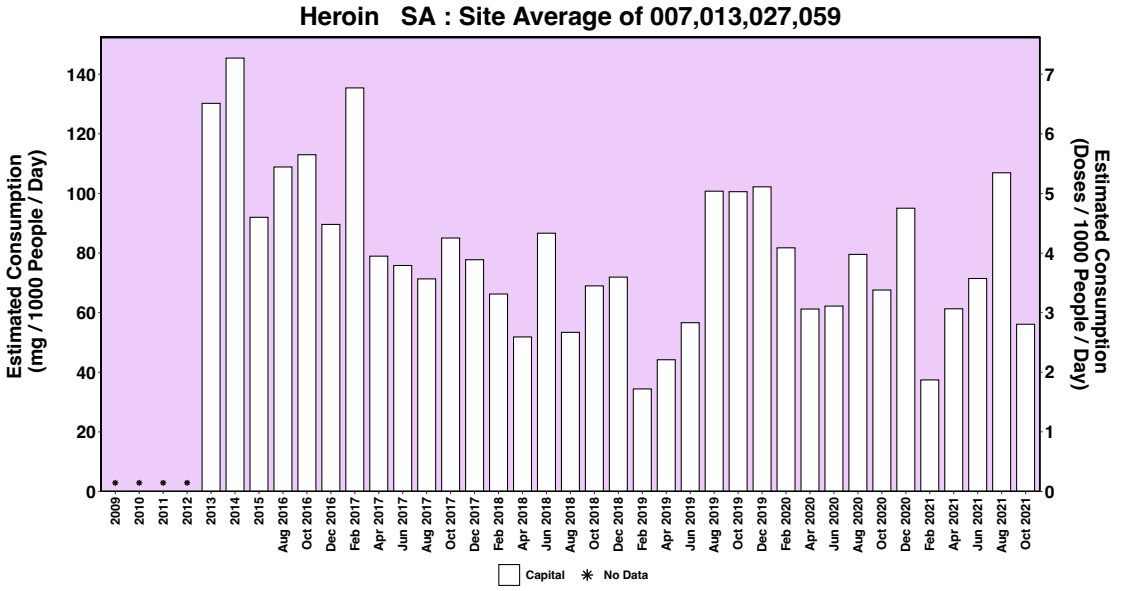


Figure 41: Estimated average consumption of heroin by state/territory, August 2019 to October 2021.

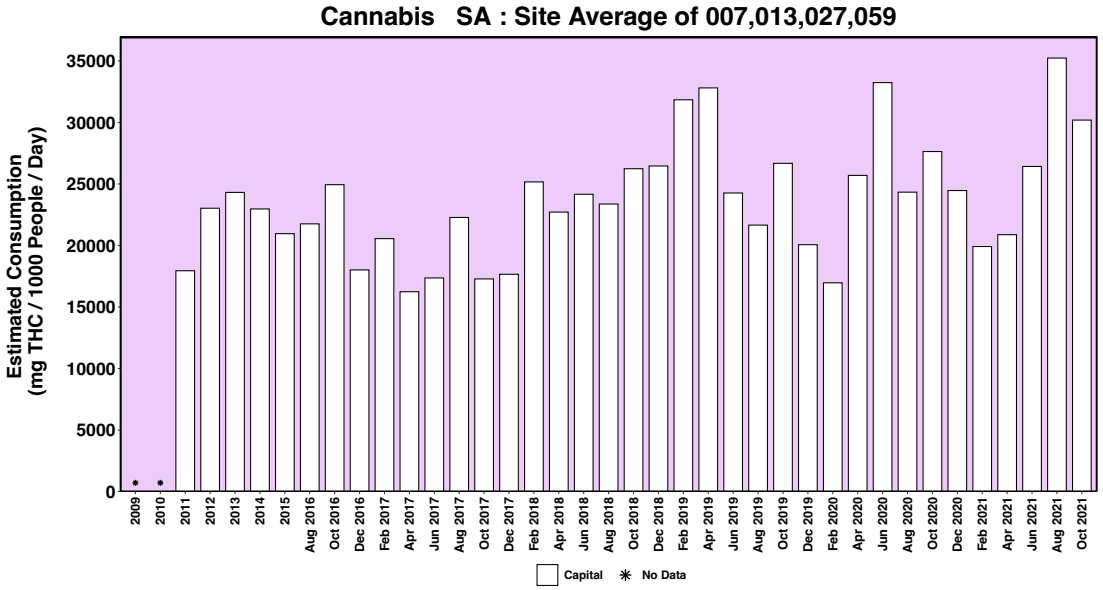
Figure 42: Change in heroin consumption for South Australia.



4.2.4 CANNABIS

Consumption of cannabis has been measured in capital city South Australia since 2011. An upward trend in consumption was observed until early 2019, followed by a short-term decline to February 2020 (Figure 43). Cannabis consumption in the capital of the state increased after the outbreak of the COVID-19 pandemic, but no clear pattern has been evident more recently.

Figure 43: Change in cannabis consumption in capital city South Australia. Cannabis is detected via the THC metabolite, THC-COOH.



Cannabis was first included in the NWDMP in August 2018. Longer-term trends show that cannabis consumption in many parts of the country has been steadily increasing (Figure 44). The effect of the pandemic has been less evident in terms of cannabis consumption. Consumption appeared to increase and peak by the second half of 2020, then decreased to early 2021 before increasing again this reporting period. 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. Consumption in sites covering the larger population centres of New South Wales, Victoria and Queensland was much lower. Tasmania is the only jurisdiction where capital city cannabis consumption was appreciably higher than regional consumption.

4.2.5 KETAMINE

Ketamine has only been included in the NWDMP since December 2020. Therefore, only 6 collections have been conducted in capital cities and 3 in regional Australia. The early findings suggest that use in the capital cities exceeds that in regional areas, with the Northern Territory reporting the highest per capita excretion levels (Figure 45). The Northern Territory capital city site and Western Australian capital city sites showed a larger variability between collection periods compared to other jurisdictions. Ketamine excretion levels in regional parts of the Northern Territory and Tasmania have increased over the 3 collection periods, however, from a low baseline. South Australia had the lowest ketamine excretion levels.

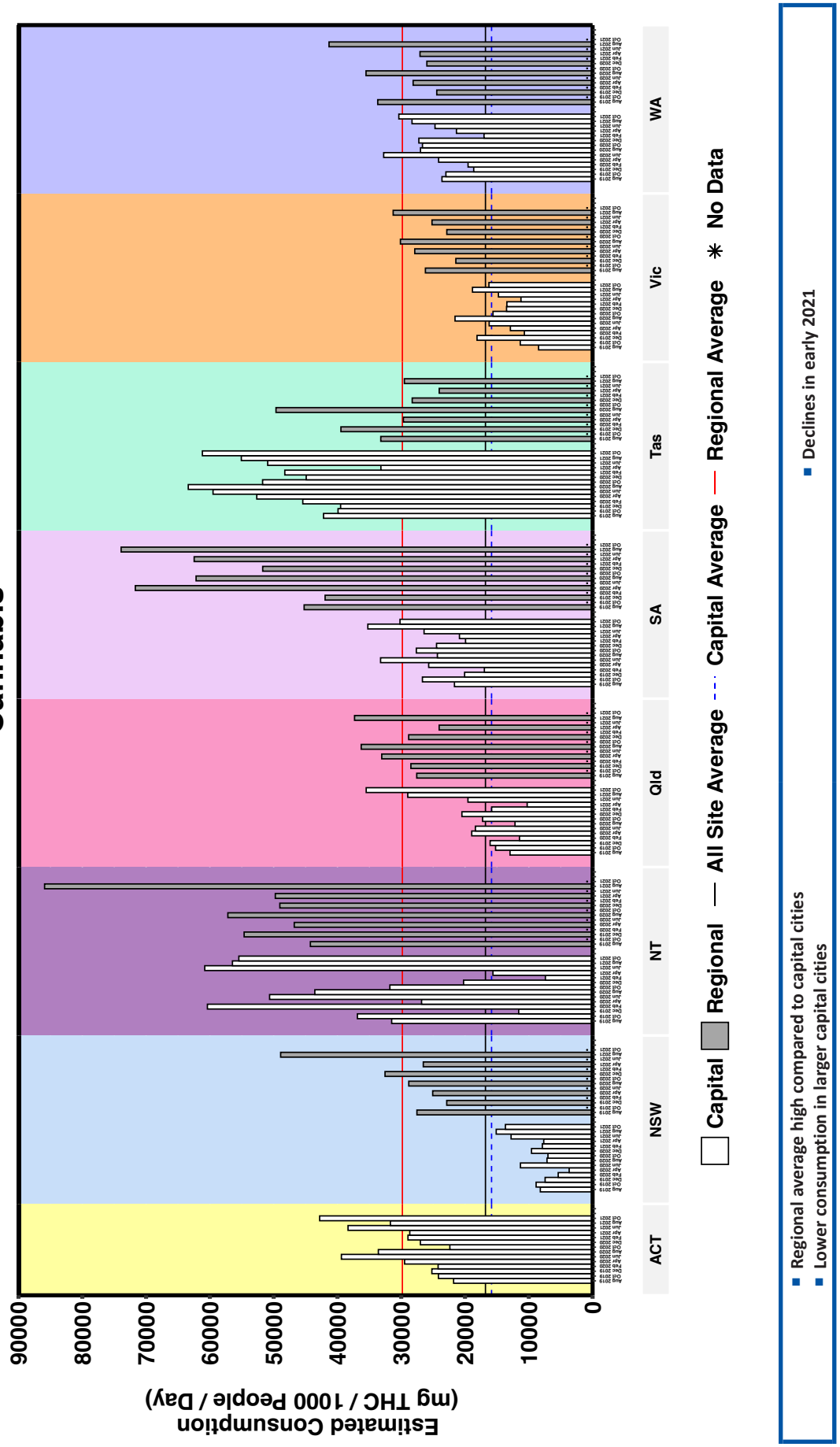


Figure 44: Estimated average consumption of cannabis by state/territory, August 2019 to October 2021.

