REPORT 24

NATIONAL WASTEWATER DRUG MONITORING PROGRAM

AUSTRALIAN CRIMINAL INTELLIGENCE COMMISSION

THE UNIVERSITY OF QUEENSLAND AUSTRALIA

University of South Australia

CONTENTS

CEO FOREWORD

I am pleased to present Report 24 of the Australian Criminal Intelligence Commission (ACIC)'s National Wastewater Drug Monitoring Program (the Program).

This report is based on data collected in August and October 2024. In August the Program covered 57% of the Australian population and in October it covered 48%. The findings are critical to inform insights on, and responses to, Australia's illicit drug markets, which are supplied by serious and organised crime (SOC) groups. SOC remains an enduring threat to our security and safety. SOC groups take advantage of high levels of demand for illicit drugs and, in Australia's case, high drug prices in world terms, focusing firmly on maximising profit at the expense of the security and wellbeing of the Australian community.

In addition to data for this reporting period, Report 24 provides data for the 8th year of the Program, enabling nationally aggregated comparisons with previous years. The report shows that overall illicit drug consumption is returning to pre-COVID levels, with 22.2 tonnes of methylamphetamine, cocaine, heroin and 3,4-methylenedioxymethylamphetamine (MDMA) consumed between August 2023 and August 2024 – the highest combined amount since Program implementation in 2016. This is a 34% increase from the previous year, driven by overall increases in consumption of all 4 drugs– methylamphetamine (21%), cocaine (69%), MDMA (49%) and heroin (14%). The 2.2 tonne increase in annual national methylamphetamine consumption is particularly concerning because it is the highest level ever recorded by the Program and because of the significant community harms the drug causes. Also concerning is the very large increase in total cocaine consumption, to the highest level reported over the life of the Program.

The growing diversity of illicit drug markets in Australia is underlined by increases in the consumption of heroin and MDMA, with heroin also at the highest consumption level recorded by the Program. This is the first time over the life of the Program that 3 drugs have been consumed at record high levels simultaneously and illustrates the long term resilience of these markets and their ability to recover from significant decreases in consumption caused by the COVID pandemic movement restrictions and hard border closures. ACIC data modelling suggests that the increases in drug consumption for methylamphetamine, cocaine and MDMA are likely to continue to 2027, though most likely not at the same rate observed during the year ended August 2024. In the case of heroin, the ACIC assesses the market is unlikely to change significantly for the next 2 years.

The methylamphetamine, cocaine, MDMA and heroin consumed between August 2023 and August 2024 had an estimated street value of $11.5 billion, with methylamphetamine accounting for 78% of this ($8.9 billion). This is money laundered domestically and out of Australia to line the pockets of SOC bosses.

While this report specifically focuses on data collected in August and October 2024, longer term trends since August 2023 reveal a more nuanced picture of national drug consumption. In August 2024, there was record high capital city methylamphetamine consumption and record high regional heroin consumption, while in October 2024 there was record high MDMA consumption and ketamine excretion in capital cities. There was relative stability in cannabis consumption nationally between August 2023 and August 2024. Ketamine excretion increased nationally over the same period and national consumption of the pharmaceutical opioids fentanyl and oxycodone decreased.

Wastewater data, combined with other drugs-related data and information, assist the ACIC and its partners to develop a comprehensive picture of illicit drug markets. The combined picture strongly indicates a concerning level of market growth across a range of drug types. Australia is not alone in dealing with threats of this type. The threat is also manifesting in the United States, Canada, the United Kingdom, parts of Europe, New Zealand and across Asia and Africa.

The world is seeing record levels of cultivation and manufacture of cocaine and methylamphetamine. In the case of methylamphetamine, this is augmented by sometimes sophisticated domestic manufacture. The MDMA market is traditionally supplied by European countries, but more recently there are indications of increased domestic manufacture. The Australian heroin market is supplied by relatively high quality product, primarily from South-East Asia. For the foreseeable future, reliable supplies to Australia of high quality methylamphetamine, cocaine, MDMA and heroin are a given and there is potential for further increases.

All of these market changes are underpinned by a global, geographically dispersed network of SOC groups that are well resourced, highly adaptive and resilient. SOC has enduring intent and capability to service a range of Australian drug markets, particularly methylamphetamine and cocaine, in a manner that challenges law enforcement's response efforts. Nevertheless, law enforcement agencies are making gains, with significant volumes of illicit drugs seized both domestically and offshore. In the case of a number of major drugs, the quantities seized exceed domestic consumption. However, law enforcement is not the only means to address Australia's illicit drug markets. A multi-dimensional approach that targets supply, demand and harm reduction is essential to reducing drug use in Australia. In addition, the ACIC's Program data present opportunities for coordinated strategies that improve the safety of the Australian community. Demand for the major drugs is resilient and difficult to address. This will continue while Australian drug users choose to consume these substances and to pay premium prices in world terms for the drugs.

Wastewater analysis is one of the most cost-effective, least intrusive methods of measuring drug use at a population level. The ACIC remains committed to working with a broad range of partners to increase understanding of illicit drug markets and contribute to government objectives in Australia and internationally. Wastewater analysis is also used, increasingly, as a component of drug 'early warning' programs. Layering data and intelligence allows for empirically-based, effective collective responses to drug markets and their harms.

Australia is a global leader in wastewater analysis and its use to inform policy and operational decision making. This knowledge is informing ACIC engagement with multi-lateral bodies such as the United Nations and international partners targeting illicit drug use.

The ACIC has recently reviewed the public reporting arrangements for the Program with a view to ensure it meets contemporary requirements, and provides a holistic and comprehensive picture of illicit drug data in the context of broader market trends. The ACIC will transition to a single annual public report which will provide detail on consumption trends over a 12-month period, with Report 25 anticipated to be released in the first half of 2026. The ACIC will continue to work closely with law enforcement and other partners to share data regularly to support their responses to drug related issues and to reduce harm to Australian communities.

ACKNOWLEDGEMENTS

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

Heather Cook
Chief Executive Officer
Australian Criminal Intelligence Commission

SNAPSHOT

STATE OF THE MARKET

For the foreseeable future **reliable supplies to Australia** of high quality methylamphetamine, cocaine, MDMA and heroin **is a given** and there is **potential for further increases**.

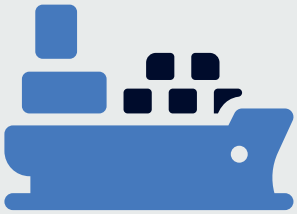
The world is seeing **record levels** of cultivation and manufacture of **cocaine and methylamphetamine**, particularly from traditional source countries in the Americas and Asia.

MDMA is traditionally supplied by countries in Europe, but more recently there have also been indications of **increased domestic manufacture**.

The Australian **heroin market** is supplied by relatively high quality product, primarily from **South-East Asia**.

High end domestic manufacture of illicit drugs is becoming **more sophisticated**, with SOC taking advantage of a broader range of chemicals and sophisticated equipment.

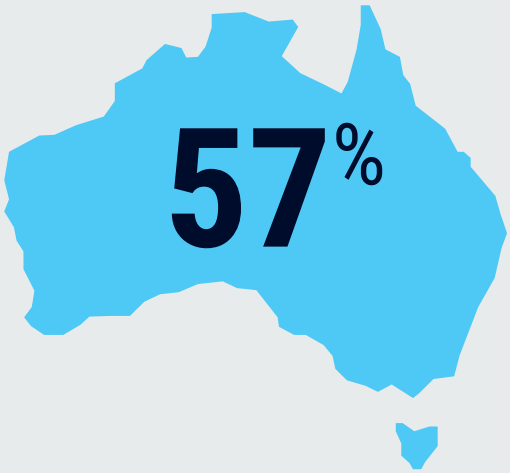
Australia is not alone in dealing with **drug threats**. They are manifesting in the **United States**, **Canada**, the **United Kingdom**, **New Zealand** and across **Asia** and **Africa**.



We are seeing **larger shipments** on a **more frequent** basis and this is likely to continue. However a **significant quantity** of illicit drugs is being **seized** by law enforcement, with the quantities seized in some cases exceeding domestic consumption.

Demand for the major drugs is **resilient** and difficult to address. This will continue while Australian drug users choose to consume these substances and to pay **premium prices** in world terms for the drugs.

Where Australia has had the opportunity to do so, we have been **successful in preventing or suppressing threats** such as fentanyl that are causing significant problems in other countries.



The August 2024 collection covers around **57 per cent** of Australia's population – about **14.5 million Australians**.

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

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

AUGUST AND OCTOBER 2024 HIGHLIGHTS

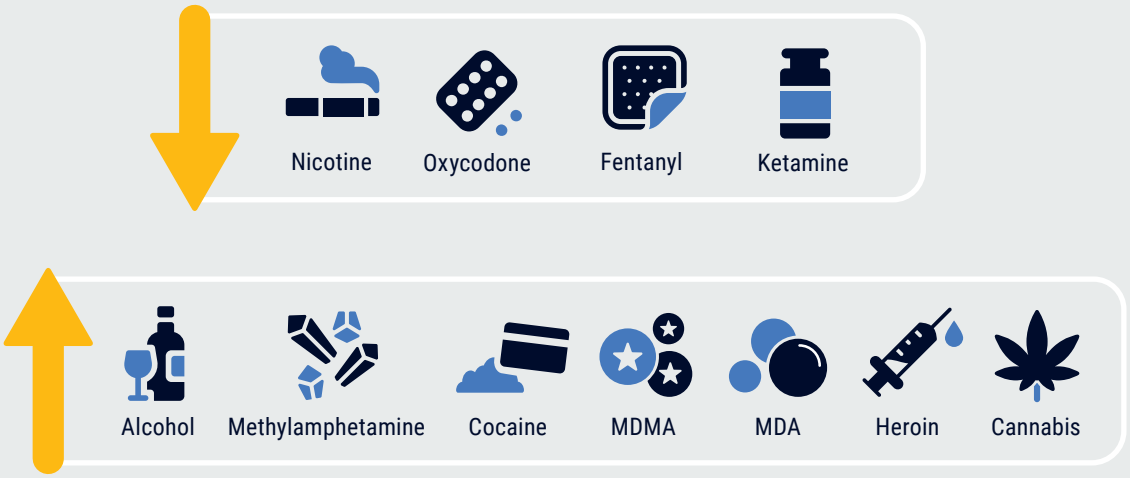
RECORD HIGHS

METHYLAMPHETAMINE
capital city
(August)

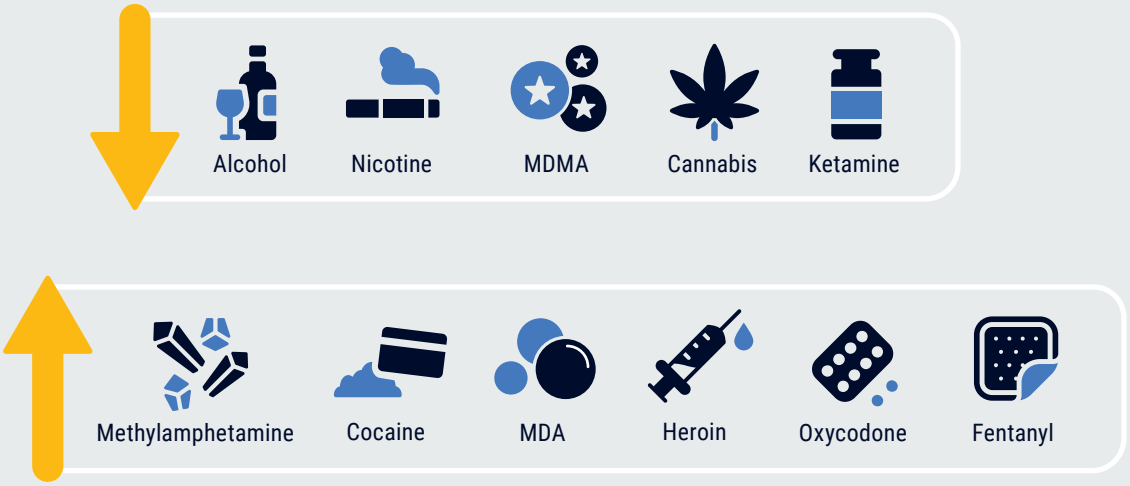
MDMA
capital city
(October)

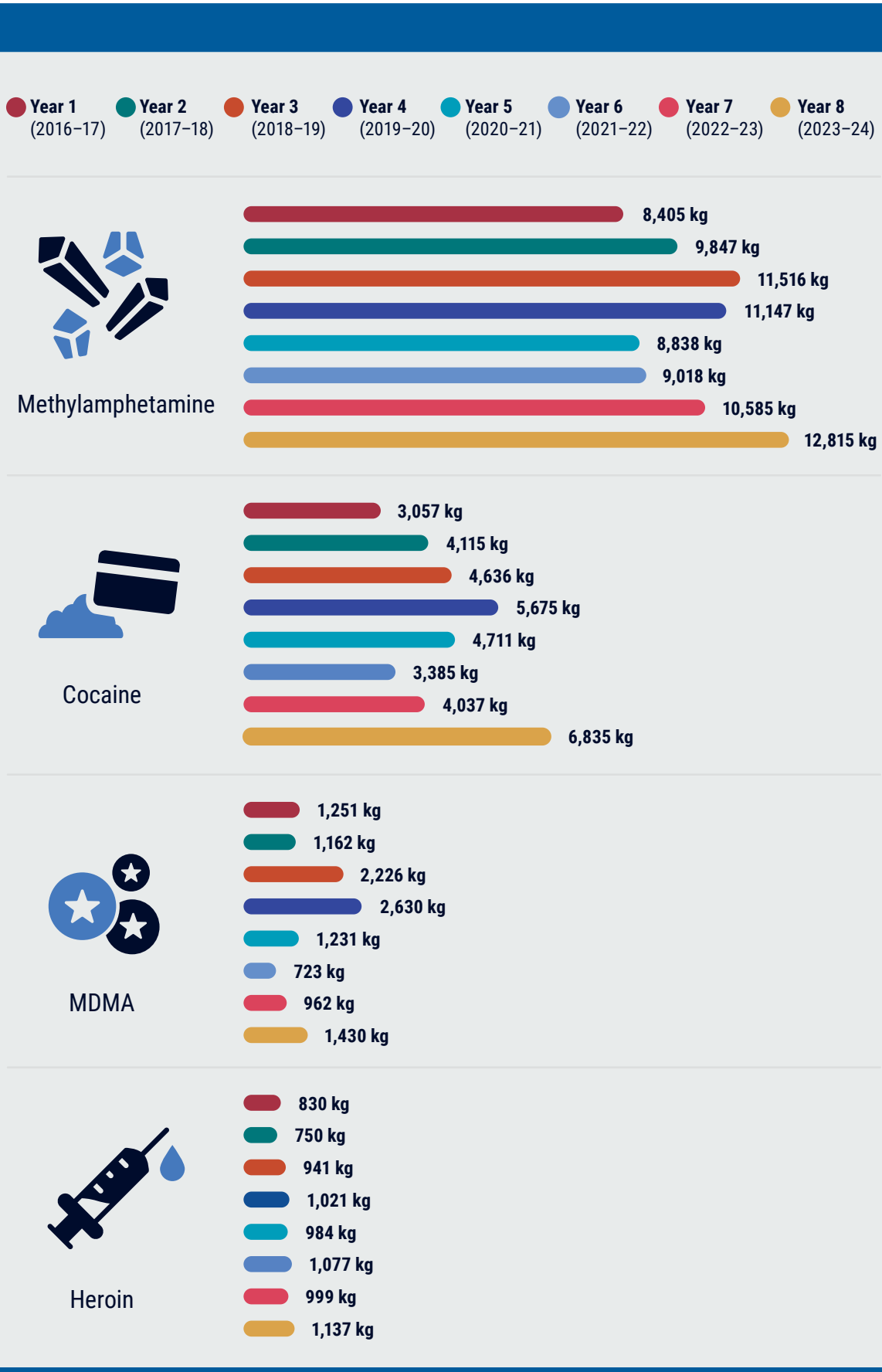
HEROIN
regional
(August)

Between April and August 2024, the population-weighted average **capital city** consumption of:



Between April and August 2024, the population-weighted average **regional** consumption of:




Year 1 (2016–17)
Year 2 (2017–18)
Year 3 (2018–19)
Year 4 (2019–20)
Year 5 (2020–21)
Year 6 (2021–22)
Year 7 (2022–23)
Year 8 (2023–24)
Methylamphetamine
8,405 kg
9,847 kg
11,516 kg
11,147 kg
8,838 kg
9,018 kg
10,585 kg
12,815 kg
Cocaine
3,057 kg
4,115 kg
4,636 kg
5,675 kg
4,711 kg
3,385 kg
4,037 kg
6,835 kg
MDMA
1,251 kg
1,162 kg
2,226 kg
2,630 kg
1,231 kg
723 kg
962 kg
1,430 kg
Heroin
830 kg
750 kg
941 kg
1,021 kg
984 kg
1,077 kg
999 kg
1,137 kg

Estimated state and territory annual consumption of methylamphetamine, cocaine, MDMA and heroin for Year 8 of the Program.