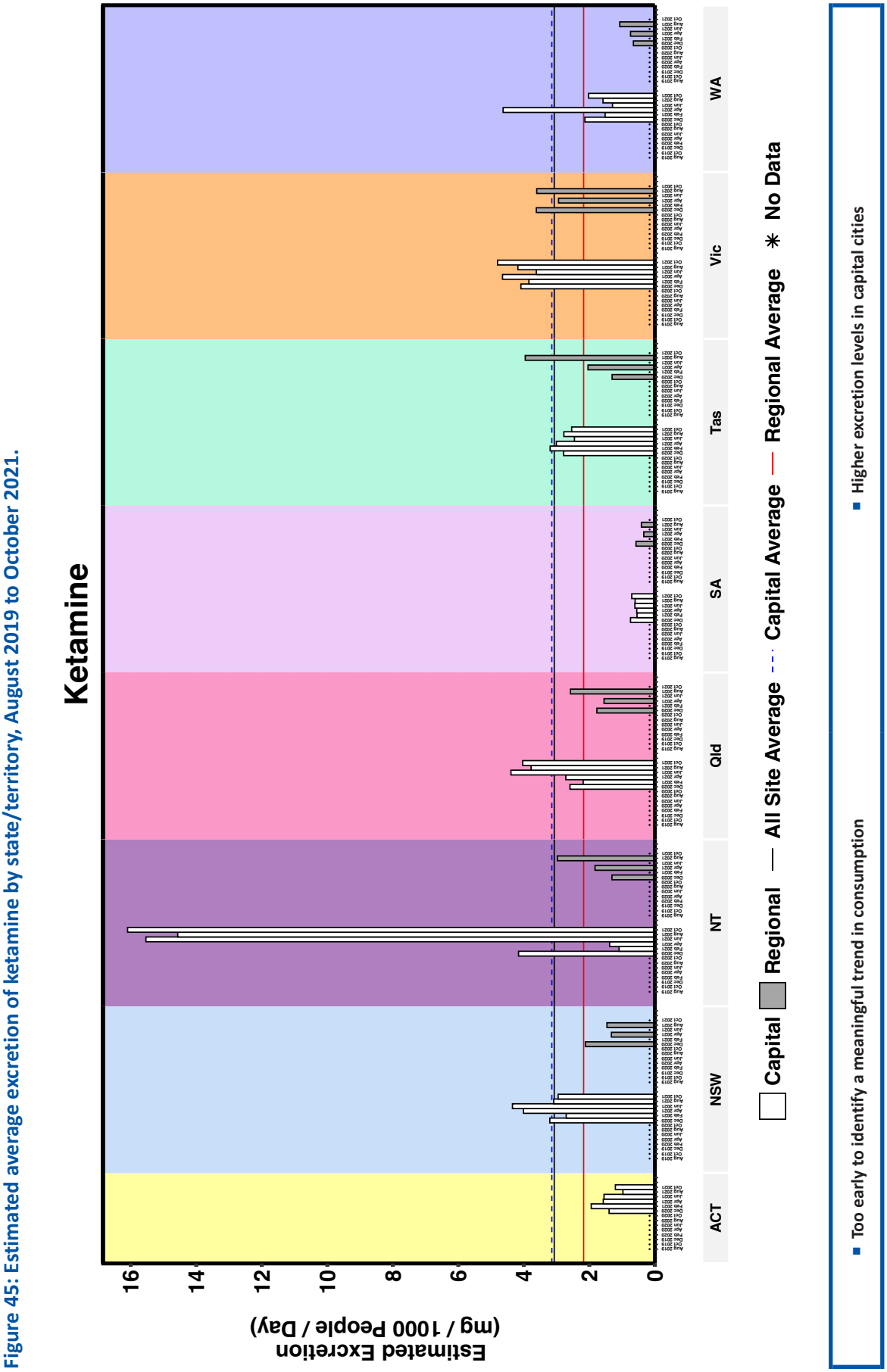


Figure 45: Estimated average excretion of ketamine by state/territory, August 2019 to October 2021.

4.3 NATIONAL CAPITAL CITY AND REGIONAL AVERAGES

In order to show the national trends for the individual substances, all capital city and regional sites were combined for each substance (Figures 46 to 51). Fewer sites were sampled in October 2016.

In terms of legal substances with abuse potential, nicotine consumption has remained relatively unchanged from the start of the Program, with only small fluctuations evident, while alcohol use appears to have been gradually declining since early 2018 in capital cities (Figure 46). Results from this reporting period show marginal fluctuations in capital city and regional nicotine consumption. In the case of alcohol, restrictions implemented in response to COVID-19 appear to have contributed to a short-term decrease in consumption averages in both regional and capital city areas in April 2020.

Overall methylamphetamine consumption rates in regional Australia increased more than in the capital cities from early 2017 to the start of the pandemic in early 2020 (Figure 47). From that point, methylamphetamine consumption decreased substantially to August 2020 before making a gradual recovery over the 6 months to early 2021 to near pre-pandemic levels. However, methylamphetamine consumption again decreased in August 2021, reaching the lowest consumption levels recorded by the Program in both capital cities and regional areas. At the beginning of the Program, capital city and regional consumption levels were relatively consistent until late 2017, when regional areas diverged as consumption in those areas increased. More recently, since mid-2020 the disparate consumption has diminished, with consumption in regional areas briefly dropping below capital city consumption for the first time since April 2017.

MDMA consumption rates declined over the first year of the Program, followed by a gradual increase towards the end of 2019 (Figure 47). 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 that observed in the cities. MDMA consumption levels reached their peaks in both areas in late 2019. MDMA consumption levels across the country then declined to those levels last observed in 2017–18. Current consumption levels are at historic lows, with capital city consumption in October 2021 the lowest level on record.

Long-term trends relating to cocaine and MDA consumption clearly show the discrepancy between capital city and regional consumption of these illicit substances (Figure 48). Cocaine consumption in the capital cities far exceeds that in regional Australia, while MDA tends to be more associated with higher regional consumption. In the last 6 months the difference in MDA consumption has diminished, with regional MDA excretion levels in April and August 2021 below capital city levels. In general, trends in MDA use have been declining since 2016, with the lowest MDA excretion levels in both capital city and regional areas recorded by the Program in August 2021.

Overall, cocaine consumption in the capital cities has trended upwards over the life of the Program, reaching a peak in mid-2020. This was mostly mirrored in the regional areas, where initial short-term fluctuations changed to an increasing trend, peaking similarly towards the end of 2019 to mid-2020. Cocaine consumption started to decrease in both capital city and regional areas in late 2020. Cocaine consumption reached its lowest levels since late 2016 in August 2021.

MDA excretion appeared relatively stable across city sites for much of the monitoring period, declining over the course of 2020 to the present. Regional rates of MDA use were variable, mainly driven by sites in Queensland, Victoria and New South Wales.

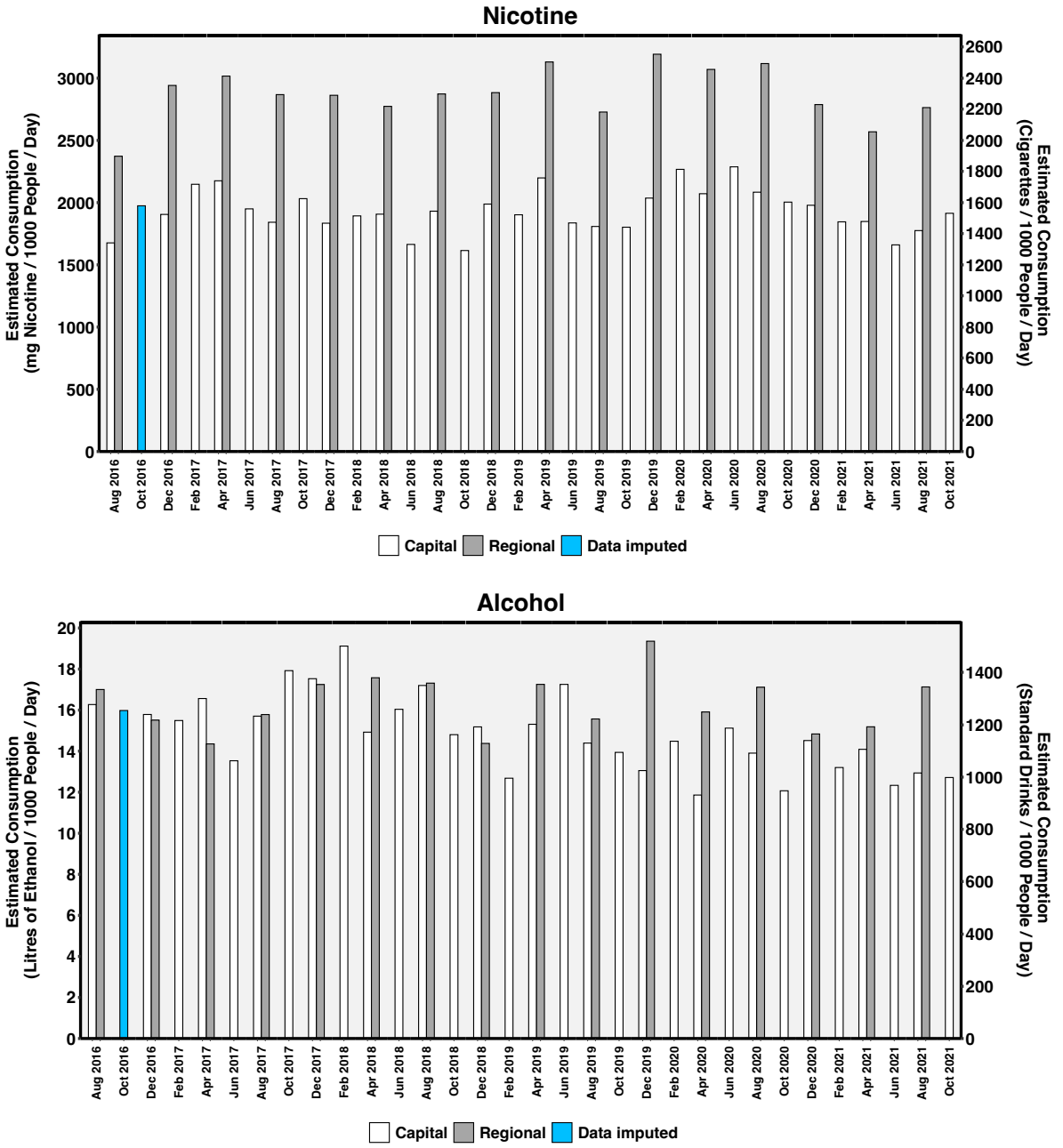
A distinct difference between capital cities and regional Australia was observed for the 2 pharmaceutical opioids, fentanyl and oxycodone (Figure 49). Capital city populations consumed both drugs at substantially lower levels compared to regional areas, although the gap in fentanyl consumption closed over the course of 2020 and 2021. Oxycodone consumption increased steadily after early 2017 and reached a peak in December 2018, and has since decreased. This was more apparent in regional centres than in the cities. Fentanyl consumption peaked from late 2017 to early 2019, stabilising for a period at relatively low rates, before declining again over the course of 2020. Fentanyl consumption is at the lowest levels recorded since the Program commenced in 2016, while oxycodone use appears to have stabilised in both capital cities and regional areas.