Methylamphetamine

ACT	118.9 kg
NSW	3,624.7 kg
NT	80.6 kg
QLD	2,509.4 kg
SA	1,124.4 kg
TAS	185.9 kg
VIC	3,455.2 kg
WA	1,716.4 kg
NATIONAL	12,815 kg

Cocaine

ACT	116.4 kg
NSW	2,784.6 kg
NT	31.2 kg
QLD	1,402.4 kg
SA	367.8 kg
TAS	50.7 kg
VIC	1,846.5 kg
WA	235.6 kg
NATIONAL	6,835 kg

MDMA

ACT	14.5 kg
NSW	511.8 kg
NT	16.3 kg
QLD	290.4 kg
SA	52.2 kg
TAS	36.0 kg
VIC	398.5 kg
WA	110.3 kg
NATIONAL	1,430 kg

Heroin

ACT	26.1 kg
NSW	444.4 kg
NT	1.2 kg
QLD	97.1 kg
SA	31.2 kg
TAS	5.1 kg
VIC	474.2 kg
WA	58.4 kg
NATIONAL	1,137 kg

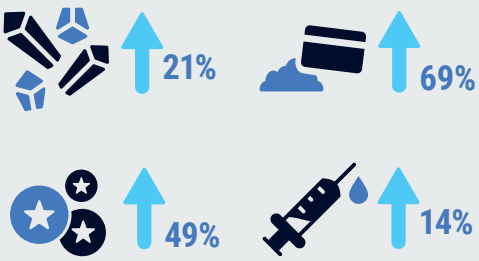
YEAR 8 TRENDS

Between Year 7 and 8 of the Program (August 2023 to August 2024) total estimated consumption of **methylamphetamine**, **cocaine**, **MDMA** and **heroin** increased by 5.6 tonnes, or 34 per cent of the combined weight.

MARKET IMPACTS:

Consumption of **methylamphetamine**, **cocaine**, **MDMA** and **heroin** increased 21%, 69%, 49% and 14% respectively.

INCREASE



MARKET VALUE:

The estimated street value of the 4 drugs in Year 8 was **$11.5 billion**, down from $12.4 billion in Year 7.

INTRODUCTION

The National Wastewater Drug Monitoring Program (the Program) coordinated by the Australian Criminal Intelligence Commission (ACIC) presents data on Australia's drug consumption for 12 substances, including methylamphetamine, cocaine, heroin and 3,4-methylenedioxymethylamphetamine (MDMA), among a range of other illicit and licit substances. Report 24 includes data for August (capital city and regional sites) and October 2024 (capital city sites only).

The Program assists in understanding drug use within populations, providing a measure of the demand for a range of drugs. Illicit drugs and licit drugs with abuse potential are inherently harmful and reliable drug consumption data are a key indicator of levels of community harm. The ACIC partners with the universities of Queensland and South Australia to deliver the Program.

Findings presented in wastewater reports provide law enforcement, policy, regulatory and health agencies with objective data on drug use. These data create opportunities to shape responses to the demand and supply sides of illicit drug markets, particularly in high-use areas, and can inform harm reduction strategies. They inform priority-setting that is responsive to constantly evolving drug markets domestically and internationally.

Longitudinal data captured by the Program increase our understanding of drug use nationally, in specific locations and over time. They provide valuable insight into trends and emerging issues in drug consumption across Australia and can identify new sources of risk. Further details about the drugs tested and program reporting are outlined below.

AUSTRALIAN DRUG MARKETS: STATE OF PLAY

Program data in Report 24 provide unambiguous evidence that several of Australia's most significant illicit drug markets are undergoing expansion. In particular, in the 12 months ending in August 2024 all jurisdictions recorded increased consumption of methylamphetamine, cocaine, MDMA and heroin, with substantial increases for some drugs in some jurisdictions. Although the reasons for this increase vary, the national result is consistent with these trends and with law enforcement's understanding of these markets.

Program longitudinal data show that for the 4 major drugs the current picture reflects a longer-term trend. For methylamphetamine there has been an overall increasing trend in consumption nationally since August 2021. For cocaine, the trend commenced in August 2022. For MDMA the trend commenced in April 2022, and in the case of heroin, a trend of general increase commenced in April 2023. In all cases these increases reflect the recovery of those markets following the impact of COVID restrictions (which saw sharp decreases in consumption) and a determination by many transnational serious and organised crime (SOC) groups to supply highly profitable markets. Health-related data concerning usage patterns in 2024 are not yet available, but it is well understood that the frequency and quantity of drugs used is related to an extent by drug type, with some having more addiction potential than others. Other factors relevant to the increases in consumption across these 4 markets between August 2023 and August 2024 are summarised below.

METHYLAMPHETAMINE

- Reliable sources of supply in Asia and the Americas, as well as domestic production.
- Larger drug shipments on a more frequent basis.
- Many sophisticated transnational and domestic SOC groups supply the market.
- Resources and knowledge for domestic manufacture are readily available.
- Resilient demand nationally and a broad user demographic.
- Diversifying importation methods, with increases in methylamphetamine imported in various media.
- Reduction in price at wholesale level.

COCAINE

- Record cultivation levels in the Americas, coupled with a strong global supply-side push.
- A wide variety of sophisticated SOC groups involved in importation and distribution.
- Cocaine is price competitive with methylamphetamine at street level.
- A broadening user demographic over time.
- Diversifying importation methods, with increases in cocaine imported in various media.

MDMA

- Remains readily available from European countries.
- Indications of increased domestic manufacture.
- Demand for MDMA has been a feature of the domestic market for more than 2 decades.
- Street level price for MDMA remains relatively stable.

HEROIN

- Majority of Australia's heroin is sourced from South East Asia, where there is ample supply to meet demand.
- A variety of sophisticated SOC groups are involved in importation and distribution.
- The increase in consumption was modest relative to the other drugs and consumption of heroin since the early 2000s has fluctuated within a relatively narrow range.

The above domestic trends are understandable in the context of global dynamics, particularly those relating to push and pull factors across global drug supply and domestic demand. According to the economic principles of supply and demand, in which price is determined by the relationship between these factors—prices generally fall where there is ample supply, while prices generally rise when demand is greater than supply. While this relationship is more complex and generally non-linear for illicit markets (including illicit drug markets), the domestic trends for the methylamphetamine market in particular can be at least partially explained through this lens given the:

- overall increased supply, including a trend towards larger drug shipments on a more frequent basis
- large increases in consumption
- corresponding decreases in price.

For the past several years the world has also seen record levels of cultivation and manufacture of cocaine and methylamphetamine, particularly from traditional source countries in the Americas and Asia. In the case of methylamphetamine, this is augmented by supplies from other source countries and sometimes sophisticated domestic manufacture. The same applies, albeit to a lesser extent, to MDMA. Traditionally, the MDMA market is supplied by European countries, but more recently there are indications of increased domestic manufacture based on large seizures of relevant precursor chemicals. The Australian heroin market is supplied by relatively high quality product, primarily from South-East Asia. Restrictions imposed by the Taliban in Afghanistan on opium cultivation are not impacting the Australian market and Australia's heroin consumption is sufficiently low that supplies from South East Asia can amply service the market. Australia's demand for the 4 major drugs represents a very small component of the quantity of these drugs, which is produced annually around the world. For the foreseeable future reliable supplies to Australia of high quality methylamphetamine, cocaine, MDMA and heroin is a given and there is potential for further increases.

The intent and capability of SOC groups to service the Australian methylamphetamine market, in particular, is very high, with the threat growing for Australia's cocaine market. This supply side push by SOC groups is servicing markets that in the year ended August 2024 exhibited increasing demand. Criminal groups are geographically dispersed across the world and resilient, challenging many current methods of disruption used by intelligence and law enforcement agencies globally. SOC is poised to take advantage of growing uncertainty in the economy, geopolitics and international affairs, focusing firmly on maximising profit at the expense of the security and wellbeing of the Australian community. Much of this illegal activity is related to Australia's highly profitable drugs markets. ACIC data modelling suggests that the increases in drug consumption for methylamphetamine, cocaine and MDMA are likely to continue until at least 2027, although unlikely at the same rate observed over this last period. In the case of heroin, ACIC assesses the market is unlikely to change significantly in the next 2 years.

High end domestic manufacture of illicit drugs is becoming more sophisticated, taking advantage of an ever-broadening range of precursor chemicals custom-designed to evade international regulations and the availability of sophisticated equipment from online marketplaces. Such operations may also involve the production of multiple drugs and precursors at the same site, at scale and employing multiple manufacturing methods. The threat to the border is enhanced by methylamphetamine and cocaine now being regularly imported in a variety of forms in an attempt to evade detection, including dissolved in liquids and impregnated into various solid media. The imported product is then reconstituted in domestic clandestine laboratories. Both the number and variety of laboratories detected has increased in recent years.

Australia is not alone in dealing with threats of this type. It is manifesting in the United States, Canada, the United Kingdom, New Zealand and across Asia and Africa. Where Australia has had the opportunity to do so, we have been successful in avoiding or suppressing threats such as fentanyl that are causing significant problems in other countries.

Data in this report reinforce what the ACIC, law enforcement and departments of health have been indicating for some time on the basis of operational activity and treatment and forensic data in their respective jurisdictions—that Australia has plentiful supplies of methylamphetamine and cocaine currently. While domestic drug prices are high in world terms, both drugs are relatively cheap in historical terms at the wholesale level and street prices are either stable or reducing. As noted above, this is likely driven by the current ready availability of these drugs.

Australia's National Drug Strategy 2017–26 is based on the 3 pillars of supply, demand and harm reduction. SOC was estimated to have cost Australia up to $68.7 billion in 2022–23, with illicit drugs accounting for over a quarter ($18.7 billion). Demand for the major drugs is resilient and difficult to address. This will continue while Australian drug users choose to consume these substances and to pay premium prices in world terms for the drugs. Unlike heroin, for which there are opioid replacement therapy options available, it is widely recognised that effective pharmacotherapy treatment options for dependent users of methylamphetamine are limited. This creates challenges in addressing market demand.

The illicit drug picture would be far gloomier but for the significant volume of illicit drugs seized both domestically and offshore by law enforcement agencies. For example, Australian Border Force and the Australian Federal Police seized 33.7 tonnes of illicit drugs and precursors in 2023–24 at the border and across Australia. In the case of a number of major drugs, the quantities seized exceeded domestic consumption. Another initiative was the scheduling in Commonwealth legislation of additional chemicals involved in the illicit manufacture of MDMA and methylamphetamine, which came into effect on 1 March 2025.

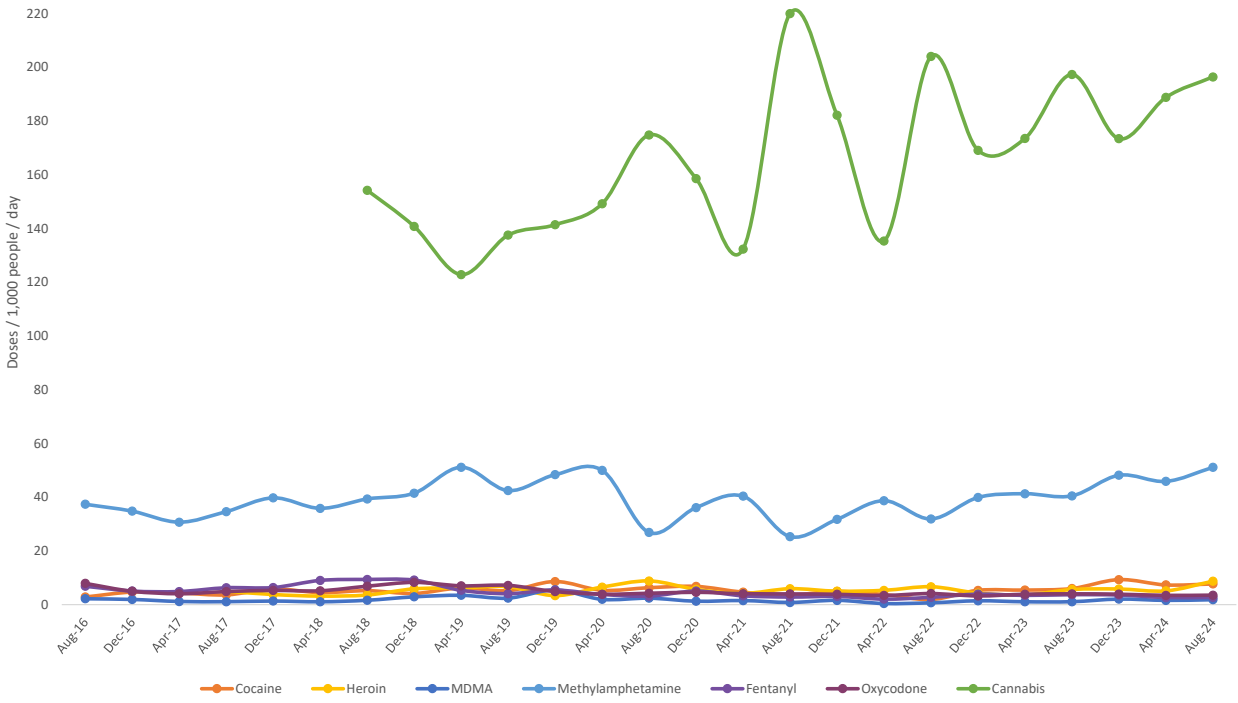
SOC groups engaged in illicit drug trafficking and production are highly capable, well-resourced and resilient. They are highly motivated to continually supply illicit drug markets by trafficking illicit drugs into and within Australia because this maximises potential profits. Some of these groups are also engaged in the illicit tobacco market, supplying cigarettes, vapes and tobacco. It is not possible to determine the proportion of nicotine consumed that is illegally obtained, but Program data do paint a picture of relative long term stability, reflecting ongoing, strong demand for nicotine products.

REPORT 24 DRUG CONSUMPTION SNAPSHOT

Average consumption of alcohol increased in both capital cities and regional areas between August 2023 and August 2024. Conversely for nicotine, average consumption decreased between August 2023 and August 2024.

Nicotine and alcohol aside, cannabis is the most consumed drug by a large margin, despite substantial fluctuations (Figure 2). Cannabis consumption in August 2024 was the same as August 2023, but there has been a degree of variation during the intervening period.

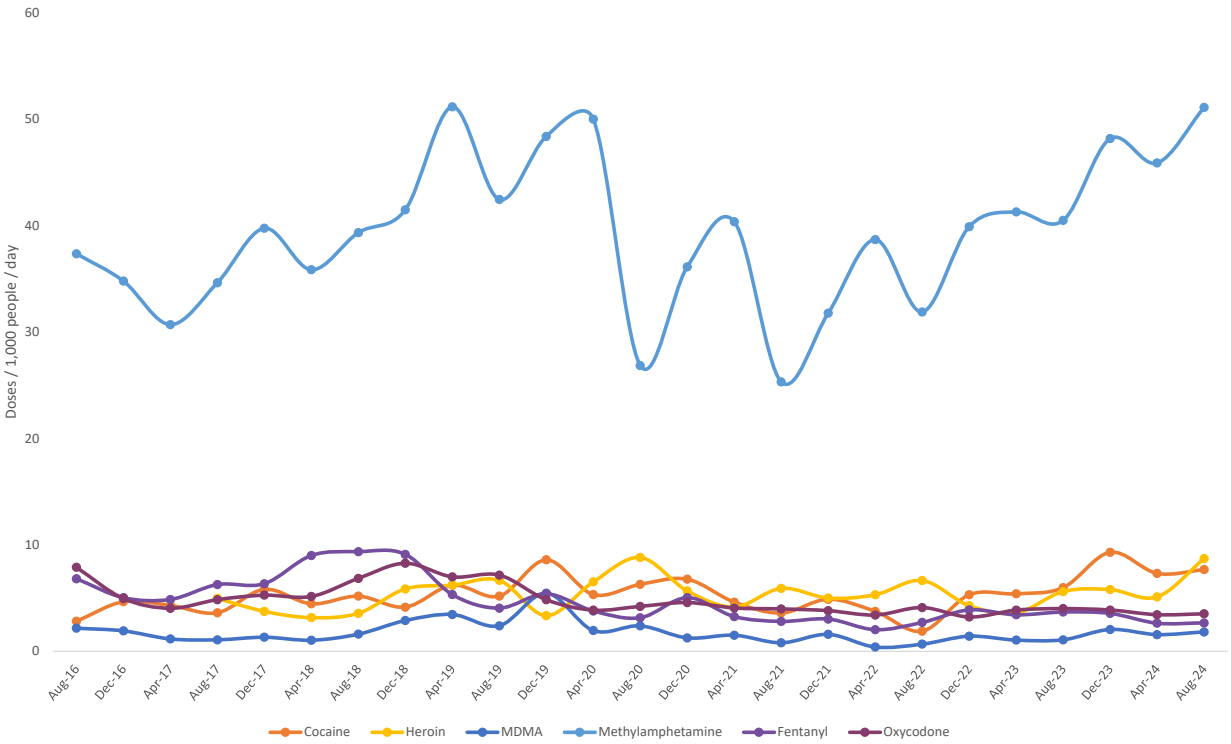
Figure 1: National average drug consumption of cannabis, methylamphetamine, cocaine, MDMA, heroin, oxycodone and fentanyl.



Methylamphetamine consumption increased in both the capital cities and regional areas between April and August 2024, with capital city consumption at record levels. This has resulted in the national consumption level being equal highest with April 2019. (Figure 3). Cocaine consumption increased in both capital city and regional areas resulting in an increase in consumption nationally. MDMA consumption increased in capital cities and decreased in regional areas.

Heroin consumption increased in both capital city and regional areas, with regional consumption at a record high level. National heroin consumption is considerably higher than in August 2023 and is the second highest level on record. Of the pharmaceutical opioids, both oxycodone and fentanyl consumption decreased from August 2023 to August 2024.

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



AN 8 YEAR RETROSPECTIVE

With the passage of 8 years, sufficient data have now been collected by the Program to permit deep longitudinal analysis of consumption trends. 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.

Throughout the life of the Program, national consumption of nicotine and alcohol far exceeded consumption of all other substances monitored. Moreover, cannabis consumption has exceeded by some margin consumption of all other illicit drugs.

In Year 8 of the NWDMP (2023–24) total national consumption of methylamphetamine, cocaine, MDMA and heroin was 22.2 tonnes, the highest combined weight recorded over the life of the Program.

The combined estimated national consumption of methylamphetamine, cocaine, MDMA and heroin increased 34% during the year to August 2024. This increase amounts to some 5.6 tonnes more consumption than in Year 7, driven by increases in all 4 drugs (Table 1). Methylamphetamine accounted for approximately 58% of the combined estimated consumption of these 4 drugs in Year 8 of the Program. By way of comparison, the next most consumed illicit stimulant (cocaine) accounted for approximately 31% of the combined consumption. The 12.8 tonnes of methylamphetamine, 6.8 tonnes of cocaine and 1.1 tonnes of heroin are record estimated levels of consumption since the Program commenced.

Table 1. Estimated annual methylamphetamine, cocaine, MDMA and heroin consumption, as total weight consumed nationally, Year 1 to Year 8 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 6 2021–22	Year 7 2022–23	Year 8 2023–24	Year 7 to Year 8
Meth	8,405	9,847	11,516	11,147	8,838	9,018	10,585	12,815	↑ 21
Cocaine	3,057	4,115	4,636	5,675	4,711	3,385	4,037	6,835	↑ 69
MDMA	1,251	1,162	2,226	2,630	1,231	723	962	1,430	↑ 49
Heroin	830[a]	750	941	1,021	984	1,077	999	1,137	↑ 14
Total	**13,543**	**15,874**	**19,319**	**20,473**	**15,764**	**14,203**	**16,583**	**22,217**	↑ **34**[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 7 and 8 of the Program.

Program data also show fluctuating consumption over time for the drugs covered by the Program, including record high and low consumption of various drugs at different times since August 2016, emphasising that illicit drug markets do not operate in a consistent manner. However, there has been limited change over the life of the Program in the hierarchy of consumption of the 4 major illicit drugs. The only change that has occurred in the hierarchy over the life of the Program has been heroin overtaking MDMA in Years 6 and 7.

VALUE OF DRUGS CONSUMED

Using Program consumption data and the most recent national median price data available to the ACIC, it is possible to calculate the overall estimated street value of the major illicit drugs. In Year 8 (2023–24) the total market value of the 4 major illicit drugs of concern decreased from a record $12.4 billion to 11.5 billion (Table 2). This is due to a decrease in the street value of some of the drugs in the reporting period, particularly methylamphetamine, in part due to increased supply. The methylamphetamine market, which has the highest value of the 4 drug types and where consumption increased by 21%, accounted for the majority of that expenditure, amounting to $8.97 billion (78% of the total estimated expenditure). Analysis over a long period has indicated that in Australia street prices of the major drugs change little in response to external factors, including changes in wholesale prices or variations in supply. We judge that this is due in part to the large profit margin enjoyed by SOC groups and the fact that illicit drug users in Australia are 'price-takers'[1]. Also, the differences in prices between the 4 drugs do not appear to be a major factor in drug choice: the median national street price of a cocaine 'deal' is less than the price for a crystal methylamphetamine deal, so price does not appear to be a factor in the relative consumption of cocaine.

1 A price taker is an entity or individual that must accept the prevailing market price for a good or service, lacking the market power to influence that price themselves.

Table 2. Estimated street value of annual methylamphetamine, cocaine, MDMA and heroin consumption for Year 1 to 8 of the Program.

Drug	Estimated consumption (kilograms per annum)							% Change
	Year 1 (A$) 2016–17	Year 2 (A$) 2017–18	Year 3 (A$) 2018–19	Year 4 (A$) 2019–20	Year 5 (A$) 2020–21	Year 6 (A$) 2021–22	Year 7 (A$) 2022–23	Year 8 (A$) 2023–24
Meth	7.24b	7.38b	8.63b	6.96b	7.95b	8.34b	10.58b	8.97b
Cocaine	1.06b	1.54b	2.08b	1.41b	1.88b	1.10b	1.31b	2.22b
MDMA	145.59m	114.19m	211.08m	226.72m	95.50m	62.32m	99.51m	147.93m
Heroin	207.50m	375.00m	423.45m	382.87m	418.20m	538.50m	449.55m	284.25m
Total	**8.6b**	**9.4b**	**11.3b**	**8.9b**	**10.3b**	**10.0b**	**12.4b**	**11.5b**

ESTIMATED STATE AND TERRITORY CONSUMPTION

At the state and territory level, consumption of all 4 drugs increased in all jurisdictions in Year 8 of the Program. The most notable increases in consumption were in cocaine (Tables 3 to 6). There were varying changes in methylamphetamine consumption across jurisdictions, with the highest increase in the Northern Territory (53%). Cocaine consumption during Year 8 was marked by a considerable increase in the Northern Territory (222%) and Tasmania (107%), albeit from a low base. There were notable increases in MDMA consumption in most jurisdictions, particularly the Northern Territory (92%) and Western Australia (65%). Heroin consumption increased in all jurisdictions, with consumption increasing 65% in Tasmania and 46% in Western Australia. It is unusual for there to be increases for the 4 major drugs in all jurisdictions and this is of concern. There are diverse causal factors for consumption changes, particularly at the state and territory level, and even more so at sampling sites within jurisdictions. This is because markets are more influenced by local environmental factors (for example, demographic factors and how close a sampling location is to a primary supply route) that influence consumption at these levels.

Table 3. Estimated methylamphetamine consumption per jurisdiction in Year 1 to Year 8 of the Program.

Jurisdiction	Estimated consumption (kilograms per annum)								% Change
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 7 to Year 8
ACT	80.3	93.0	119.4	122.1	93.2	83.2	93.9	118.9	↑ 27
NSW	2,298.3	2,604.5	3,337.4	3,409.7	2,877.0	2,912.3	3,290.9	3,624.7	↑ 10
NT	65.5	75.5	84.8	66.6	54.7	50.1	52.8	80.6	↑ 53
Qld	1,277.5	1,893.3	2,247.7	2,246.8	1,608.8	1,650.7	1,953.8	2,509.4	↑ 28
SA	1,005.3	1,159.5	943.2	980.5	838.5	775.9	938.6	1,124.4	↑ 20
Tas	92.0	127.1	177.1	155.0	88.5	99.3	134.7	185.9	↑ 38
Vic	2,039.2	2,477.7	3,124.6	2,980.2	2,307.9	2,502.2	2,798.6	3,455.2	↑ 23
WA	1,547.3	1,416.8	1,482.7	1,186.2	969.9	944.8	1,322.3	1,716.4	↑ 30

Table 4. Estimated cocaine consumption per jurisdiction in Year 1 to Year 8 of the Program.

Jurisdiction	Estimated consumption (kilograms per annum)								% Change
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 7 to Year 8
ACT	67.8	81.2	83.4	113.9	91.9	54.0	63.1	116.4	84
NSW	1,812.3	2,397.8	2,548.0	2,988.2	2,374.5	1,622.9	1,933.7	2,784.6	44
NT	19.0	27.4	22.8	20.9	12.4	7.6	9.7	31.2	222
Qld	319.4	576.6	714.1	918.5	845.3	570.1	705.1	1,402.4	99
SA	107.1	129.2	173.1	243.8	170.5	160.2	201.8	367.8	82
Tas	10.9	15.5	16.6	26.8	35.1	29.2	24.5	50.7	107
Vic	676.5	819.9	968.0	1,216.0	1,083.9	860.6	974.4	1,846.5	90
WA	43.9	67.9	110.0	147.0	98.3	80.7	124.8	235.6	89

Table 5. Estimated MDMA consumption per jurisdiction in Year 1 to Year 8 of the Program.

Jurisdiction	Estimated consumption (kilograms per annum)								% Change
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 7 to Year 8
ACT	28.4	14.4	36.5	38.6	17.8	6.5	10.5	14.5	38
NSW	462.8	450.5	834.7	986.1	446.1	234.2	334.0	511.8	53
NT	37.8	24.1	32.4	46.4	32.1	13.7	8.5	16.3	92
Qld	216.5	223.2	502.4	627.6	301.3	189.3	195.8	290.4	48
SA	56.5	66.6	70.8	127.8	79.6	26.8	38.6	52.2	35
Tas	30.6	16.7	54.9	54.1	31.0	12.4	22.8	36.0	58
Vic	319.6	291.3	511.9	479.0	232.0	194.3	285.1	398.5	40
WA	99.0	74.9	182.4	271.3	91.5	46.6	66.9	110.3	65

Table 6. Estimated heroin consumption per jurisdiction in Year 1 to Year 8 of the Program.

Jurisdiction	Estimated consumption (kilograms per annum)								% Change
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 7 to Year 8
ACT	14.7	15.3	10.3	16.9	15.3	17.3	22.6	26.1	15
NSW	264.6	222.2	307.0	323.9	356.9	389.6	366.4	444.4	21
NT	1.0	1.0	1.0	1.4	1.6	1.1	1.0	1.2	20
Qld	65.5	66.2	66.4	77.7	84.8	100.5	82.0	97.1	18
SA	47.8	34.8	30.5	41.8	37.5	34.7	28.5	31.2	9
Tas	3.3	4.5	2.8	4.3	5.4	3.2	3.1	5.1	65
Vic	402.1	359.4	469.7	464.4	424.4	479.3	456.0	474.2	4
WA	31.1	46.8	53.8	91.4	58.7	51.4	40.0	58.4	46

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

IMPLEMENTATION

The ACIC 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 collection and analysis of samples.[2]

In this report, Program wastewater analysis measured the presence[3] 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 range of monitored substances with its partners, stakeholders and universities.

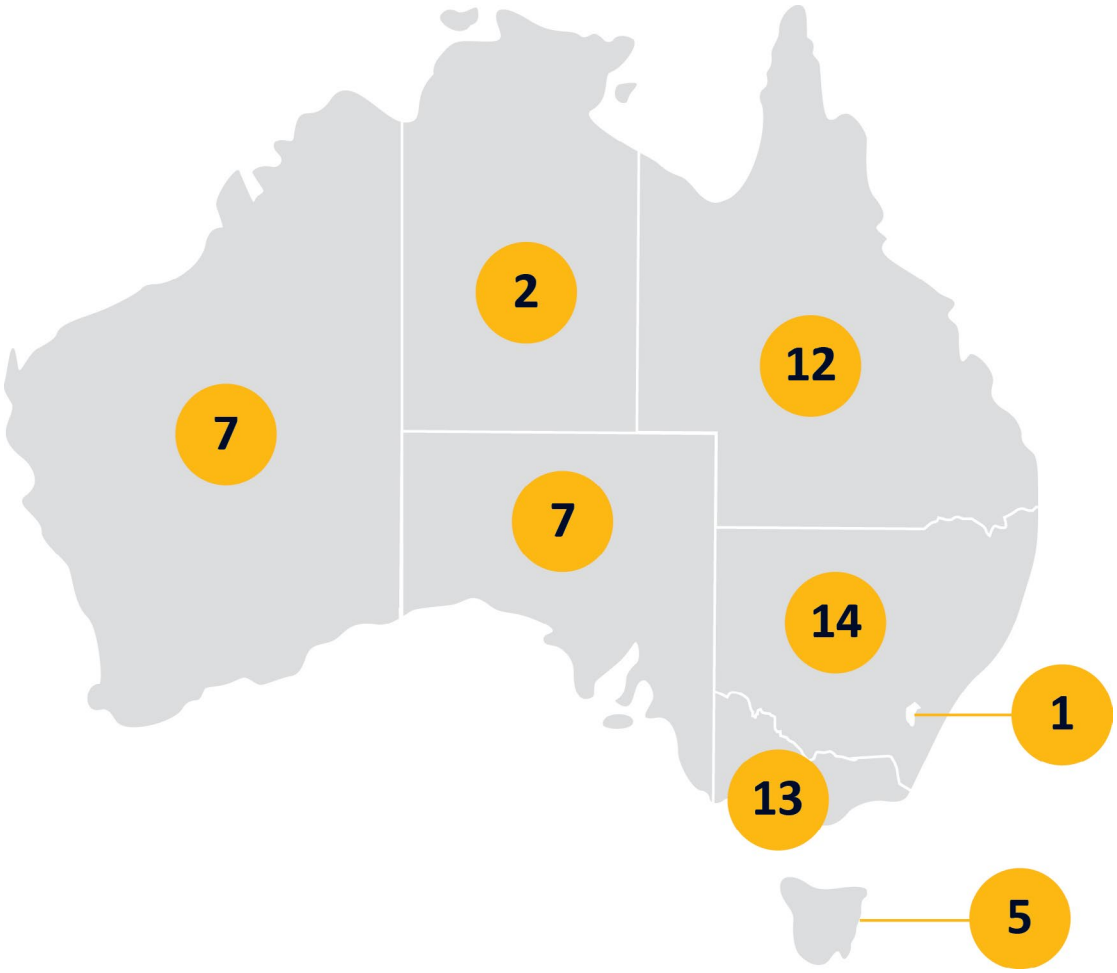
Both contracted universities monitor wastewater across Australia, covering all state and territory capital cities and a range of regional cities and towns. In August 2024, 61 wastewater treatment plants participated nationally, covering 57% of the Australian population (Figure 1).[4]Sites were selected to permit the ACIC to provide data on major population areas, to represent a cross-section of regional cities and towns and sites where treatment plant operators have established relationships with the universities.

2 Errors/variation within the extraction and analysis methods exist for each drug type and across sampling locations, but are usually less than ±10%.

3 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.

4 Sampling also occurred in October 2024 in capital city sites, with 20 participating wastewater sites nationally, covering approximately 48 per cent of the Australian population.

Figure 3: Breakdown of sites by jurisdiction for August 2024.



Participation by all states and territories is vital to informing our understanding of the national picture of drug use and demand. Although the location of sites within and between states and territories may change over the life of the Program, the intention is to ensure site continuity.

REPORTING

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 and ketamine (for which reliable dose figures are unavailable), 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, internationally recognised methodology. Wastewater-based epidemiology has been standardised by a European network of laboratories focussed on quality sampling and analysis called the Sewage Core Group Europe (SCORE). The SCORE network facilitates an annual inter-laboratory testing program among participating laboratories that research and measure illicit drugs in wastewater across the globe. As part of this routine laboratory benchmarking, participating laboratories which pass analytical criteria are invited to submit 7 days of wastewater data for their region in roughly the same time period, thus ensuring the quality of the analysis and comparability of reported data. The research teams at The University of Queensland and the University of South Australia have taken part in and passed this testing regime for more than 5 years. As the methods are standardised internationally, this allows for the comparison of data between countries. Every batch of samples that is analysed domestically is subjected to 3 levels of quality controls comprising known amounts of authentic reference drug standards. These are analysed in duplicate to ensure accuracy and reproducibility. With substantial coverage (>50 sites), the estimates in Australia are derived from a large proportion of the population and regular geographically diverse sampling.

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.

Wastewater data are also particularly useful for identifying differences in levels of drug consumption in capital cities and regional areas of Australia. The data reinforces different dynamics that apply to both capital city and regional markets and illustrate drug consumption variations that exist 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 decision-making of serious and organised crime groups that supply illicit drug markets.

Regular 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 that can be used to inform local responses. This is important because it allows wastewater data to complement a number of other Australian drug data collections that have limited regional coverage or are confined to capital cities. It also permits the ACIC and partners to speak with greater confidence about local drug threats.

Triangulated data show 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 illustrate that consumption of the respective drugs also varies considerably at different sites within jurisdictions. It is important that Australian drug datasets are interpreted holistically. When considering the whole spectrum of market indicators (covering health indicator data including ambulance call-outs, emergency presentations, overdoses and coronial data, treatment services and mental health presentations and law enforcement, survey and forensic data), the combined picture indicates concerning growth nationally, particularly in the markets for illicit stimulants.

When coupled with seizure and detection data (onshore and offshore), wastewater data provide an important indicator of the collective capacity and intentions of SOC groups. Also, demand is best understood at a population level and wastewater data lends itself to this. The level of drug consumption is the best and most reliable indicator of total illicit drug market size, noting that there may be short-term unmet demand, especially where drugs are largely (for example, methylamphetamine) or exclusively (cocaine and heroin) imported.

The ACIC engages with academic institutions, industry and public sector agencies to identify further data applications. Identified opportunities included 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. The Program is sufficiently flexible to allow for bespoke collection activity in different geographic locations and at varying intervals in response to identified needs and objectives.

BENEFITS OF THE PROGRAM

Wastewater data are an important part of the national suite of datasets that increase understanding of drug consumption, demand and supply in Australian cities and regional locations. Ensuring Program data are publicly available assists understanding and informs the national conversation on drug markets, including their supply, the harm they cause and policy responses. This report builds on national drug consumption data contained in the 23 preceding reports to identify trends over more than 8 years in drug use across states, territories and the nation.

The ACIC's wastewater work extends far beyond the Program. We are exploiting new technology developed by our university partners to enhance sampling opportunities. Innovation in the range of chemicals that can be reliably detected and quantified in wastewater is also occurring, with these advances having application for intelligence, law enforcement, health and broader community harm reduction purposes. Moreover, wastewater analysis now routinely extends to a broader range of drugs than is reported in the Program for research and development purposes, which aids future understanding of emerging drug market issues and responses.