The remaining substances, heroin, ketamine and cannabis had mixed patterns in the national context (Figures 50 and 51). Heroin trends were quite variable, partly attributable to low dose numbers and driven largely by the capital city Victorian sites, which were the highest in the nation for heroin consumption. Consumption of the drug is relatively low in regional areas and displays more erratic consumption patterns.

Sampling for ketamine commenced in December 2020. Early signs are that use of the pharmaceutical compound tends to be higher in the capital cities. Current trends appear to be relatively stable at the national level in both capital cities and regional areas, and at a relatively low baseline in comparison to other drugs.

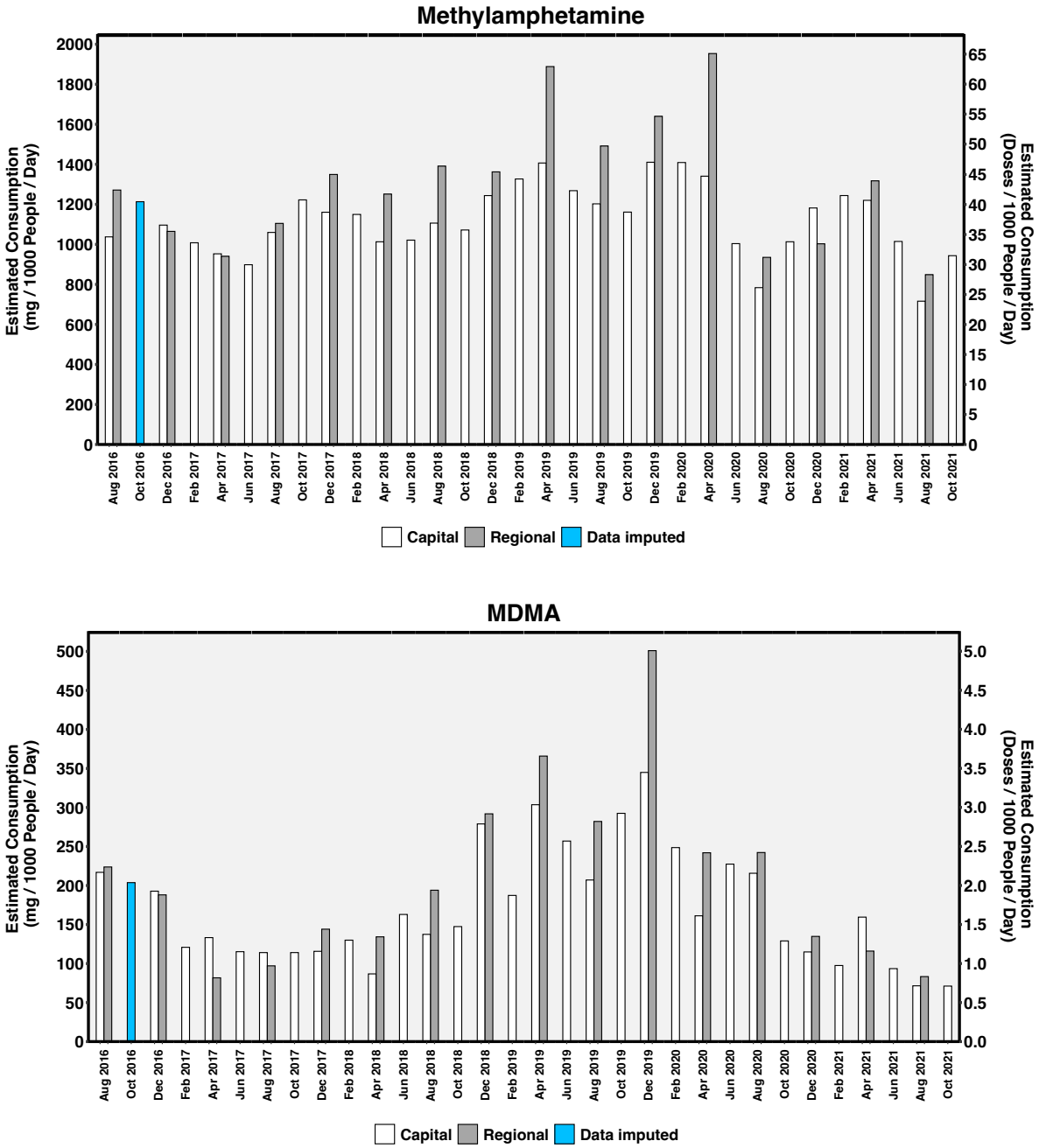
Cannabis showed relatively steady consumption rates across capital cities over the first year, followed by a rising trend towards the end of 2019 and again after the introduction of COVID-19 lockdowns. Cannabis consumption reached record high levels in regional and capital city sites in Australia in August 2021.

Figure 46: The population-weighted average of all sites for nicotine and alcohol.



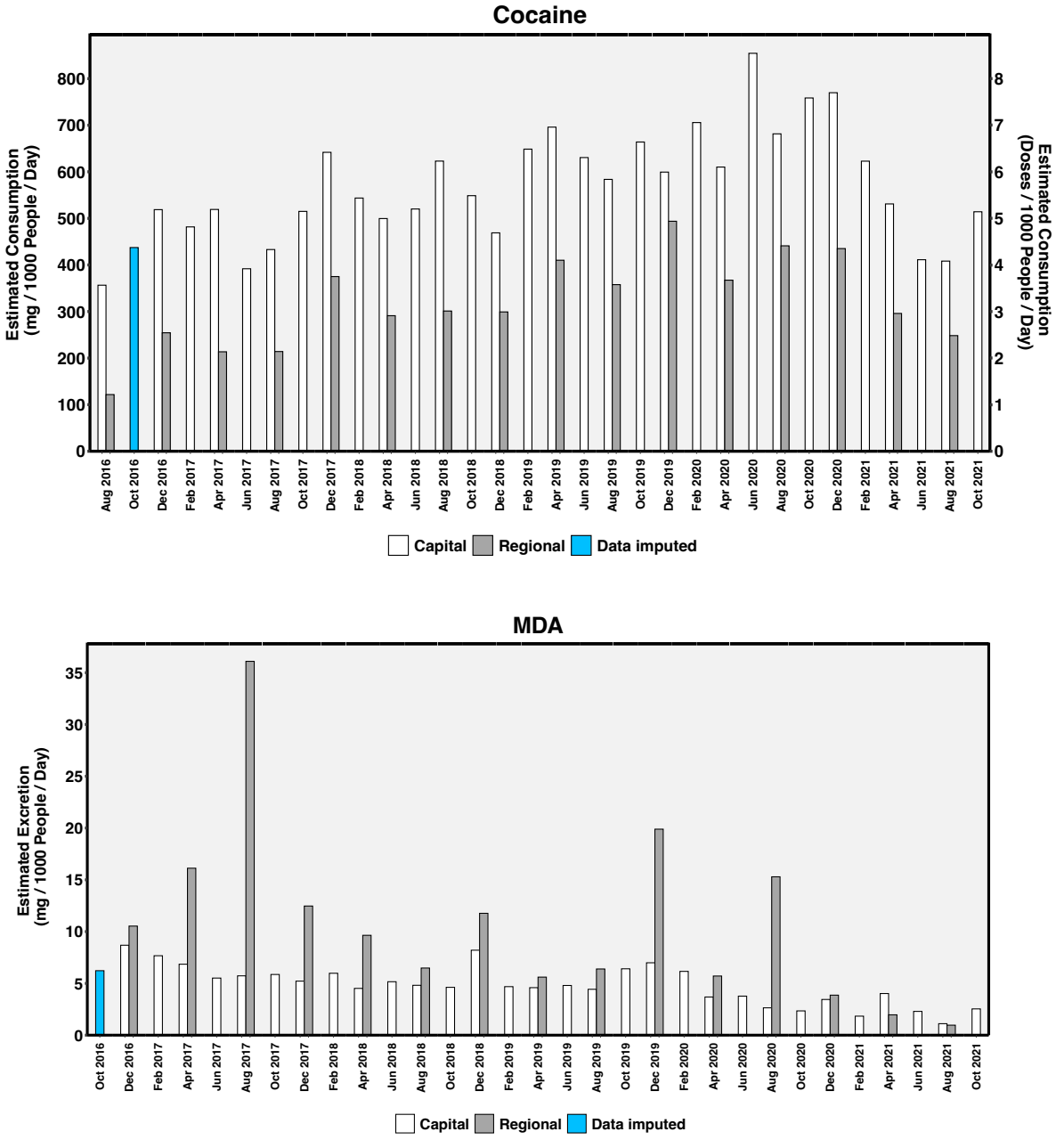
Regional areas are only sampled every second collection period. As Queensland and New South Wales capital city sites were not sampled in October 2016, their average consumption in August and December 2016 was used to provide the overall October estimate.