RESEARCH FINDINGS

Prepared by The University of Queensland (B Tscharke, R Verhagen, R Bade, J O'Brien, P Prasad, D Barry, K Marano, G Elisei, T Reeks, P Thai, K Thomas, J Mueller) and University of South Australia (E Jaunay, M Ghetia, B Peake, B Simpson, J White, C Gerber)

LIST OF ABBREVIATIONS

ABS	Australian Bureau of Statistics
ACIC	Australian Criminal Intelligence Commission
ACT	Australian Capital Territory (capital city is Canberra)
DASSA	Drug and Alcohol Services South Australia
LC-MS/MS	Liquid chromatography tandem mass spectrometry
LOD	Limit of detection
LOQ	Limit of quantification
MDA	3,4-methylenedioxyamphetamine
MDMA	3,4-methylenedioxymethylamphetamine
NSW	New South Wales (capital city is Sydney)
NT	Northern Territory (capital city is Darwin)
NWDMP	National Wastewater Drug Monitoring Program
Qld	Queensland (capital city is Brisbane)
SA	South Australia (capital city is Adelaide)
SPE	Solid phase extraction
Tas	Tasmania (capital city is Hobart)
THC	Tetrahydrocannabinol, active substance in cannabis
THC-COOH	11-nor-9-carboxy-tetrahydrocannabinol, metabolite of THC
Vic	Victoria (capital city is Melbourne)
WA	Western Australia (capital city is Perth)
WWTP	Wastewater treatment plant

TERMINOLOGY

Methylamphetamine is also commonly known as methamphetamine. In this report methylamphetamine is used, consistent with the preferences of the ACIC.

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 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: INTRODUCTION

BACKGROUND

Wastewater analysis is a technique for monitoring the population-scale consumption of substances. The Australian Criminal Intelligence Commission (ACIC) National Wastewater Drug Monitoring Program (NWDMP) has reported on substances of concern in Australia since August 2016. The NWDMP focuses on 12 licit and illicit drugs: nicotine (consumption of tobacco products, gums, patches, e-cigarettes/vapes), ethanol from alcohol consumption, pharmaceuticals with abuse potential such as oxycodone, fentanyl and ketamine, as well as the illicit substances methylamphetamine, MDMA (ecstasy), MDA, cocaine, cannabis and heroin.

Wastewater treatment plants (WWTPs) located across capital cities and regional Australia, covering all states and territories, have been invited to participate in the Program. The report presents patterns of substance consumption across Australia, showing differences in levels between capital cities and regional centres, within and between states and territories and nationally. Sites have been given a unique number which is used in every report. Site names and locations are not included in the report to maintain the confidentiality of participating treatment plants. Only site codes are presented in the results. More detailed data collection methods are described in Appendix 4.

DATA IN THIS REPORT

Samples are collected at WWTPs for one week every 2 months for sites in capital cities and for one week every 4 months for regional sites. This report compares consumption data from previous reports with results obtained from wastewater samples collected for up to 7 days in regional and capital city sites in August and capital cities in October 2024. A total of 61 sites participated in August, consisting of 22 capital city sites and 39 regional sites covering a population of 14.5 million Australians (Figure 4). Data from this report equates to coverage of approximately 57 per cent of Australia's population for August and 48 per cent for October.

A total of 549 new samples have been added to the 11,720 previously collected, bringing the total number since the beginning of the Program to 12,269. The samples provide national data on drug consumption and build on prior results to provide trends between locations and over time. 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.

Figure 4: Participating WWTPs in August 2024 showing the number of capital city and regional sites by state and territory. Each state or territory is assigned a colour which is used to identify them in figures.

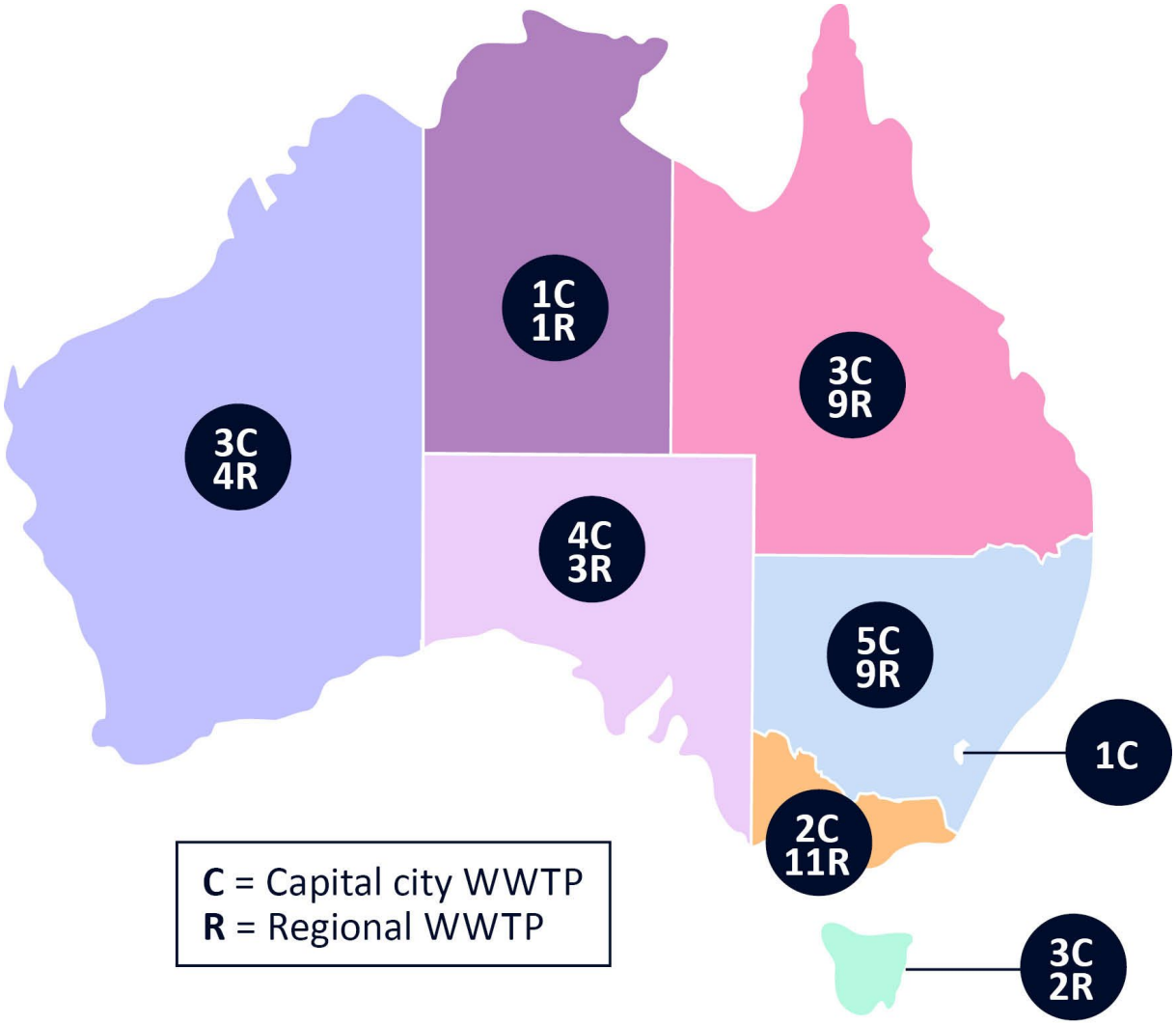


Table 7: Number of participating WWTPs for the periods covered in this report. One collection period aims to collect data from both capital city (C) and regional (R) sites, while the other collection period aims to collect data from capital city sites only.

State/territory	Aug 2024 Capital	Aug 2024 Regional	Oct 2024 Capital
ACT	1	–	1
NSW	5	9	3
NT	1	1	1
Qld	3	9	3
SA	4	3	4
Tas	3	2	3
Vic	2	11	2
WA	3	4	3
Sites	**22**	**39**	**20**
Population (millions) C & R	**12.4**	**2.1**	**12.1**
% of Australian Population	**48.9**	**8.1**	**47.6**
Total population (millions)	**14.5**		**12.1**
% of Australian Population	**57.0**		**47.6**

Estimates have been rounded to the nearest 0.1 million. Census 2021 population used (25,422,788) for population percentage estimates.

2: RESULTS

Estimated drug consumption data are presented differently in the following sections. Results are compared at the individual site level for August 2024 (section 2.1), and averaged to state or territory to compare longer term trends for the past 2 years (section 2.2). Trends are also presented nationally in section 2.3 and within each state and territory (section 2.4). Methods of data collection can be found in Appendix 4.

August 2024 data were used to compare individual sites as it included the latest set of results for the full suite of regional and capital city sites. We recommend exercising caution when comparing results between sites as some sites provided samples for fewer days than others. The number of collection days can vary from 5 to 7. For example, sites in Tasmania are not always able to collect samples over the weekend. It is not always possible to coordinate collection during the same week of the month at all sites, so sampling weeks may not correspond in all instances. A list of the detection frequency for each drug can be found in Appendix 3. The uncertainties in individual population estimates have less impact when data are averaged, for example at the state/territory or national level. The uncertainties in population estimates are likely to be higher for smaller sites (e.g., regional communities) or where large short-term population changes occur due to employment opportunities, tourism, or festival events.

2.1 INDIVIDUAL SITE COMPARISON OF DRUG CONSUMPTION IN AUGUST 2024

2.1.1 NICOTINE AND ALCOHOL

Nicotine is the main psychoactive substance present in tobacco leaves, some vaping products and nicotine replacement therapies used to facilitate cessation of smoking. Two nicotine metabolites, cotinine and hydroxycotinine, were used to estimate the consumption of nicotine. The estimate is expressed as nicotine in this report as the method cannot distinguish between nicotine from tobacco, e-cigarettes, or nicotine replacement therapies such as patches and gums.

Nationally, average nicotine consumption was higher in regional areas compared to capital cities in August 2024 (red horizontal and blue dotted lines, respectively, Figure 5). The Northern Territory was the only jurisdiction where capital city and regional consumption were collectively above the national average. Most capital city sites had similar consumption. Some regional sites in New South Wales, Victoria and Western Australia had a large spread over the collection week. Most jurisdictions had some regional sites with a relatively high mean consumption and some capital city sites with lower mean consumption.

The specific marker of ethanol consumption, ethyl sulphate, was used to determine the scale of alcohol consumption across the country. The regional average consumption of alcohol was slightly higher than the capital city average in August 2024 (Figure 6). Darwin had the highest mean alcohol consumption of the capital cities in August, with regional consumption being highest in the Northern Territory.

Figure 5: Estimated nicotine consumption for August 2024 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 can vary from 5 to 7.

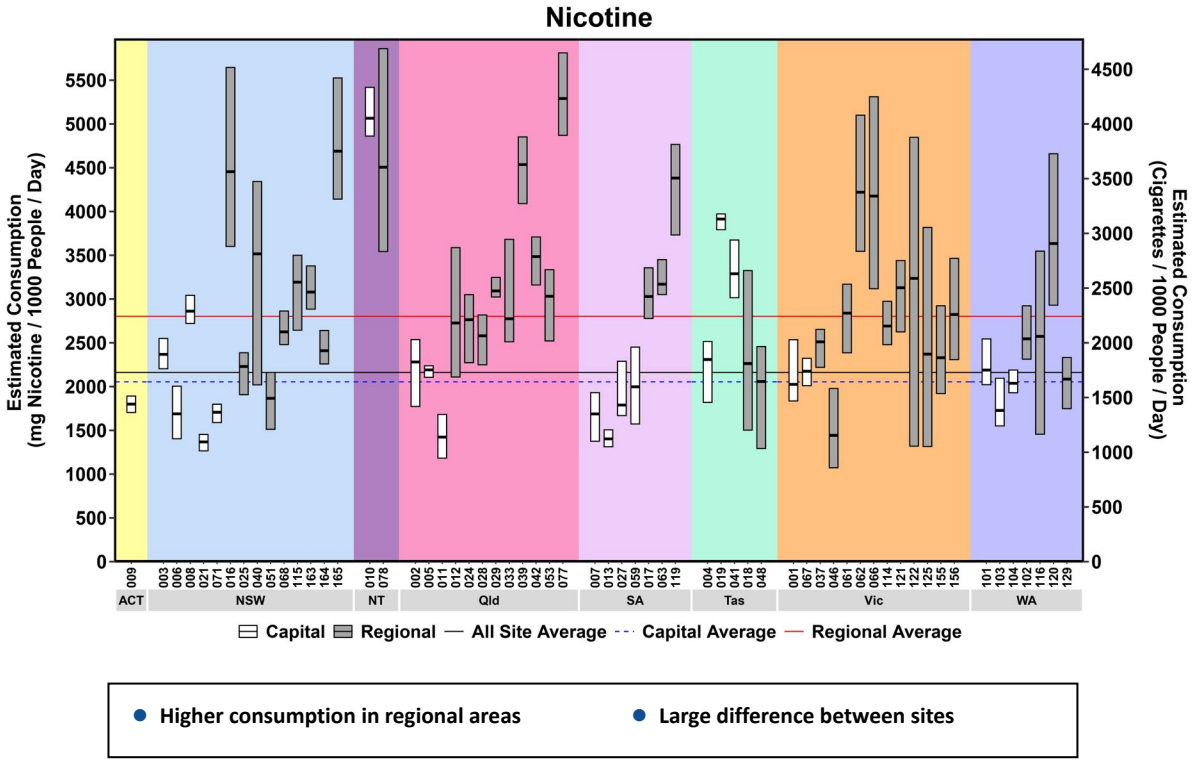
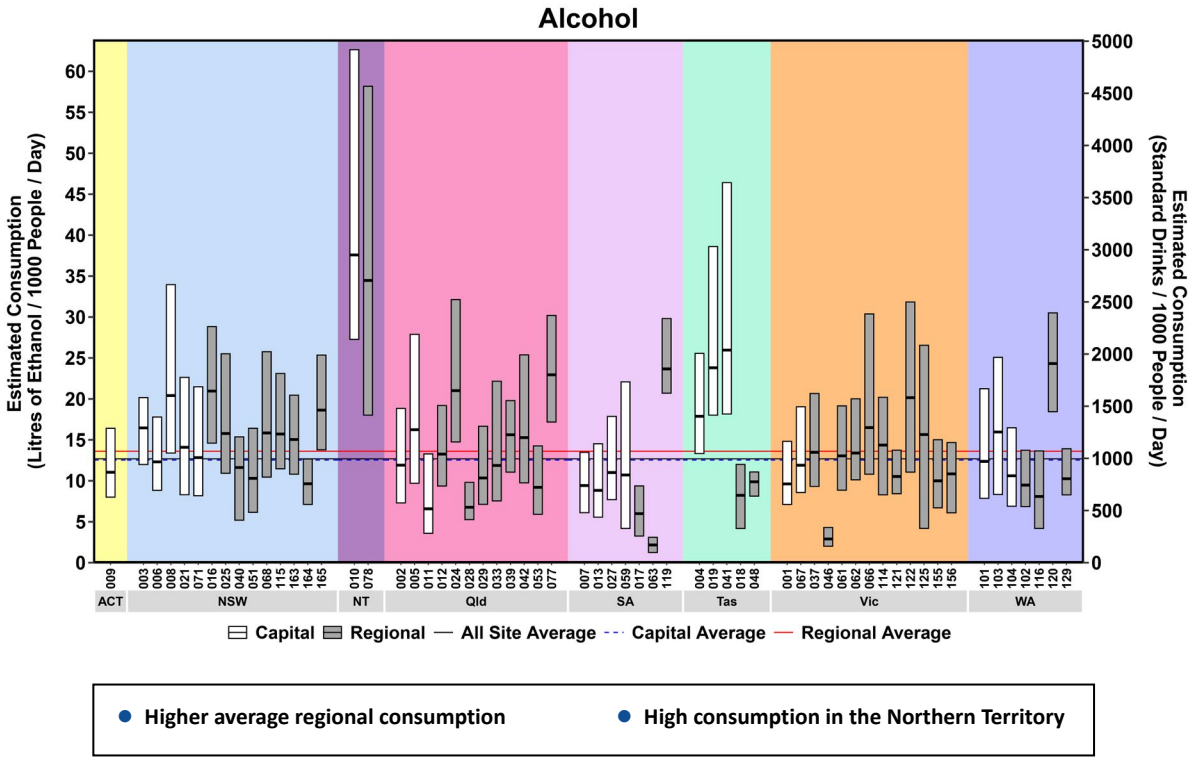


Figure 6: Estimated alcohol consumption for August 2024 in litres consumed per day (left axis) and standard drinks per day (right axis) per thousand people. The number of collection days can vary from 5 to 7.



2.1.2 STIMULANTS

2.1.2.1 METHYLAMPHETAMINE

Average national methylamphetamine consumption was higher in regional areas of the country (Figure 7). A regional site in each of South Australia, Western Australia and Victoria had the highest average consumption. Adelaide and Perth had the highest capital city consumption of methylamphetamine. There was considerable variation in methylamphetamine consumption at regional sites in August 2024.

2.1.2.2 AMPHETAMINE

The measured concentration of amphetamine in the August 2024 samples mostly fell within a range which is consistent with the reported excretion rates following methylamphetamine consumption (Gracia-Lor et al. 2016). The results broadly matched our previous findings (see Appendix 4 of Report 1), suggesting the levels of amphetamine in wastewater samples can be mostly attributed to the metabolism of methylamphetamine. The proportion of amphetamine in some parts of the country are increasing relative to methylamphetamine, implying consumption of amphetamine. However, it is also excreted following consumption of prescribed drugs lisdexamfetamine and dexamfetamine. The method cannot differentiate between this medical consumption and illicit consumption. The high levels of methylamphetamine in most parts of the country means a firm conclusion is not possible.

2.1.2.3 COCAINE

Benzoylecgonine is a specific metabolite of cocaine and was used to estimate cocaine consumption. The average consumption of cocaine was higher in capital cities compared to regional areas

(Figure 8). Most sites in Sydney had the highest mean cocaine consumption. Regional Western Australia and the Northern Territory had consumption well-below the national average.

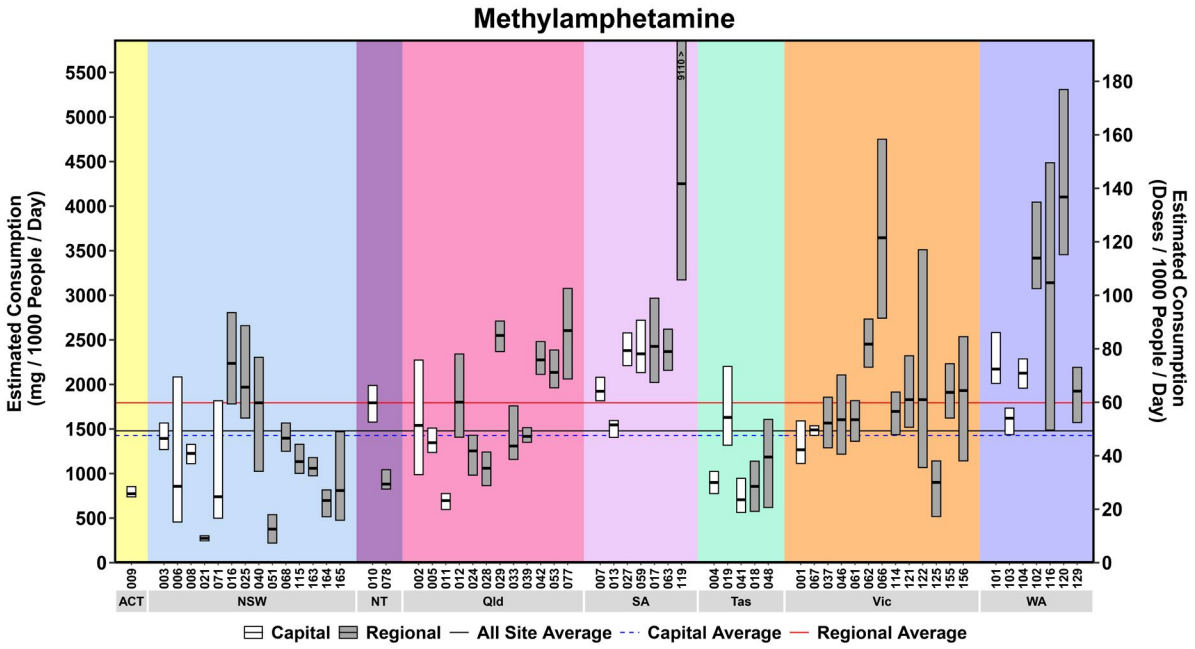
2.1.2.4 MDMA (3,4-METHYLENEDIOXYMETHYLAMPHETAMINE)

Average consumption of MDMA was slightly higher in capital cities compared to regional areas in August 2024 (Figure 9). Darwin and 3 sites in Sydney had the highest MDMA consumption in the country. Average consumption of MDMA in regional areas was highest in New South Wales, Queensland and Victoria.

2.1.2.5 MDA (3,4-METHYLENEDIOXYAMPHETAMINE)

The results for MDA are expressed as excreted amounts (Figure 10). The national average MDA excretion for regional areas was higher than the capital cities. Excretion in Darwin and Hobart was higher than the other capital cities. Sites in regional Victoria and South Australia had the highest excretion of MDA in regional areas.

Figure 7: Estimated methylamphetamine consumption for August 2024 in mass consumed per day (left axis) and doses per day (right axis) per thousand people. Text describing the extreme values shown above the graph are based on the left y axis. The number of collection days can vary from 5 to 7.



- Higher average regional consumption
- Well above average consumption in regional SA, Vic and WA

Figure 8: Estimated cocaine consumption for August 2024 in mass consumed per day (left axis) and doses per day (right axis) per thousand people. Text describing the extreme values shown above the graph are based on the left y axis. The number of collection days can vary from 5 to 7.

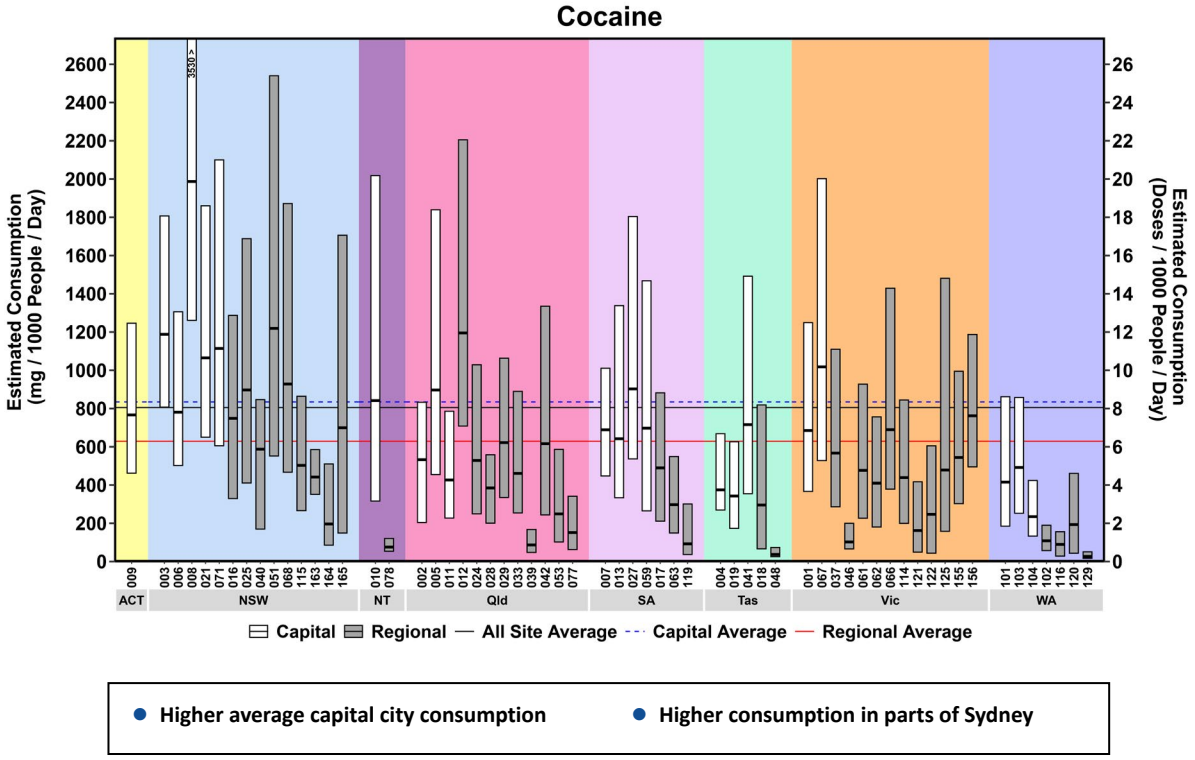


Figure 9: Estimated MDMA consumption for August 2024 in mass consumed per day (left axis) and doses per day (right axis) per thousand people. Text describing the extreme values shown above the graph are based on the left y axis. The number of collection days can vary from 5 to 7.

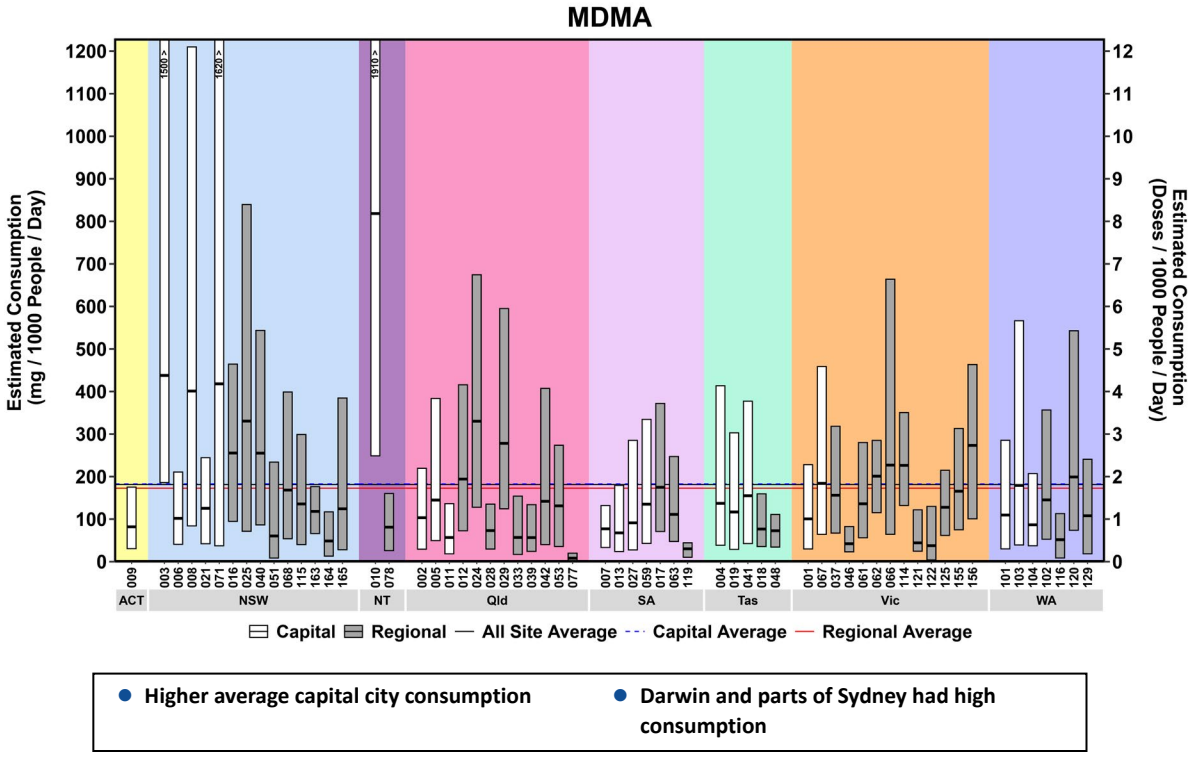
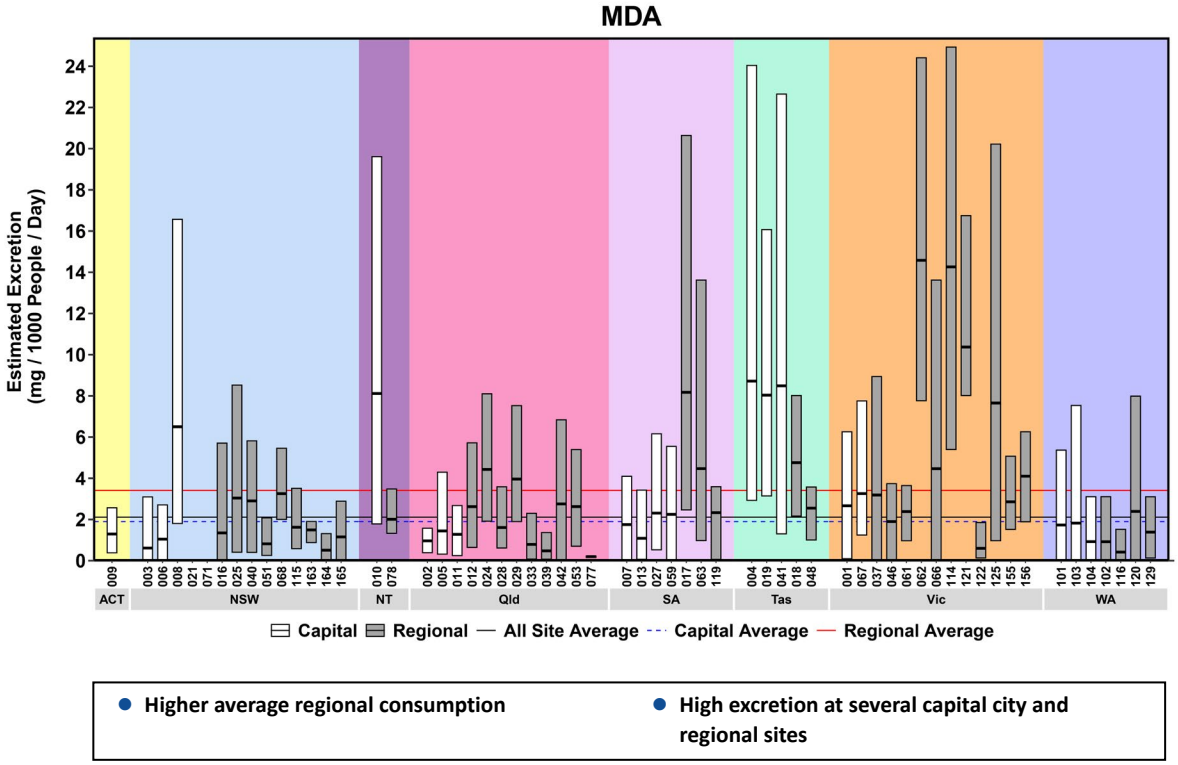


Figure 10: Estimated MDA excretion for August 2024 in mass excreted per day per thousand people. The number of collection days can vary from 5 to 7.



2.1.3 OPIOIDS

Two prescription opioids, oxycodone and fentanyl, are included in the report as well as heroin, an illicit drug. The main metabolites (noroxycodone, norfentanyl and 6-monoacetylmorphine, respectively) were measured to estimate the consumption of these drugs. Oxycodone and fentanyl are legally prescribed pharmaceuticals to treat pain. Although wastewater analysis cannot differentiate between prescribed consumption and consumption for non-medical purposes, these substances remain of interest due to their abuse potential.

2.1.3.1 OXYCODONE

Oxycodone consumption in August 2024 is shown in Figure 11. Average consumption of oxycodone was higher in regional areas compared to the capital cities, with large variation in consumption observed across different sites. Most sites in regional Victoria had above average consumption, meanwhile all sites in regional Western Australia were well below. Hobart had the highest consumption of the capital cities.

2.1.3.2 FENTANYL

Average fentanyl consumption was higher in regional areas compared to the capital cities (Figure 12). A regional site in New South Wales and Victoria had very high consumption. A Hobart site had the highest mean consumption of the capital city sites. Fentanyl consumption fell below the limit of detection for all or some days of the week at several sites.

2.1.3.3 HEROIN

Heroin consumption was substantially higher on average in the capital cities in August 2024 (Figure 13). Consumption fell below the limits of detection in many regional sites in Australia and several sites in Sydney. This is in contrast to a regional site in New South Wales and several sites in regional Victoria where heroin consumption was high.

Figure 11: Estimated oxycodone consumption for August 2024 in mass consumed per day (left axis) and doses per day (right axis) per thousand people. The number of collection days can vary from 5 to 7.