Figure 47: The population-weighted average of all sites for methylamphetamine and MDMA.



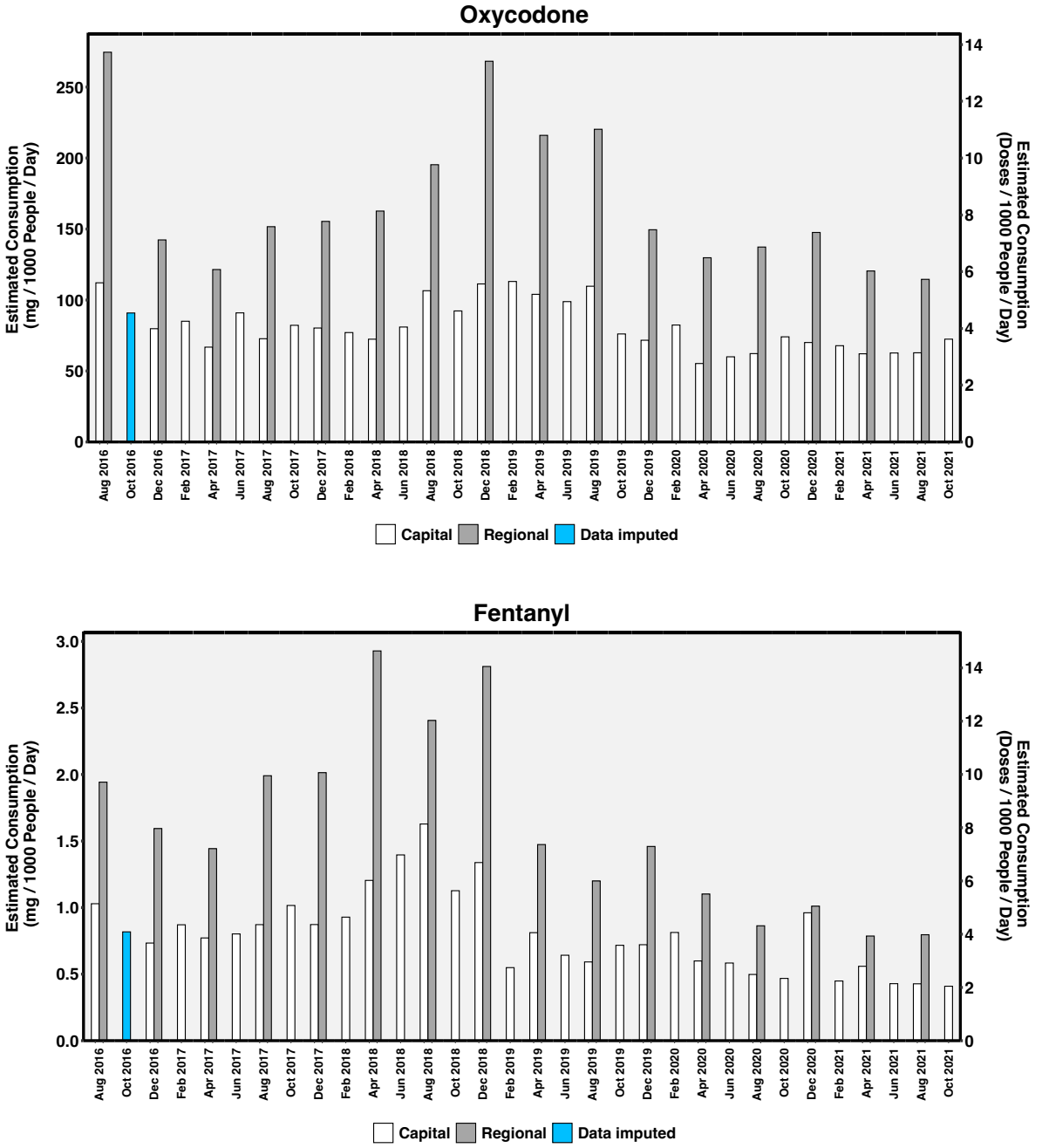
Regional areas are only sampled every second collection period. As Queensland and New South Wales capital city sites were not sampled in October 2016, their average consumption in August and December 2016 was used to provide the overall October estimate.

Figure 48: The population-weighted average of all sites for cocaine and MDA.



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 49: The population-weighted average of all sites for 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 50: The population-weighted average of all sites for heroin and ketamine.

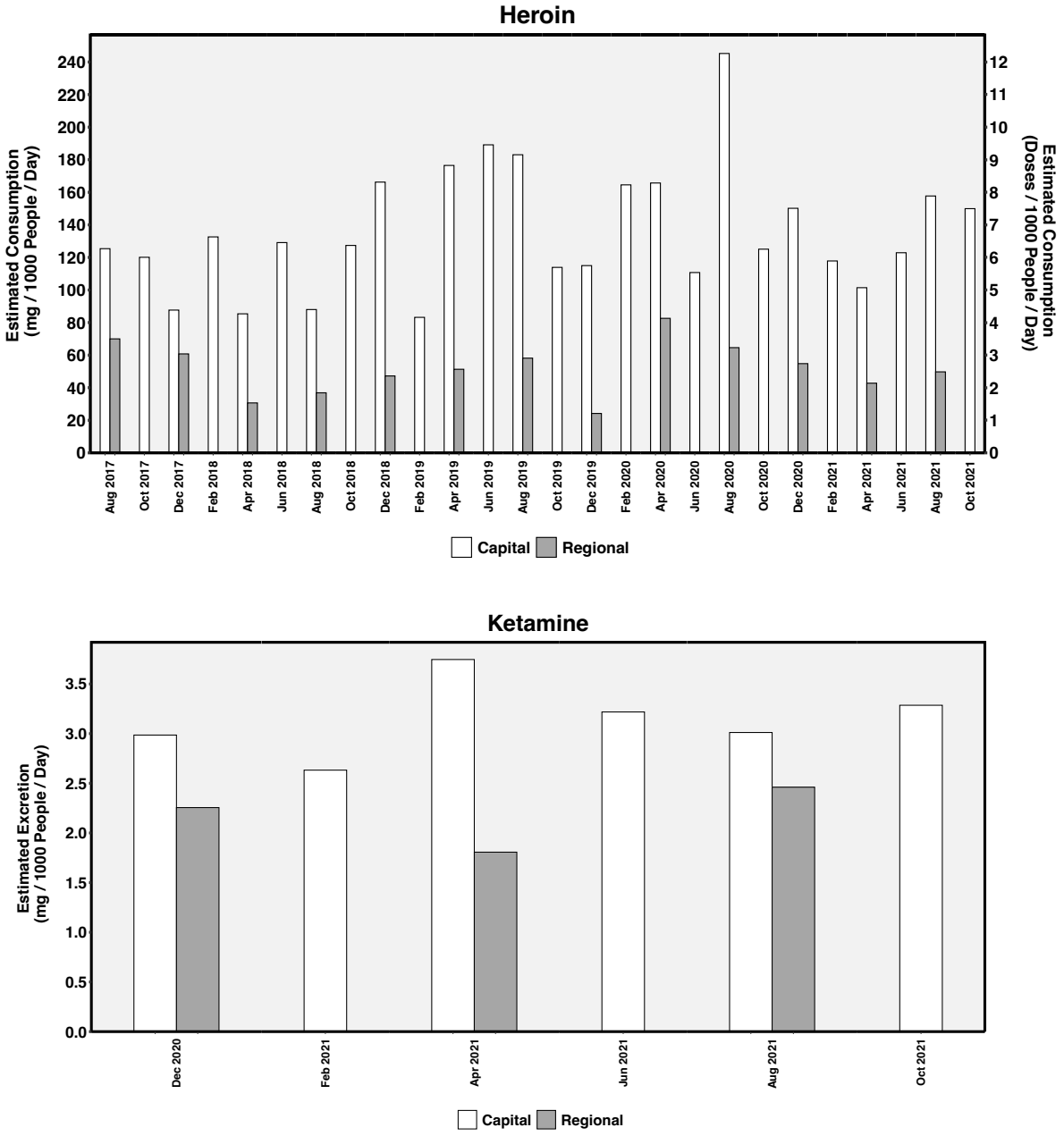
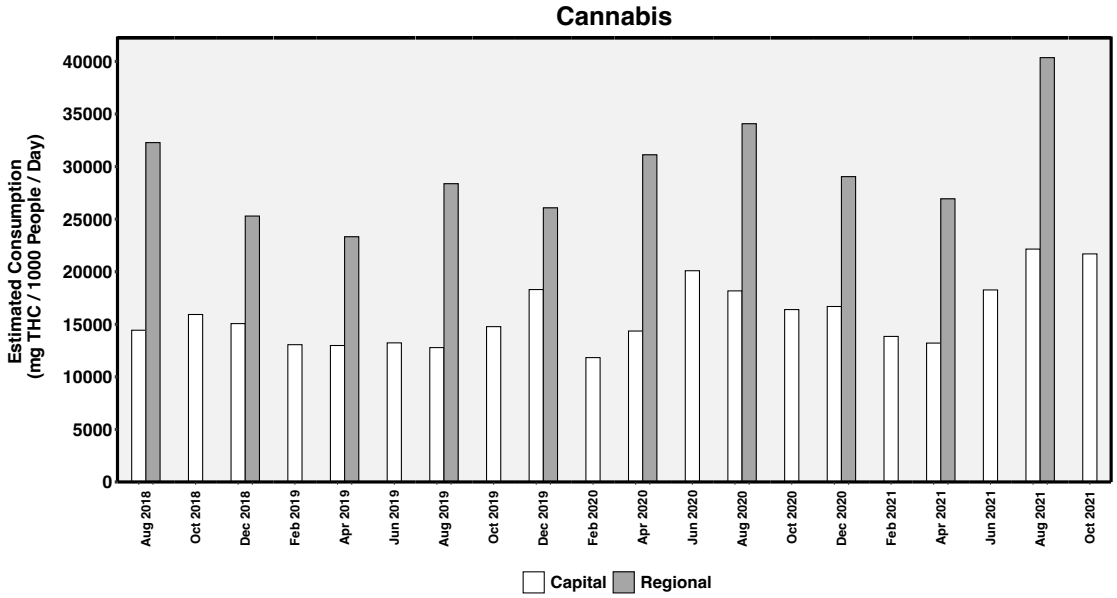