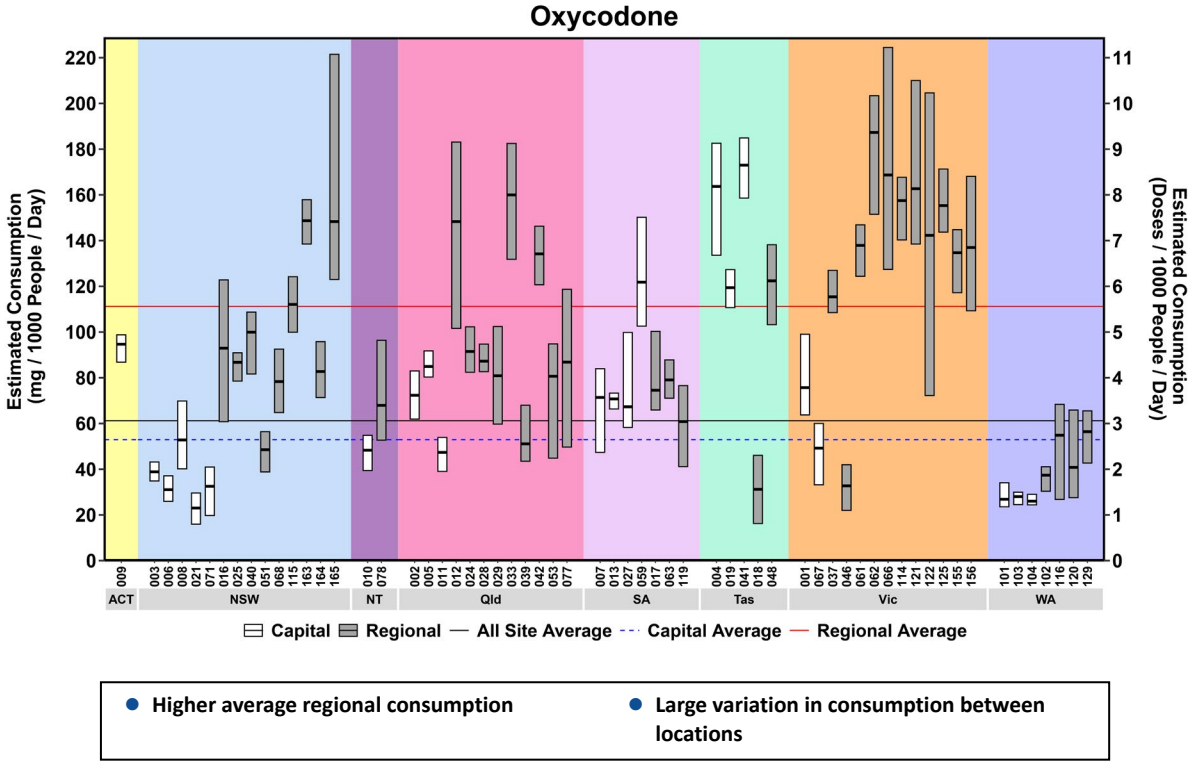
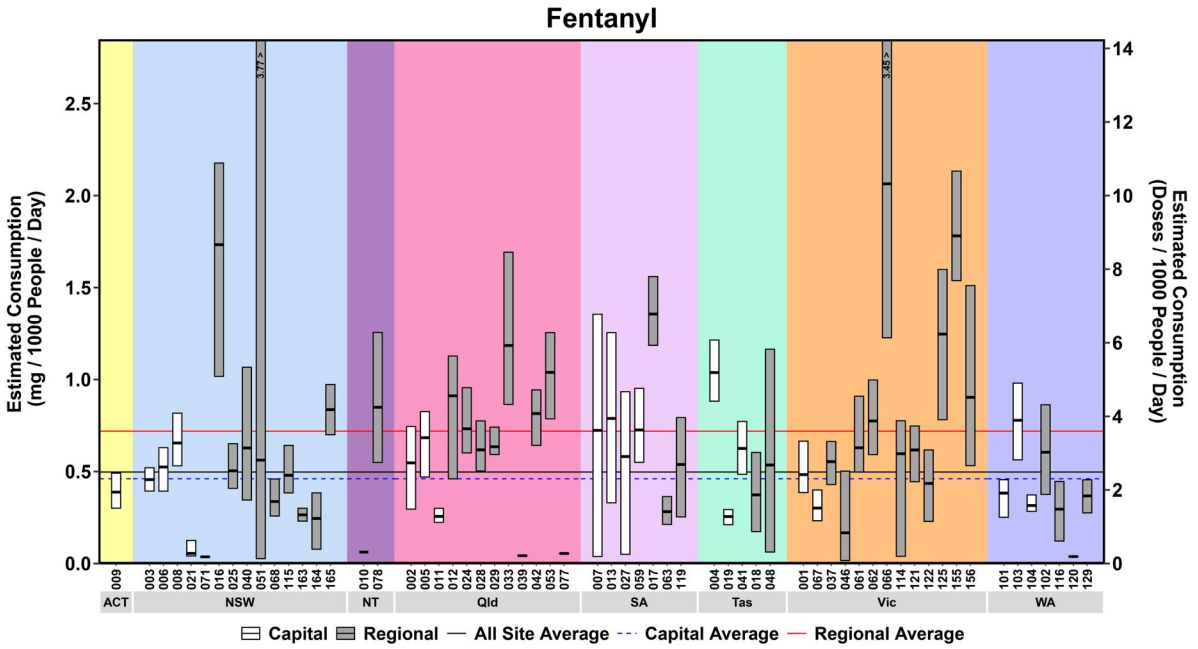
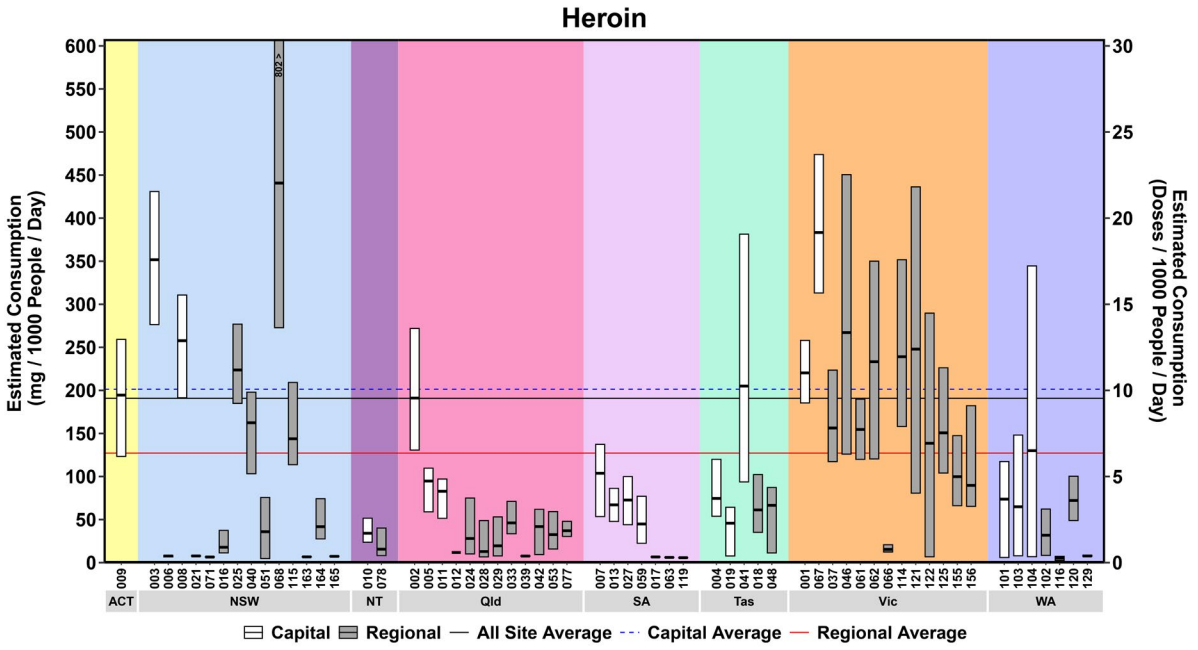


Figure 12: Estimated fentanyl consumption for August 2024 in mass consumed per day (left axis) and doses per day (right axis) per thousand people. Text describing the extreme values shown above the graph are based on the left y axis. The number of collection days can vary from 5 to 7.



- Higher average regional consumption
- Several sites had consumption levels below quantification limits

Figure 13: Estimated heroin consumption for August 2024 in mass consumed per day (left axis) and doses per day (right axis) per thousand people. Text describing the extreme values shown above the graph are based on the left y axis. The number of collection days can vary from 5 to 7.



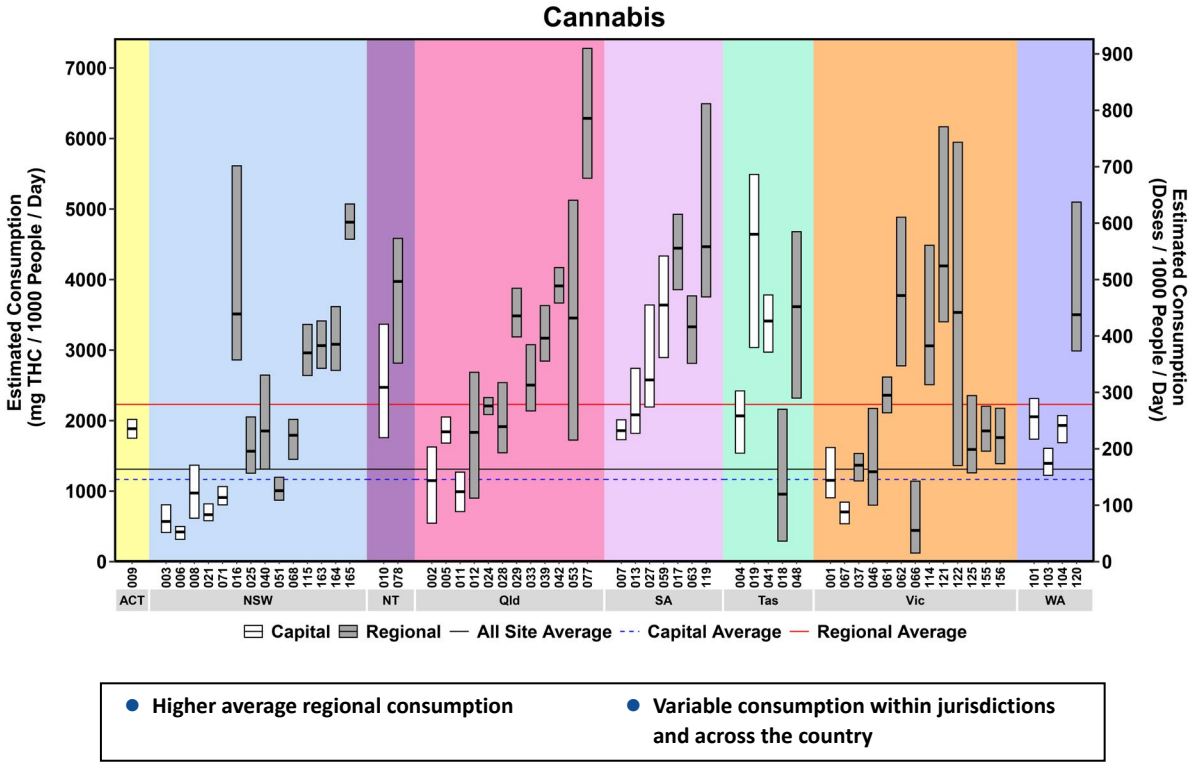
- Higher average capital city consumption
- High consumption in regional Vic and NSW

2.1.4 CANNABIS

In terms of wastewater analysis, the sewer design and collection method may play a part in the reportable levels of THC-COOH used for the purposes of the NWDMP. Accordingly, any spatial comparisons should be made with caution. For the NWDMP, separate samples are collected each day and preserved specifically for THC-COOH analysis, except in some sites in regional Western Australia where this is not possible. The dose amount (8 mg) used in the report is based on the desired effect on an average user of the active ingredient, regardless of the route of administration, e.g. inhaled smoke, part of a plant being used or oral ingestion through edible forms (Freeman and Lorenzetti, 2020). An 8 mg amount would represent between 210–450 mg of dried cannabis containing 15% THC, depending on occasional or regular users consuming the product (Sharma et al 2012).

Cannabis consumption in August 2024 is shown in Figure 14. Regional cannabis consumption was higher than the capital cities and a large spread was observed between sites. Hobart had the highest consumption of the capital cities. A Queensland site had the highest regional consumption.

Figure 14: Estimated cannabis consumption for August 2024 in mass consumed per day (left axis) and doses per day (right axis). The number of collection days can vary from 5 to 7.



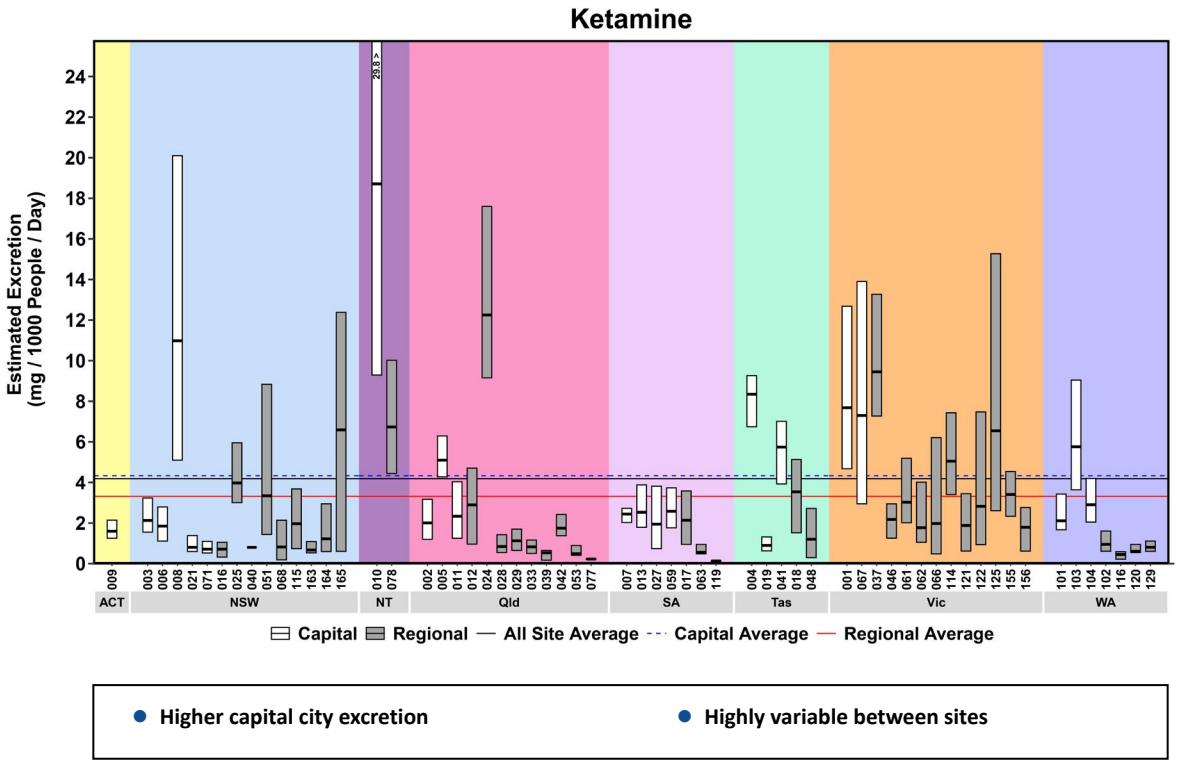
- Higher average regional consumption
- Variable consumption within jurisdictions and across the country

2.1.5 KETAMINE

Ketamine, measured as its metabolite, norketamine, is used medically for the management of acute pain often associated with surgery or trauma. Ketamine also has veterinary applications. Due to its sedative and hallucinogenic effects, the drug has been associated with illicit substance use and is listed as a new psychoactive substance by the United Nations Office on Drugs and Crime. The reported proportions of ketamine and its metabolites in wastewater leave some doubt as to an appropriate factor to convert excreted amounts to consumed amounts. Therefore, measured levels are shown here as excreted daily mass loads.

Ketamine excretion in August 2024 was higher in capital cities compared to regional sites (Figure 15). The results were highly variable across Australia. A few sites in several states and territories had levels well above the relevant averages. In contrast, multiple sites had very low ketamine excretion levels.

Figure 15: Estimated ketamine excretion for August 2024 in mass excreted per day (left axis) per thousand people. The number of collection days can vary from 5 to 7.



2.2 TEMPORAL CHANGES IN DRUG CONSUMPSION ESTIMATE BY JURISDICTION

The population-normalised 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 and October 2024 collections, while regional areas were updated for August 2024. This needs to be considered when comparing results between sections 2.1 and 2.2.

Although every effort has been 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 is most evident for the regional averages, where regional participation has been more varied between periods, while capital city site participation has been more consistent (see Appendix 2 for sites participating in this report). Due to the larger number of data points collected by the Program, the current report presents the last 2 years of data. 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 graph in this section represent the cumulative average across all sampling time points and all samples analysed for each substance. They are not the averages for only the current reporting period as found in section 2.1. Updated changes to the graphs relating to this report are the 2 most recent bars consisting of capital cities (August and October 2024) and the single most recent bar for regional areas (August 2024). Some temporal changes reflected in these bars may be a consequence of updated populations used in the calculations. See Appendix 4 of Report 17 for the difference in populations for the 2016 and 2021 Census for each catchment.

2.2.1 NICOTINE AND ALCOHOL

The consumption of nicotine refers to all sources of the chemical, including tobacco, e-cigarettes, and replacement therapies. Nicotine consumption has been consistently higher in regional areas since the Program commenced (Figure 16). The Northern Territory had the highest nicotine consumption nationally in August 2024.

Average alcohol consumption is higher in regional areas compared to the capital cities (Figure 17). However, Tasmania is a clear exception, with alcohol consumption in Hobart amongst the highest in the country, despite regional consumption being relatively low in the state. In August and October 2024, only the Northern Territory had higher alcohol consumption than Hobart. Alcohol consumption in other parts of the country is relatively stable.

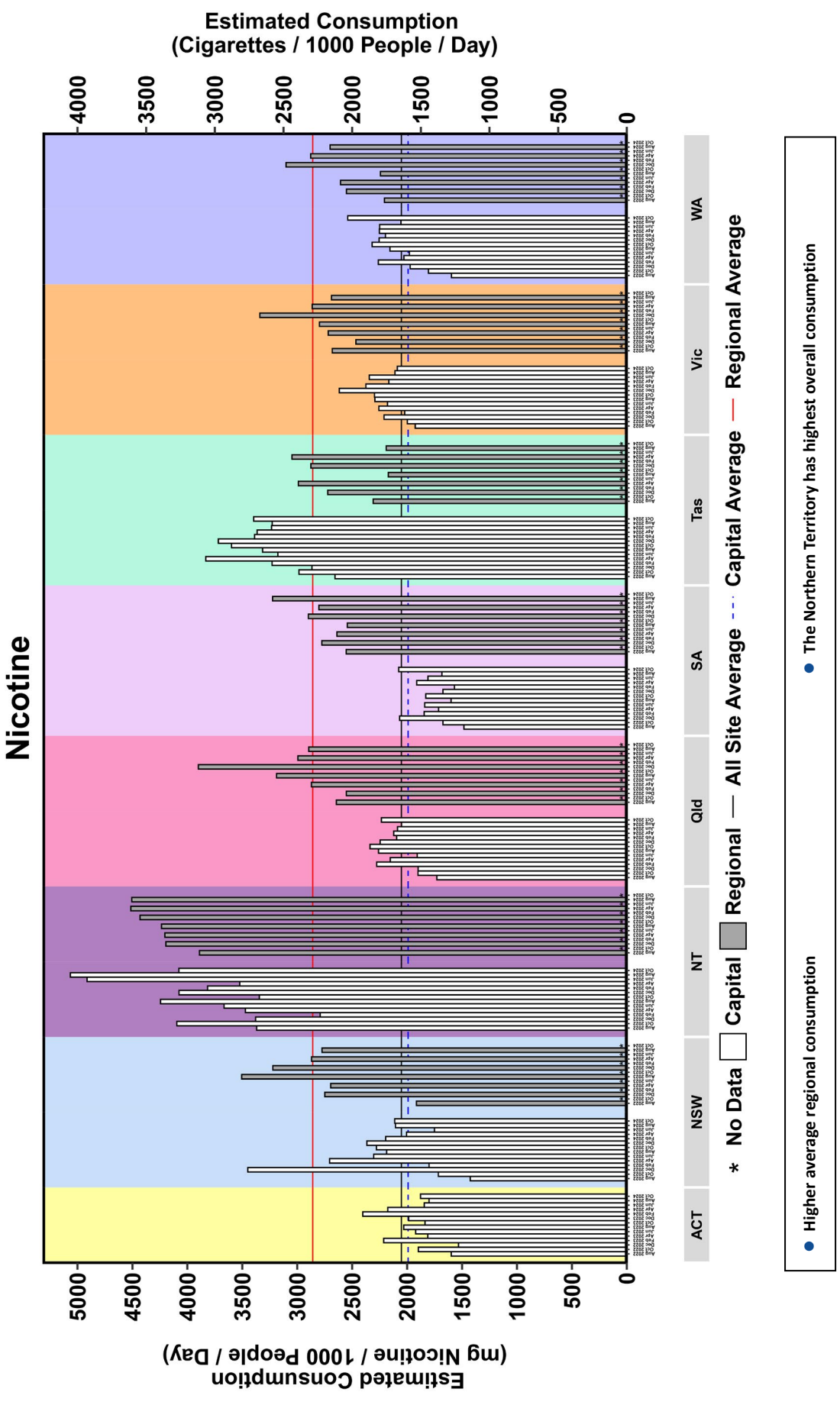


Figure 16: Estimated average consumption of nicotine by state/territory, August 2022 to October 2024, where 1 cigarette provides 1.25 mg of nicotine.

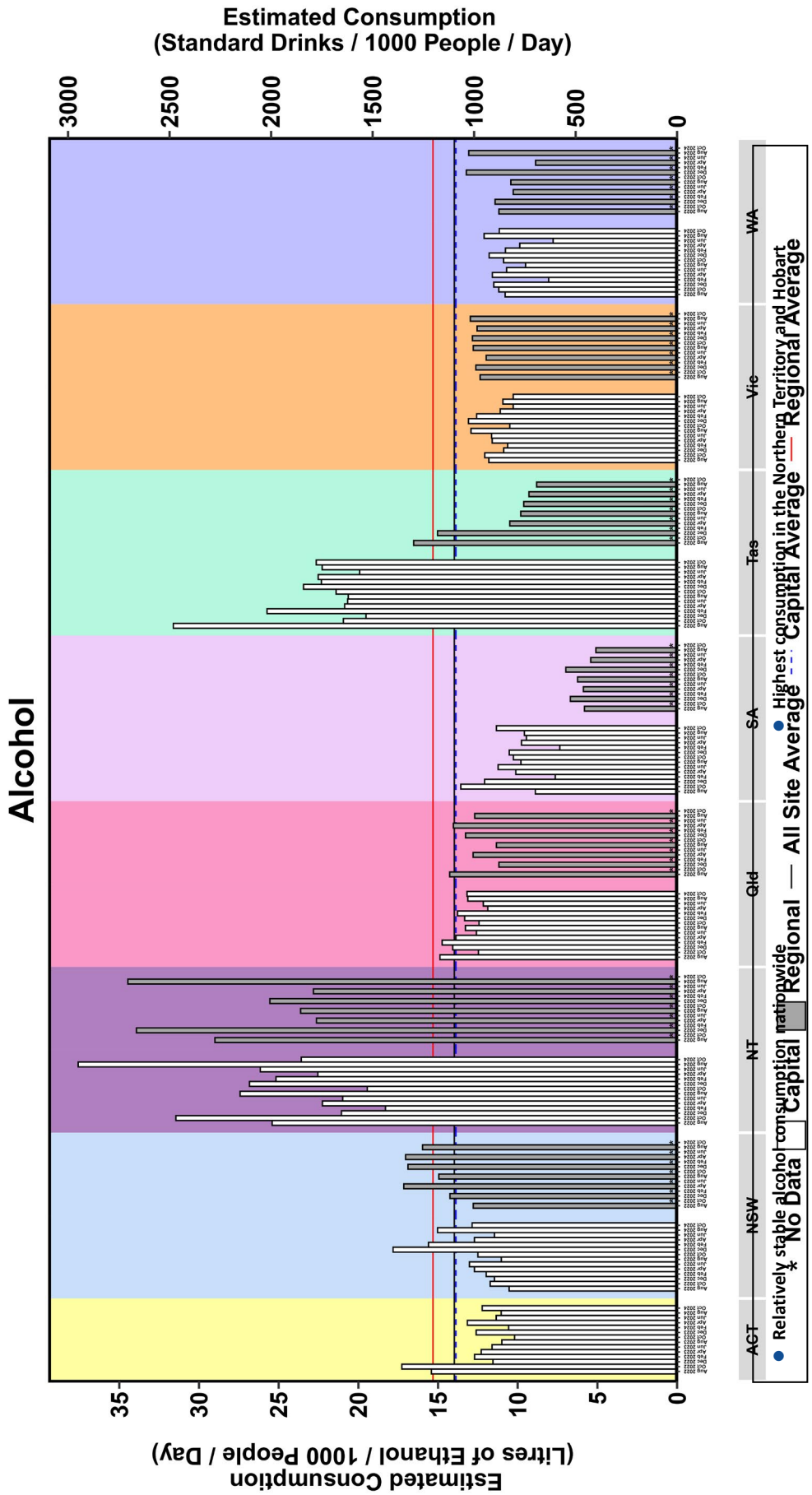


Figure 17: Estimated average consumption of alcohol by state/territory, August 2022 to October 2024. A standard drink is 10.0 g, or 12.6 mL.

2.2.2 STIMULANTS

2.2.2.1 METHYLAMPHETAMINE

Methylamphetamine consumption has been increasing in most parts of the country and across jurisdictions (Figure 18). The latest results show consumption was at the highest level in the last 2 years in many jurisdictions. Sydney and Melbourne are the most obvious exceptions. South Australia and Western Australia had the highest methylamphetamine consumption in August and October 2024, with regional Western Australia the highest overall. On average, regional consumption is higher than in the capital cities.

Historical levels of methylamphetamine consumption predating the NWDMP have been available for some sites, shown in Figure 19 and Figure 20. Current results show that the drug continues to be consumed at relatively high levels at all of these sites.

2.2.2.2 COCAINE

Average cocaine consumption in capital cities is higher than in regional areas (Figure 21). There has been an increase in cocaine consumption over the past year. Sydney has the highest consumption in the country. Regional New South Wales and Queensland have much higher cocaine consumption than other regional parts of the country.

2.2.2.3 MDMA

MDMA consumption is shown in Figure 22. Recognising that MDMA consumption is recovering from record low levels, considerable increases in consumption were evident in Sydney and Darwin. MDMA consumption has been increasing to a lesser degree in several other jurisdictions over the course of 2024. Average consumption has been historically higher in regional areas over the life of the Program.

2.2.2.4 MDA

MDA is expressed as excreted amounts due to the lack of drug metabolism information (Figure 23). The excretion of MDA tends to fluctuate at low levels in most jurisdictions. The long-term average excretion of MDA in regional parts of the country is well above that of the capital cities. However, this trend has been changing in several jurisdictions. Hobart had the highest MDA excretion in August 2024.

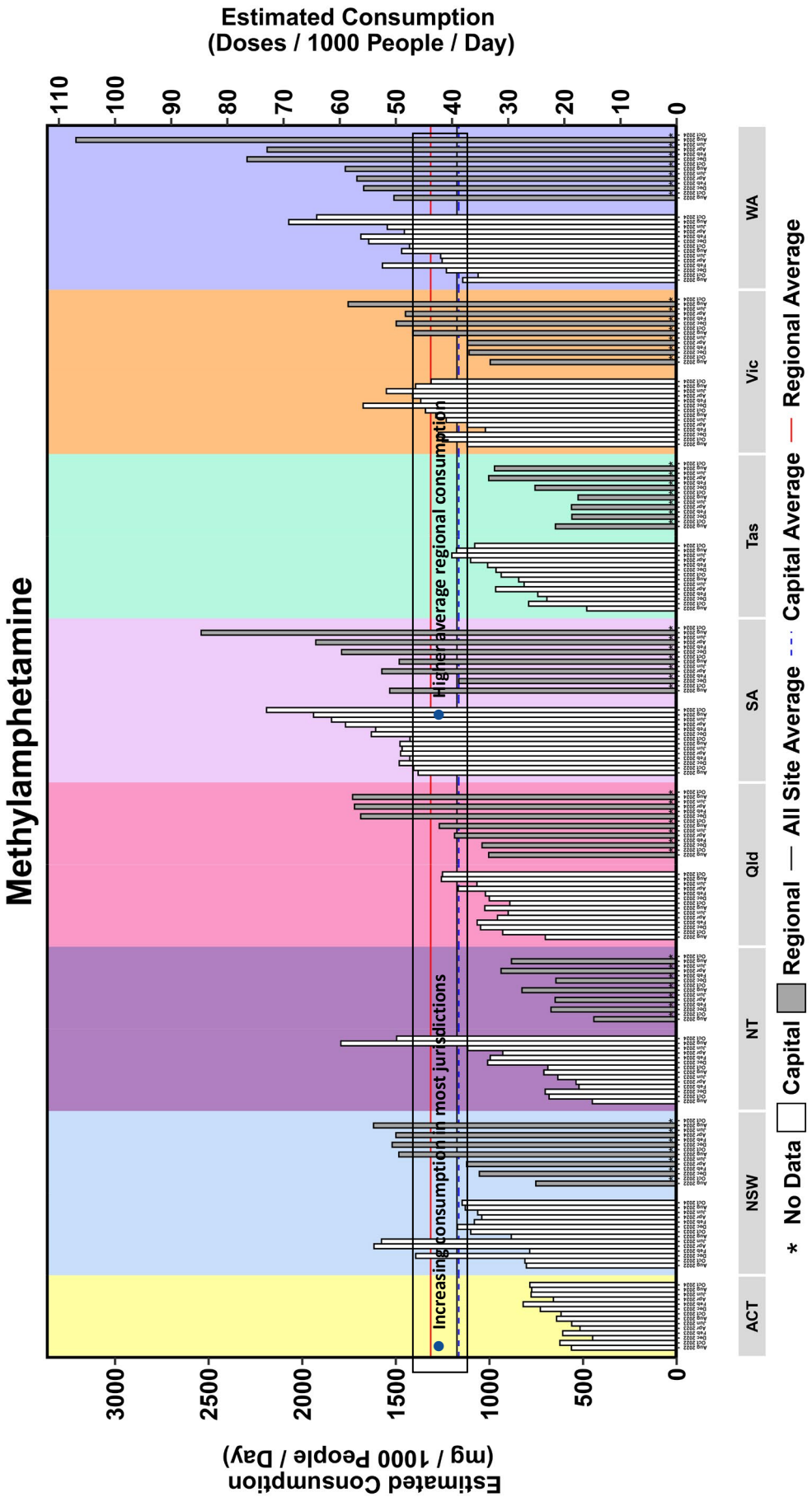


Figure 18: Estimated average consumption of methylamphetamine by state/territory, August 2022 to October 2024.

Figure 19: Change in methylamphetamine consumption for sites in Queensland and Adelaide with historical data.

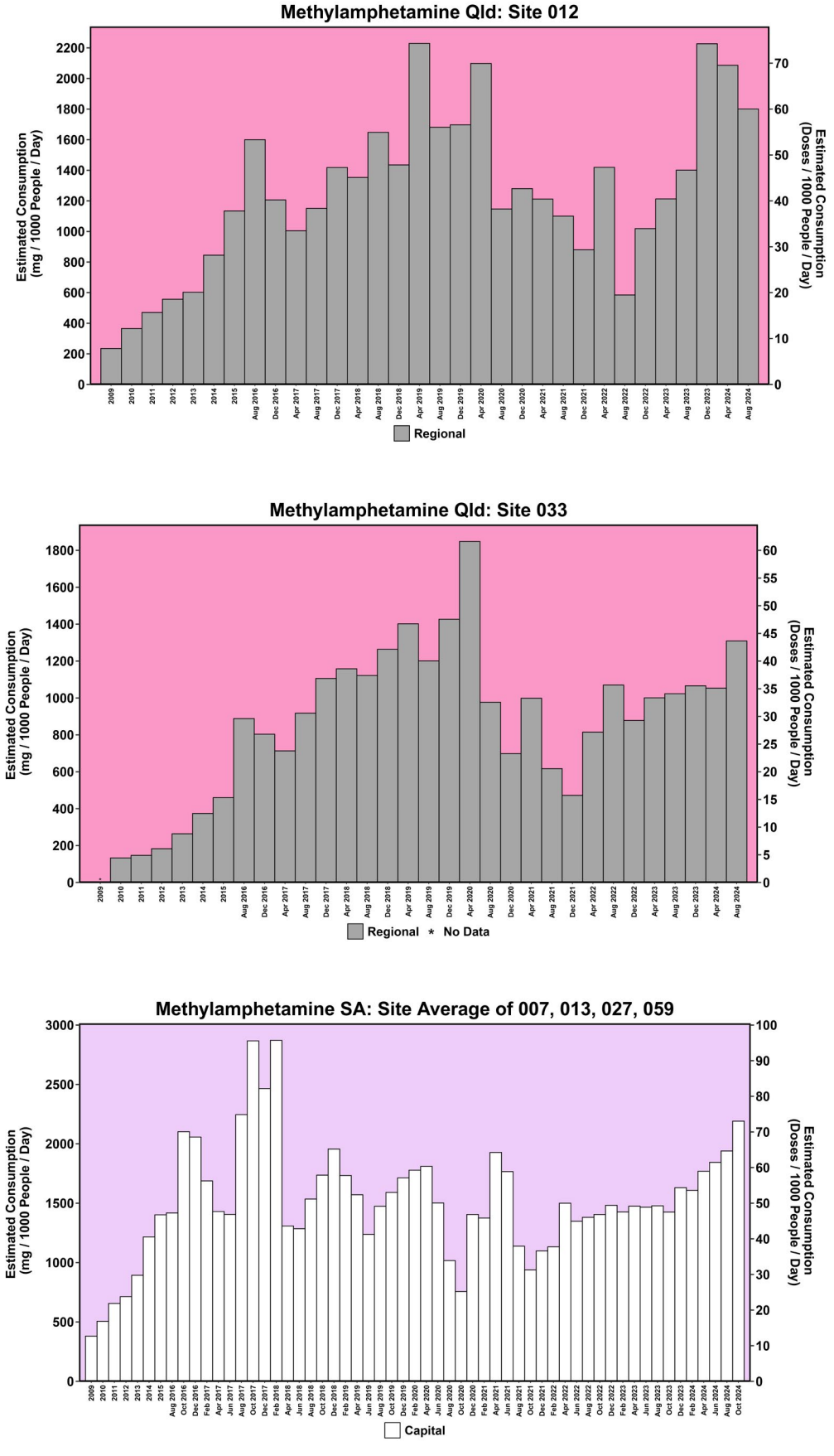
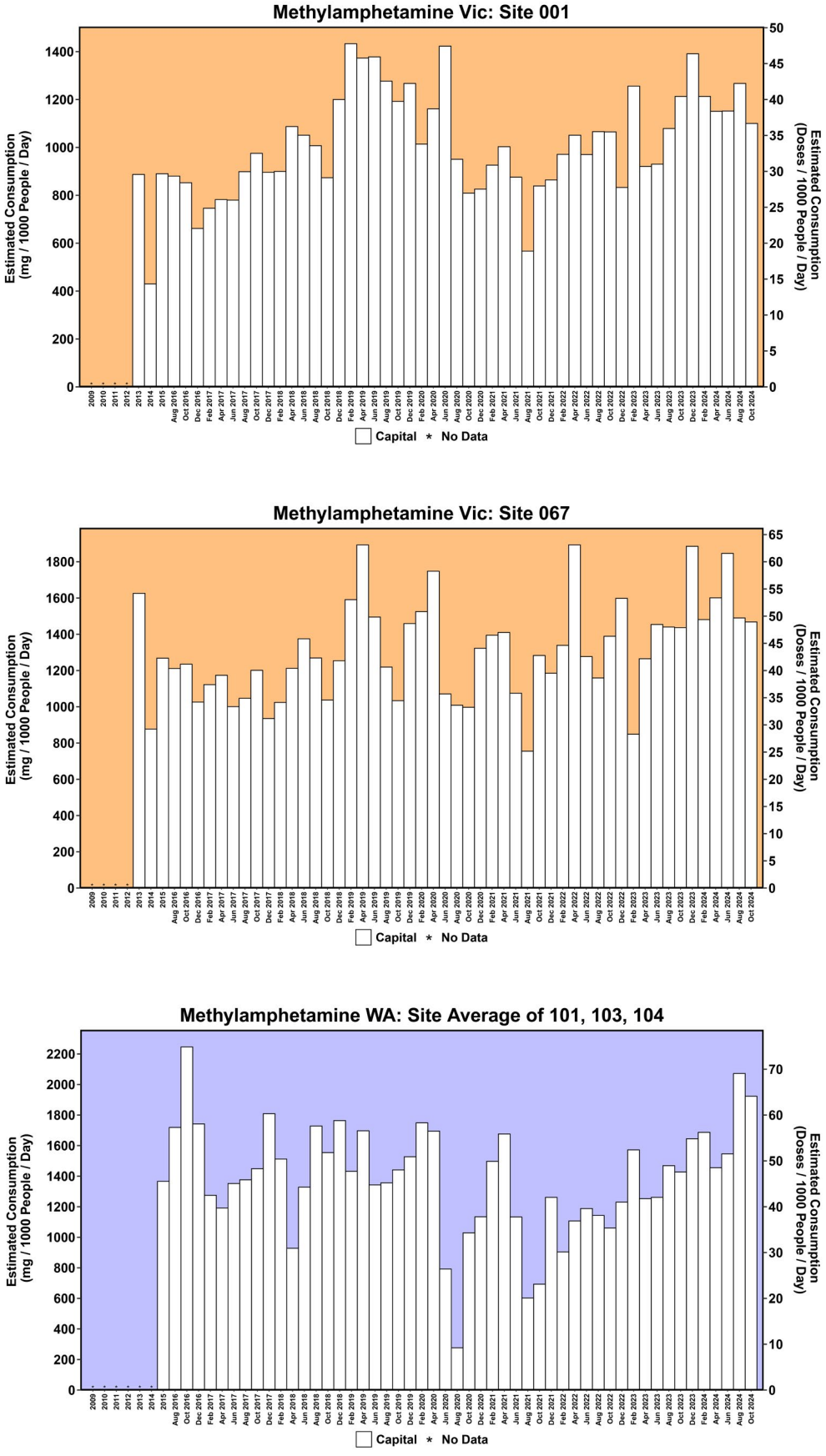


Figure 20: Change in methylamphetamine consumption for sites in Melbourne and Perth with historical data. Both Melbourne sites were the average of one week per year in 2013, 2014 and 2015.