Figure 51: The population-weighted average of all sites for cannabis.



4.4 DRUG PROFILE FOR EACH STATE AND TERRITORY

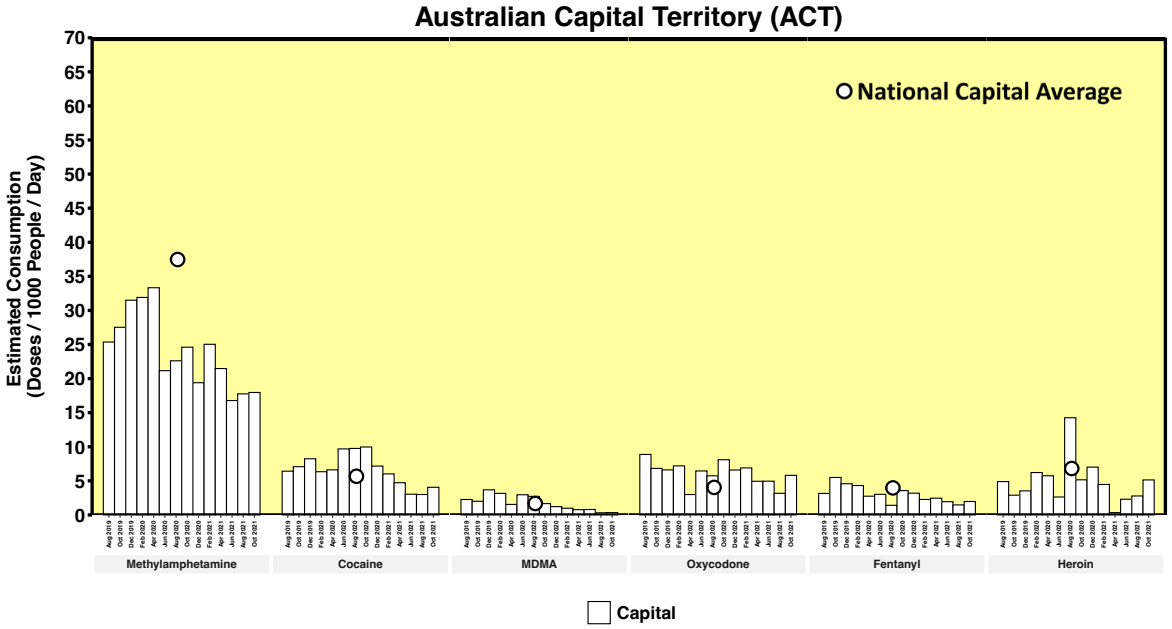
To compare the scale of use of different types of drugs within the same region (for example, within a state or territory), drug consumption was reported as the number of doses consumed and plotted on the same figure. Cannabis has been omitted from this section in this and previous reports since the definition of a typical dose of cannabis is not well defined. Cannabis will be included in comparisons when an appropriate dose for cannabis becomes available. In the absence of clear pharmacokinetic excretion data for MDA and ketamine, 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 (excretion factors listed 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 1,600 cigarettes (Figure 9) and 1,200 standard drinks (Figure 10), whereas for methylamphetamine, the national average consumption was approximately 25 doses per 1,000 people per day (Figure 13).

Aside from nicotine and alcohol, of the illicit drugs with available dose information, methylamphetamine remained the highest (Figures 52 to 55). This was the case across all regions of Australia, with the scale of methylamphetamine consumption consistently high for both capital cities and regional areas. Even with the dramatic decrease in methylamphetamine consumption in some jurisdictions, the drug was still present at higher levels than any other illicit substance included in the graphs (Figure 55).

During the early stage of the NWDMP, regional use of methylamphetamine in New South Wales far exceeded use in the capital city (Figure 52). More recently, the relative scales of use have converged to be more similar in regional and city areas. In the last 2 years, the difference between regional and capital city consumption has also diminished for other jurisdictions, for example in Queensland and Victoria. In other parts of the country such as Western Australia, South Australia and Tasmania the difference between capital city and regional areas was generally smaller. 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 consumption in most regions up to the latter part of 2020 was conspicuous, but levels have declined for the most part in the current reporting period. In most states, a decline in pharmaceutical opioid consumption is apparent, especially in regional areas (Figure 52). Victoria was the jurisdiction most affected by a second wave of COVID-19 infections and associated lockdowns in 2020. However, for the most part, recent patterns in illicit drug use appeared to be consistent with other states (Figure 55).

Figure 52: Profile of average drug consumption by state or territory, August 2019 to October 2021 for capital sites and to August 2021 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.



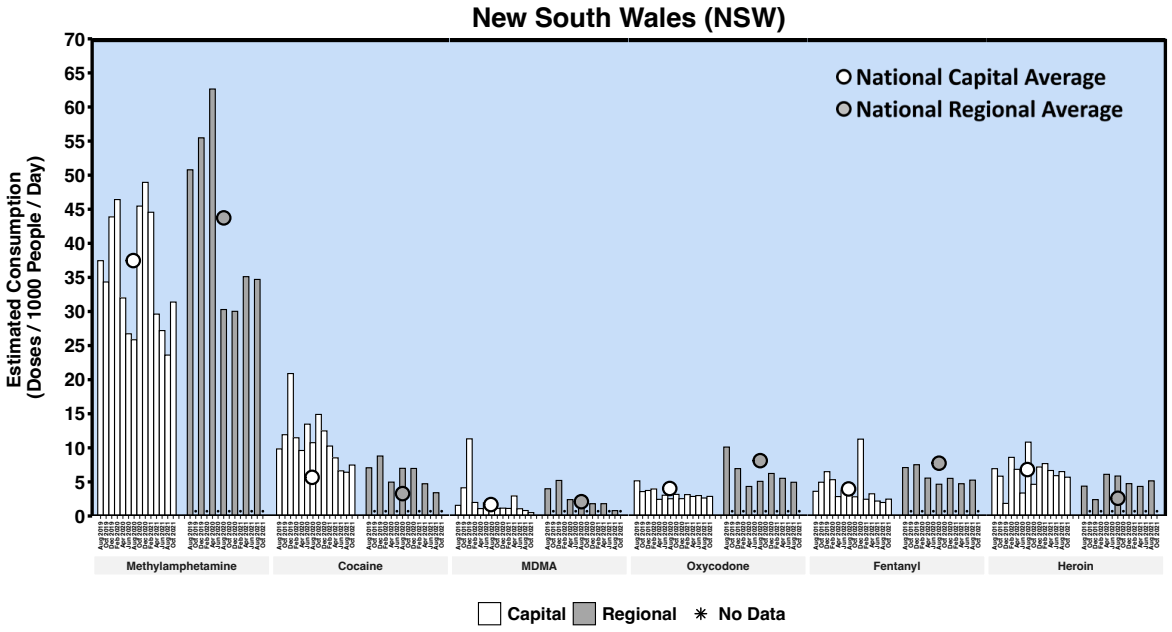


Figure 53: Profile of average drug consumption by state or territory, August 2019 to October 2021 for capital sites and to August 2021 for regional sites.

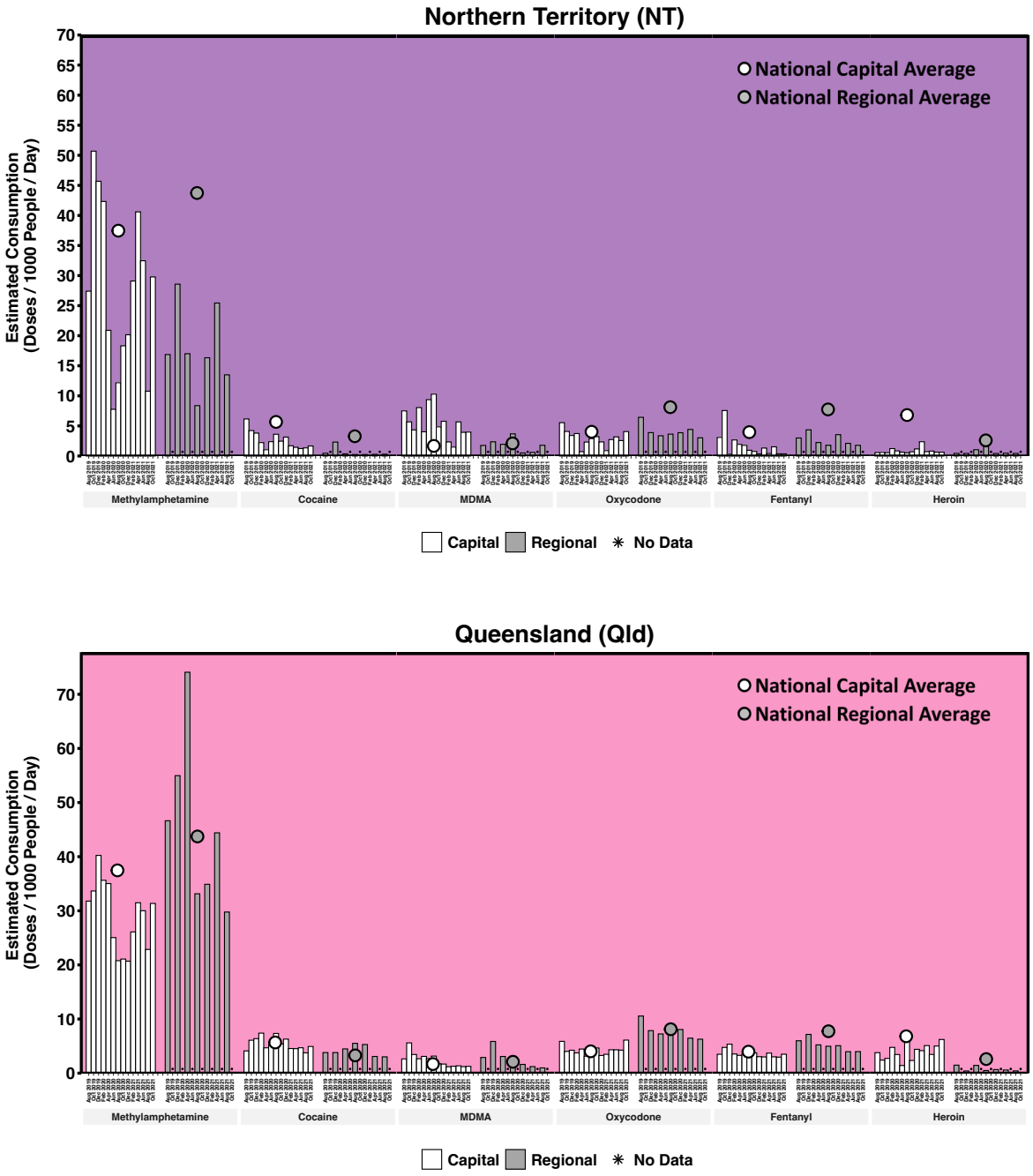


Figure 54: Profile of average drug consumption by state or territory, August 2019 to October 2021 for capital sites and to August 2021 for regional sites. Note: the y axis for South Australia is higher than the other jurisdictions.

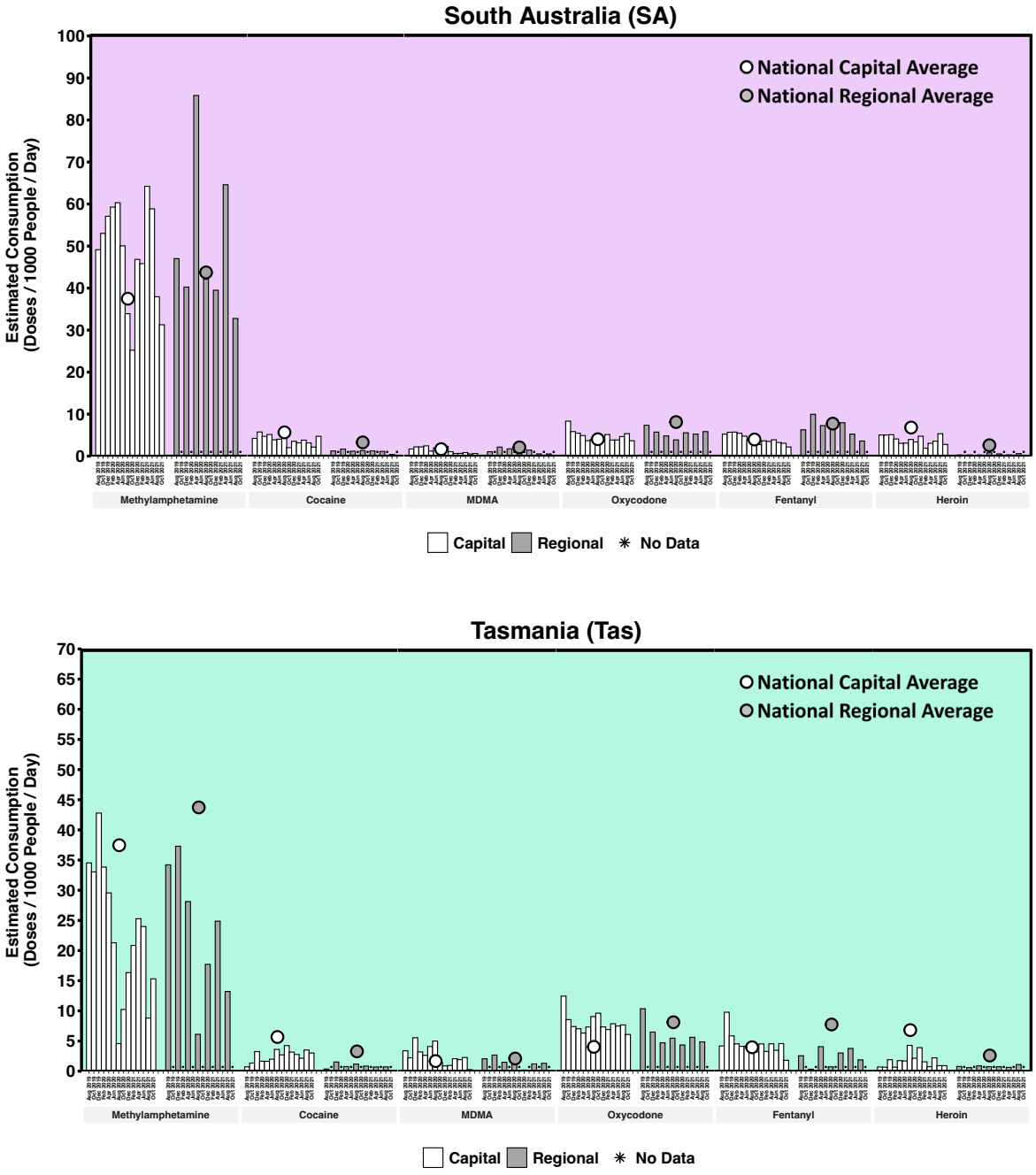
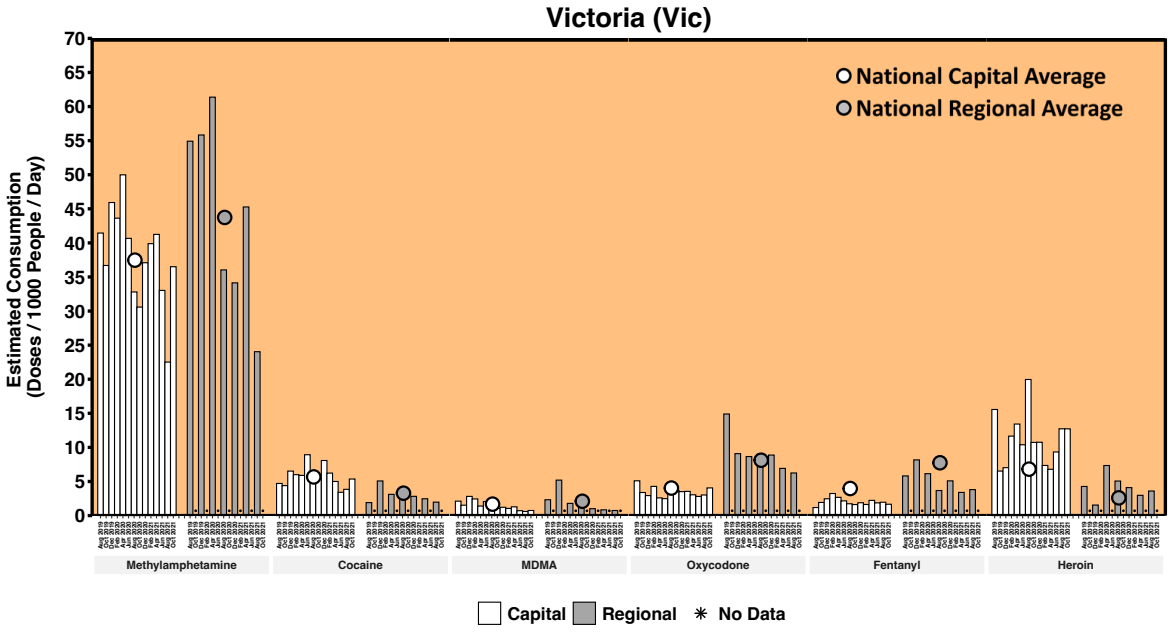
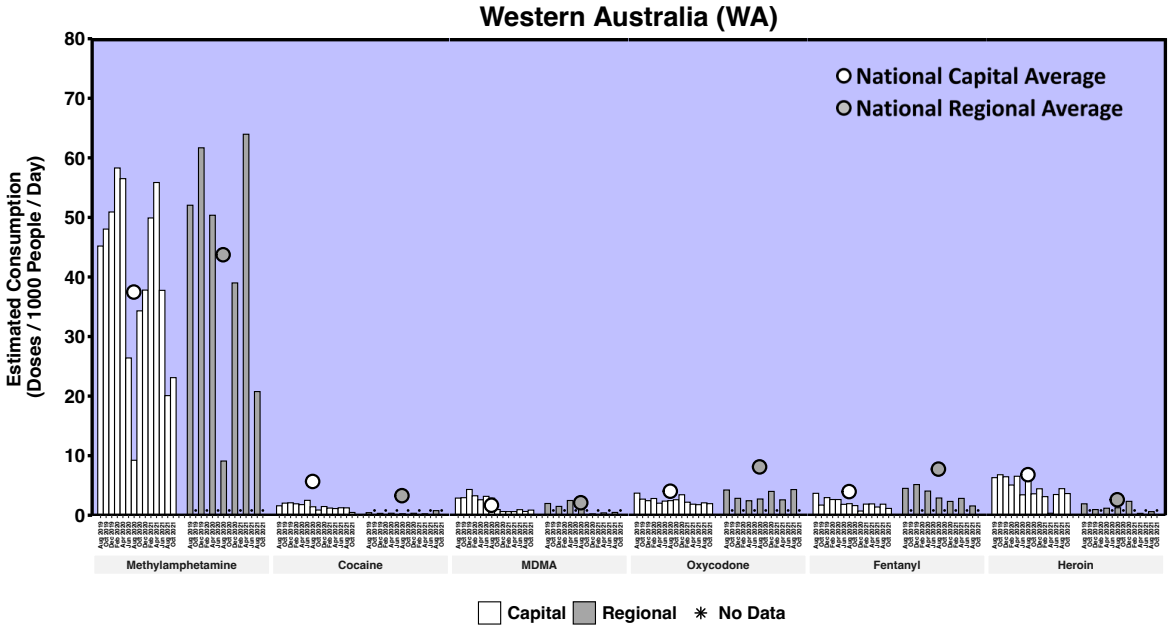


Figure 55: Profile of average drug consumption by state or territory, August 2019 to October 2021 for capital sites and to August 2021 for regional sites. Note: the y axis for Western Australia is higher than the other jurisdictions.





5: ACKNOWLEDGEMENTS

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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]	10[ge]
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.
Norketamine	Ketamine	1	2	n.a.^	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

^Ketamine is excreted as norketamine and several conjugated metabolites. As the level of conjugation is not well known and conjugated metabolites (e.g., glucuronides) are likely to deconjugate in the sewer, a ketamine excretion rate has not been assigned at this time. Once the impact of in-sewer deconjugation is known, this will be revised.

APPENDIX 2: SAMPLING DETAILS OF EACH SITE FOR AUGUST AND OCTOBER 2021

Site	Capital or regional	August 2021	October 2021	Population
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	7	–	> 150,000
NSW: 016	Regional	7	–	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
NSW: 163	Regional	7	–	< 30,000
NSW: 164	Regional	7	–	< 30,000
NSW: 165	Regional	7	–	< 30,000
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	7	–	> 150,000
Qld: 020	Regional	–	–	< 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	7	–	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: 076	Regional	7	–	< 30,000
SA: 119	Regional	7	–	< 30,000

APPENDIX 2 (CONTINUED)

Site	Capital or regional	August 2021	October 2021	Population
Tas: 004	Capital	7	3	< 30,000
Tas: 019	Capital	5	5	< 30,000
Tas: 041	Capital	7	5	< 30,000
Tas: 018	Regional	7	–	< 30,000
Tas: 038	Regional	–	–	< 30,000
Tas: 048	Regional	7	–	< 30,000
Tas: 058	Regional	–	–	< 30,000
Vic: 001	Capital	7	7	> 150,000
Vic: 067	Capital	7	7	> 150,000
Vic: 037	Regional	6	–	> 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	–	–	< 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	7	> 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		36	–	
Capital Sites		22	20	
Total Sites		**58**	**20**	
Regional Samples		251	–	
Capital Samples		152	132	
Total Samples		403	132	
Cumulative Samples		**7,371**	**7,503**	

APPENDIX 3: PROPORTION OF SAMPLES ABOVE LOD (%) FOR EACH DRUG AND PERIOD ASSESSED[8]

Drug	Capital or regional	August 2021	October 2021
Alcohol	Capital	100	100
Alcohol	Regional	100	–
Cannabis	Capital	100	100
Cannabis	Regional	100	–
Cocaine	Capital	100	96
Cocaine	Regional	72	–
Fentanyl	Capital	86	88
Fentanyl	Regional	93	–
Heroin	Capital	74	82
Heroin	Regional	26	–
Ketamine	Capital	95	97
Ketamine	Regional	81	–
MDA	Capital	57	71
MDA	Regional	35	–
MDMA	Capital	99	98
MDMA	Regional	95	–
Methylamphetamine	Capital	100	100
Methylamphetamine	Regional	100	–
Nicotine	Capital	100	100
Nicotine	Regional	100	–
Oxycodone	Capital	100	100
Oxycodone	Regional	100	–

8 Percentage detections for previous collection periods are available in Appendix 4 of Report 6 and Appendix 3 of Reports 7 to 14.

CONCLUSIONS

CONCLUSIONS

For the 15th report of the National Wastewater Drug Monitoring Program, wastewater analysis was conducted in August (capital city and regional sites) and October 2021 (capital city sites only). The Program 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.[9]

METHYLAMPHETAMINE

When comparing data for April and August 2021, the population-weighted average consumption of methylamphetamine decreased in both capital city and regional sites to the lowest levels recorded by the Program. Average capital city methylamphetamine consumption then increased from August to October 2021. Average regional methylamphetamine consumption exceeded capital city consumption. In August 2021, South Australia had the highest estimated average capital city consumption of methylamphetamine, while New South Wales had the highest average regional consumption.

COCAINE

When comparing data for April and August 2021, the population-weighted average consumption of cocaine decreased in both capital city and regional sites. Average capital city cocaine consumption then increased from August to October 2021. Average capital city cocaine consumption continued to exceed average regional consumption. In August 2021, New South Wales had the highest estimated average capital city and regional consumption of cocaine.

3,4-METHYLENEDIOXYMETHYLAMPHETAMINE (MDMA)

When comparing data for April and August 2021, the population-weighted average consumption of MDMA decreased in both capital city and regional sites, with average capital city MDMA consumption in August 2021 the lowest level recorded by the Program. Average capital city MDMA consumption remained relatively stable from August to October 2021. Average regional MDMA consumption exceeded capital city consumption. In August 2021, the Northern Territory had the highest estimated average capital city and regional consumption of MDMA.

3,4-METHYLENEDIOXYAMPHETAMINE (MDA)

MDA is a metabolite of MDMA, but also an illicit drug in its own right. When comparing data for April and August 2021, MDA excretion decreased in both capital city and regional sites to the lowest levels recorded by the Program. Average capital city MDA excretion then increased from August to October 2021. Average capital city MDA excretion exceeded average regional excretion. In August 2021, the Northern Territory had the highest estimated average capital city excretion of MDA, while Western Australia had the highest average regional excretion.

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

HEROIN

When comparing data for April and August 2021, the population-weighted average consumption of heroin increased in both capital city and regional sites. Average capital city heroin consumption then decreased from August to October 2021. Average capital city heroin consumption continued to exceed average regional consumption. In August 2021, Victoria had the highest estimated average capital city consumption of heroin, while New South Wales had the highest average regional consumption.

CANNABIS

When comparing data for April and August 2021, the population-weighted average consumption of cannabis increased in both capital city and regional sites to the highest levels recorded by the Program. Average capital city cannabis consumption then decreased from August to October 2021. Average regional cannabis consumption continued to exceed average capital city consumption. In August 2021, the Northern Territory had the highest estimated average capital city and regional consumption of cannabis.

KETAMINE

When comparing data for April and August 2021, the population-weighted average excretion of ketamine decreased in capital city sites and increased in regional sites. Average capital city ketamine excretion then increased from August to October 2021. Average capital city ketamine excretion exceeded regional ketamine excretion. In August 2021, the Northern Territory had the highest estimated average capital city ketamine excretion, while Tasmania had the highest average regional excretion.

OXYCODONE

When comparing data for April and August 2021, the population-weighted average consumption of oxycodone remained relatively stable in capital city sites and decreased in regional sites to the lowest level recorded by the Program. Average capital city oxycodone consumption then increased from August to October 2021. Average regional oxycodone consumption continued to exceed average capital city consumption. In August 2021, Tasmania had the highest estimated average capital city consumption of oxycodone, while Queensland had the highest average regional consumption.

FENTANYL

When comparing data for April and August 2021, the population-weighted average consumption of fentanyl decreased in capital city sites and increased in regional sites. Average capital city fentanyl consumption further decreased from August to October 2021 to the lowest level recorded by the Program. Average regional fentanyl consumption continued to exceed average capital city consumption. In August 2021, Tasmania had the highest estimated average capital city consumption of fentanyl, while New South Wales had the highest average regional consumption.

NICOTINE

When comparing data for April and August 2021, the population-weighted average consumption of nicotine decreased in capital city sites and increased in regional sites. Average capital city nicotine consumption then increased from August to October 2021. Average regional nicotine consumption continued to exceed average capital city consumption. In August 2021, the Northern Territory[10] had the highest estimated average capital city and regional consumption of nicotine.

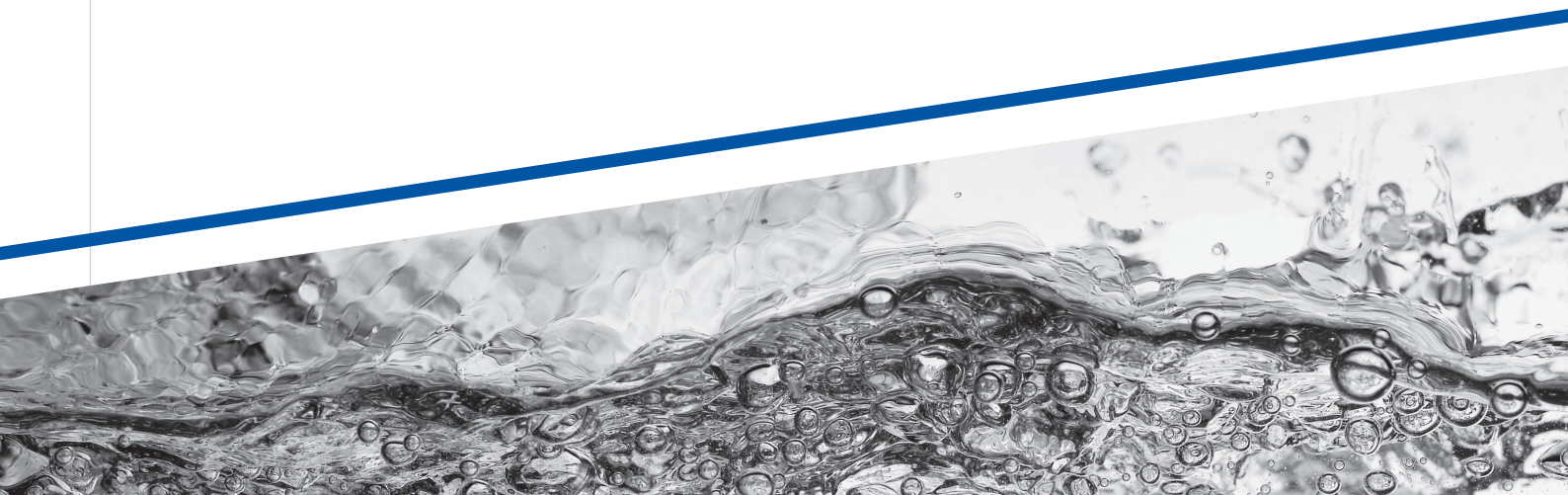
ALCOHOL

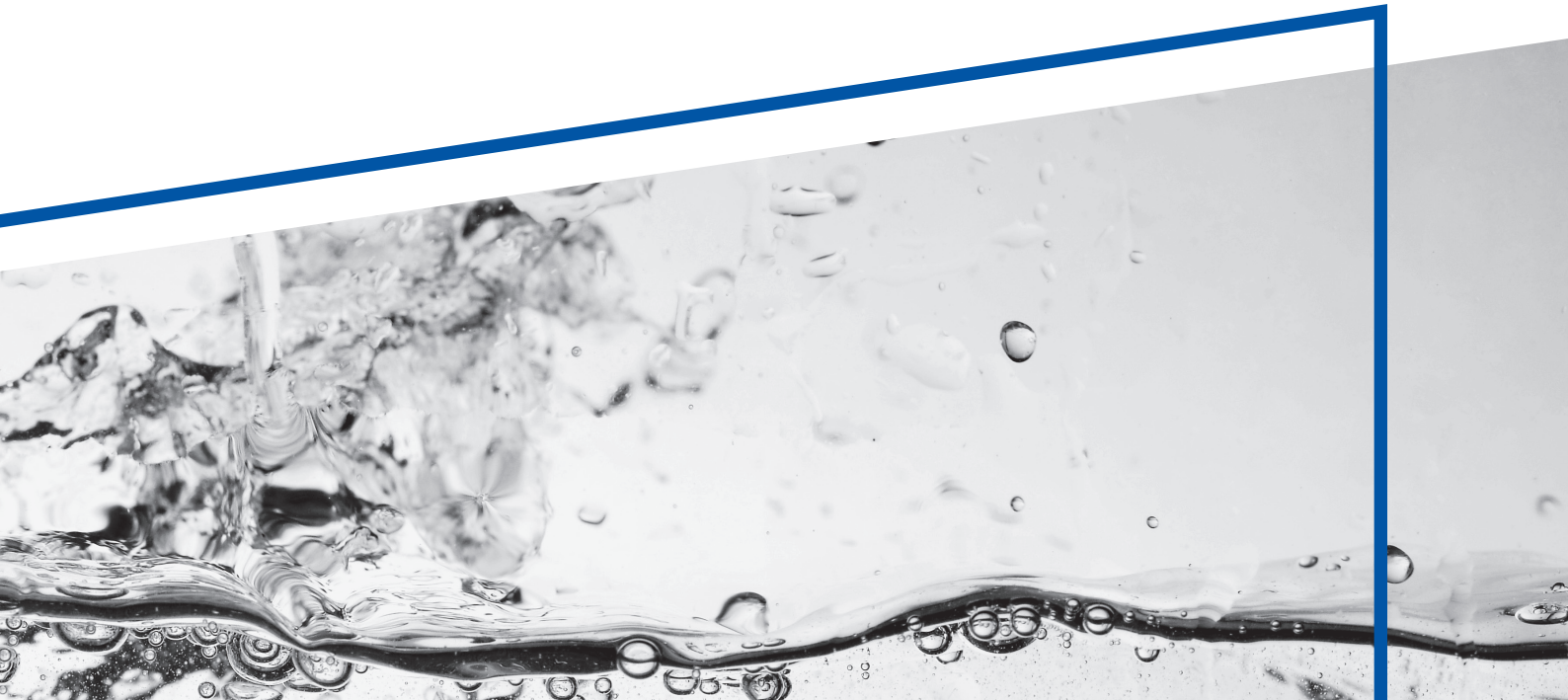
When comparing data for April and August 2021, the population-weighted average consumption of alcohol decreased in capital city sites and increased in regional sites. Average capital city alcohol consumption further decreased from August to October 2021. Average regional alcohol consumption exceeded average capital city consumption. In August 2021, the Northern Territory[11] had the highest estimated average capital city and regional consumption of alcohol.

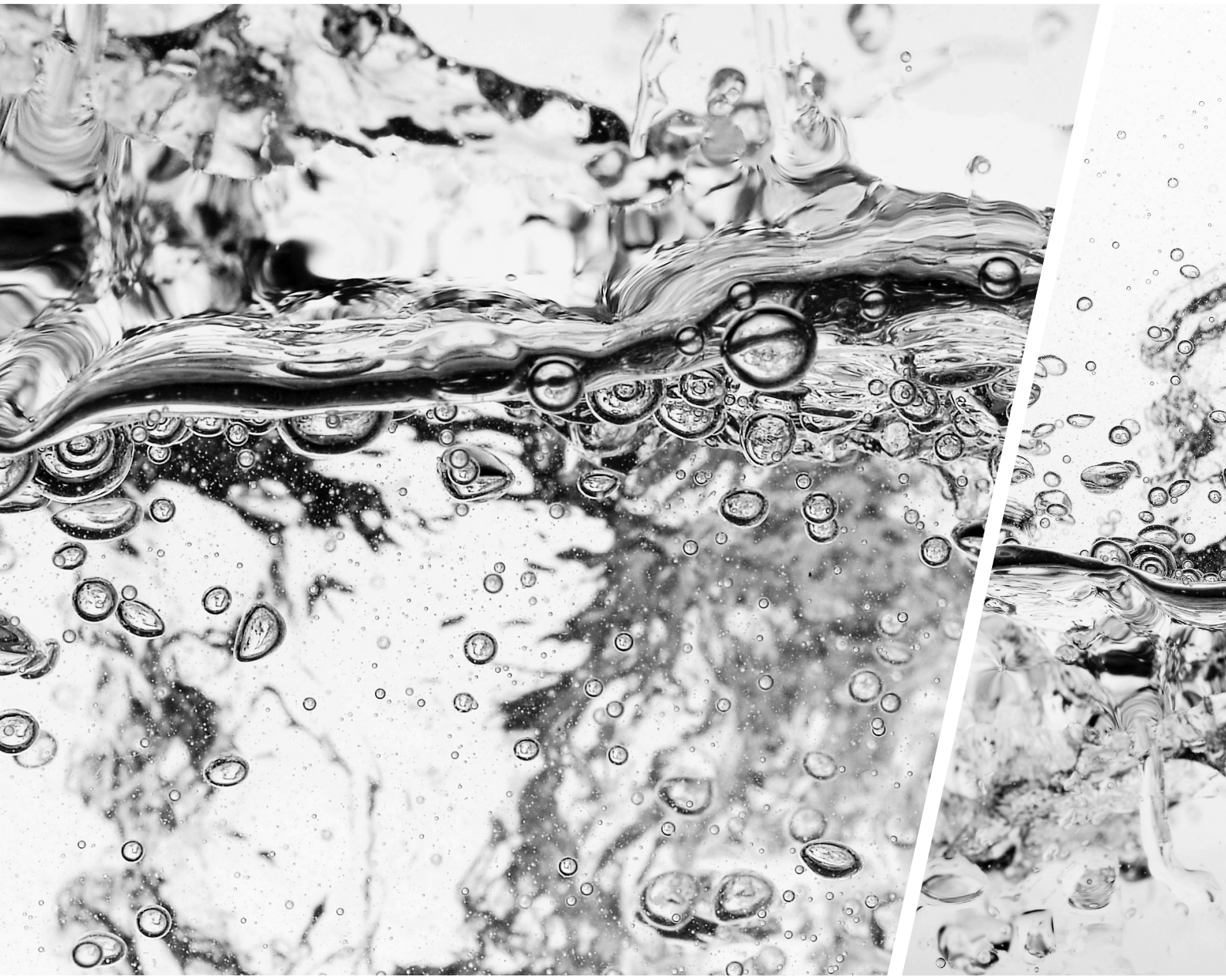
NEXT REPORT

The 16th report of the National Wastewater Drug Monitoring Program is scheduled for public release in June 2022.

10 As the Northern Territory only had 2 participating sites, results may not be representative of the Territory as a whole, however the 2 sites cover approximately 25 per cent of the population of the Northern Territory.
11 Ibid.







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