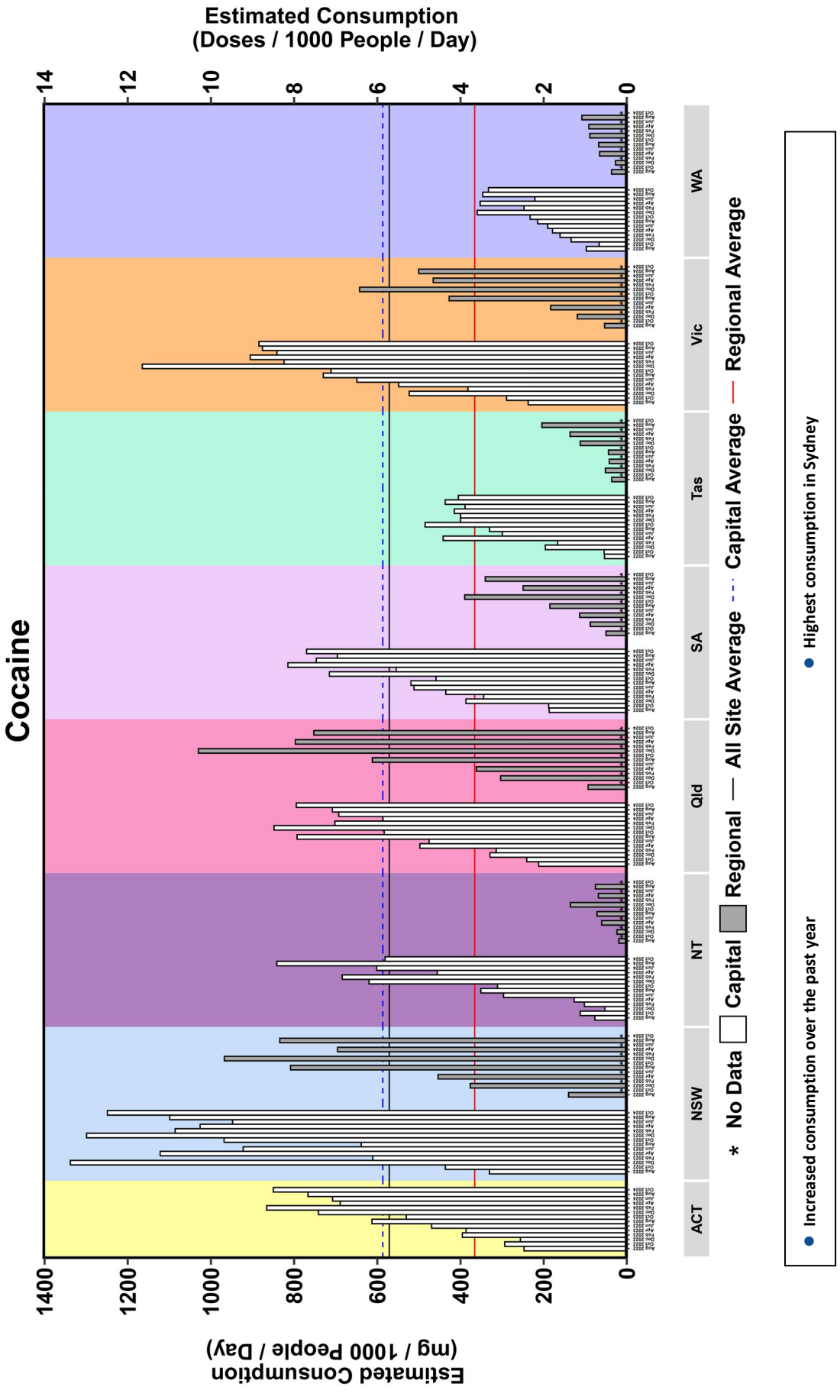


Figure 21: Estimated average consumption of cocaine by state/territory, August 2022 to October 2024.

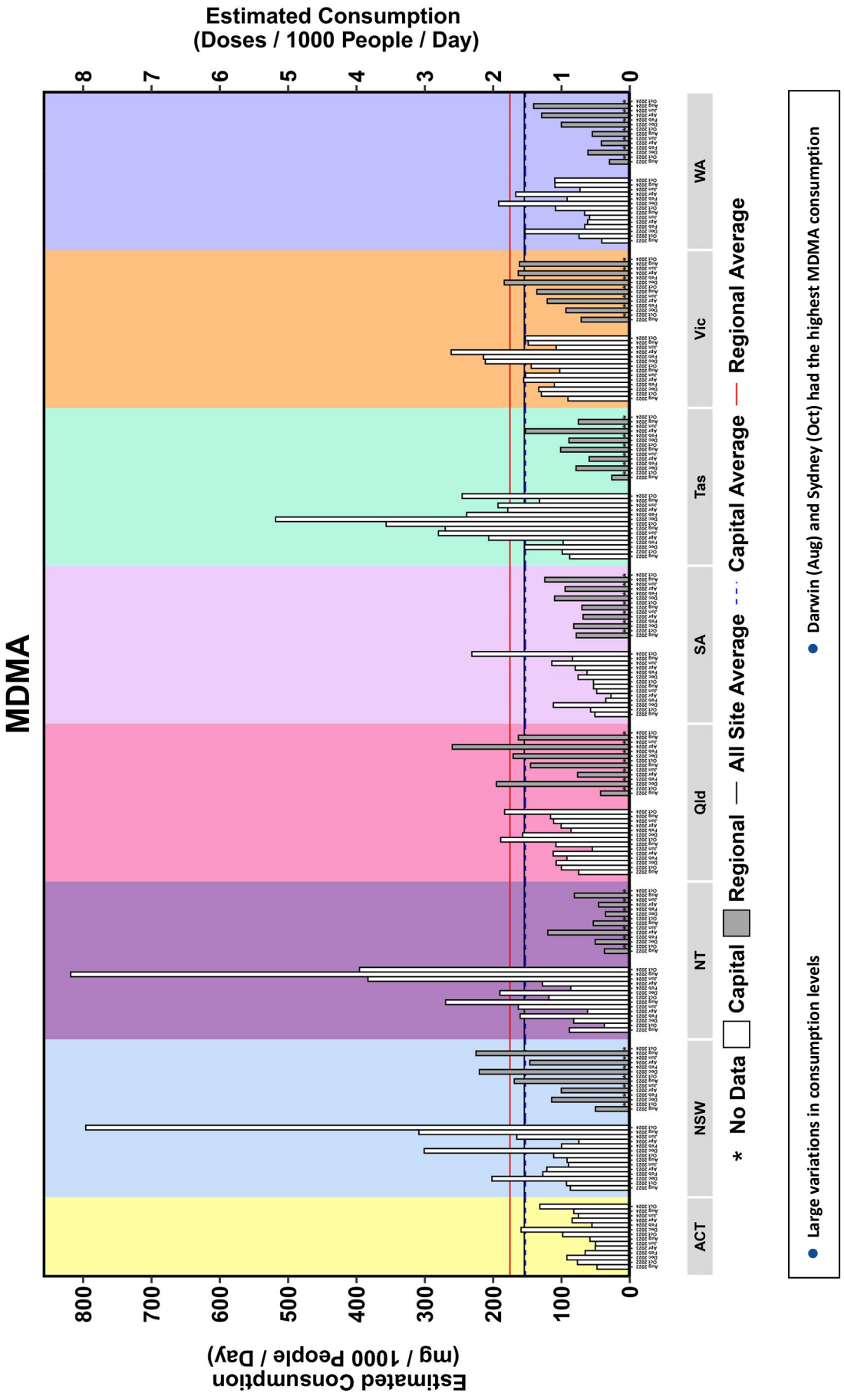


Figure 22: Estimated average consumption of MDMA by state/territory, August 2022 to October 2024.

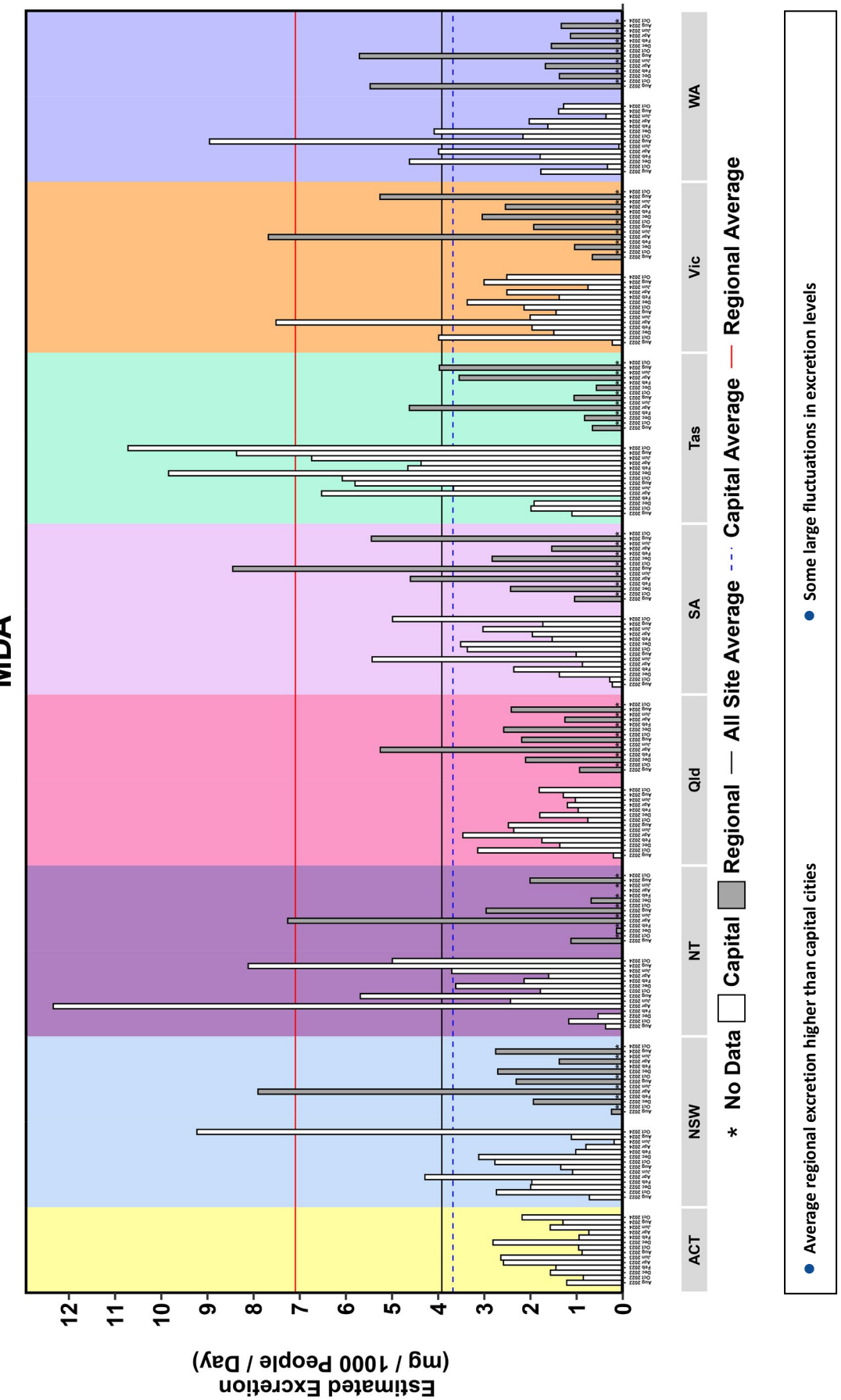


Figure 23: Estimated average excretion of MDA by state/territory, August 2022 to October 2024.

2.2.3 OPIOIDS

2.2.3.1 OXYCODONE

Oxycodone consumption in Australia is characterised by substantially higher regional consumption (Figure 24). Tasmania is an exception and also the state with the highest capital city consumption. Consumption in regional Queensland and Victoria is higher than in the other jurisdictions.

2.2.3.2 FENTANYL

Average regional consumption of fentanyl is higher than in the capital cities, with the exception of Tasmania (Figure 25). Fluctuations have been evident over the past 2 years, but have not been uniform between and sometimes within jurisdictions. Adelaide had the highest capital city consumption in August 2024 and Queensland the highest regional consumption.

2.2.3.3 HEROIN

Heroin is consumed at higher levels in the capital cities than in regional areas (Figure 26). Melbourne had the highest capital city consumption, with New South Wales the highest regional consumption. There has been increased consumption in several jurisdictions in the past year.

Historical heroin data from before the Program are available for Adelaide (pre-2016). Although current consumption is less than previous years, it reflects the upward trend in heroin consumption since the start of the year (Figure 27).

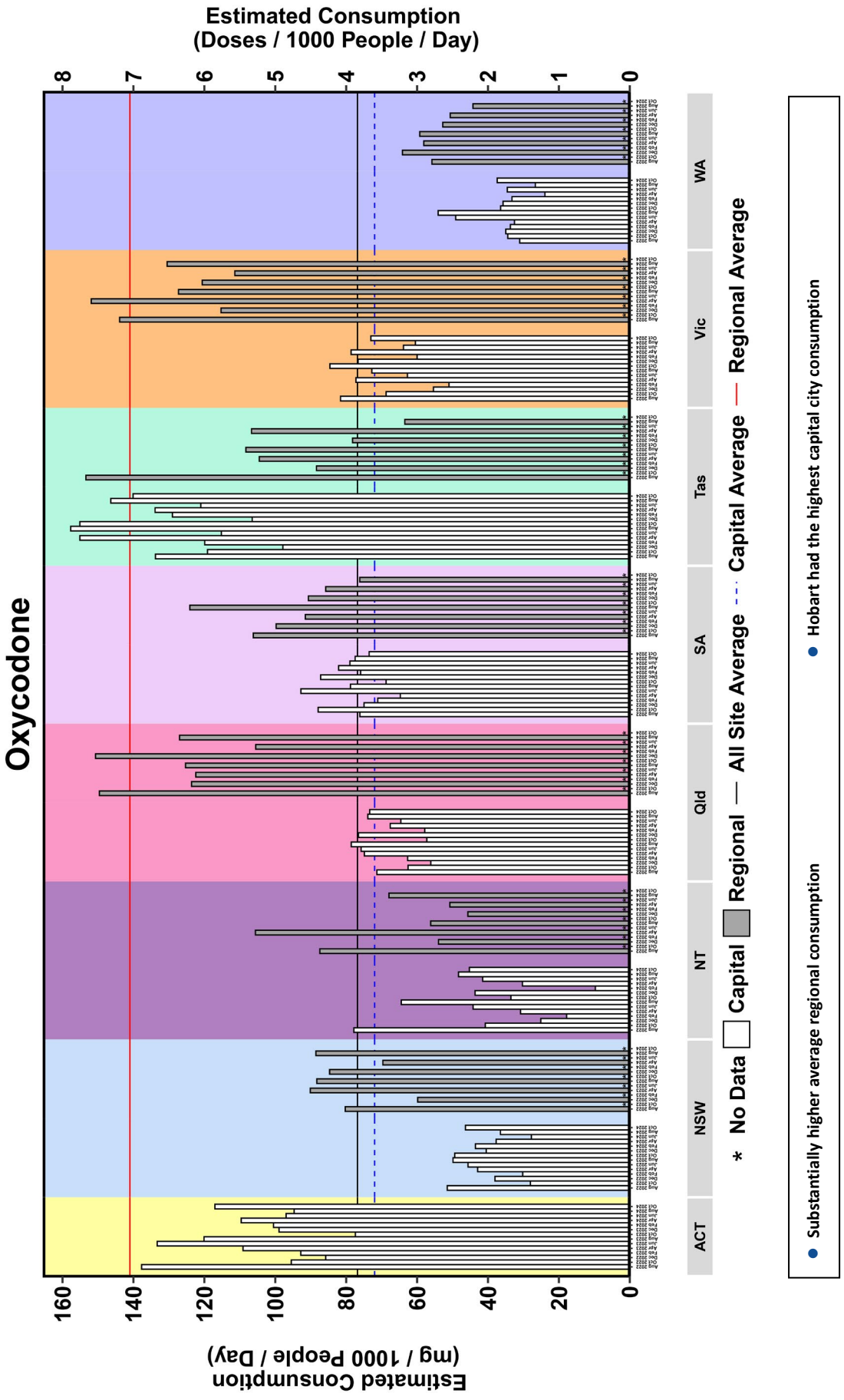


Figure 24: Estimated average consumption of oxycodone by state/territory, August 2022 to October 2024.

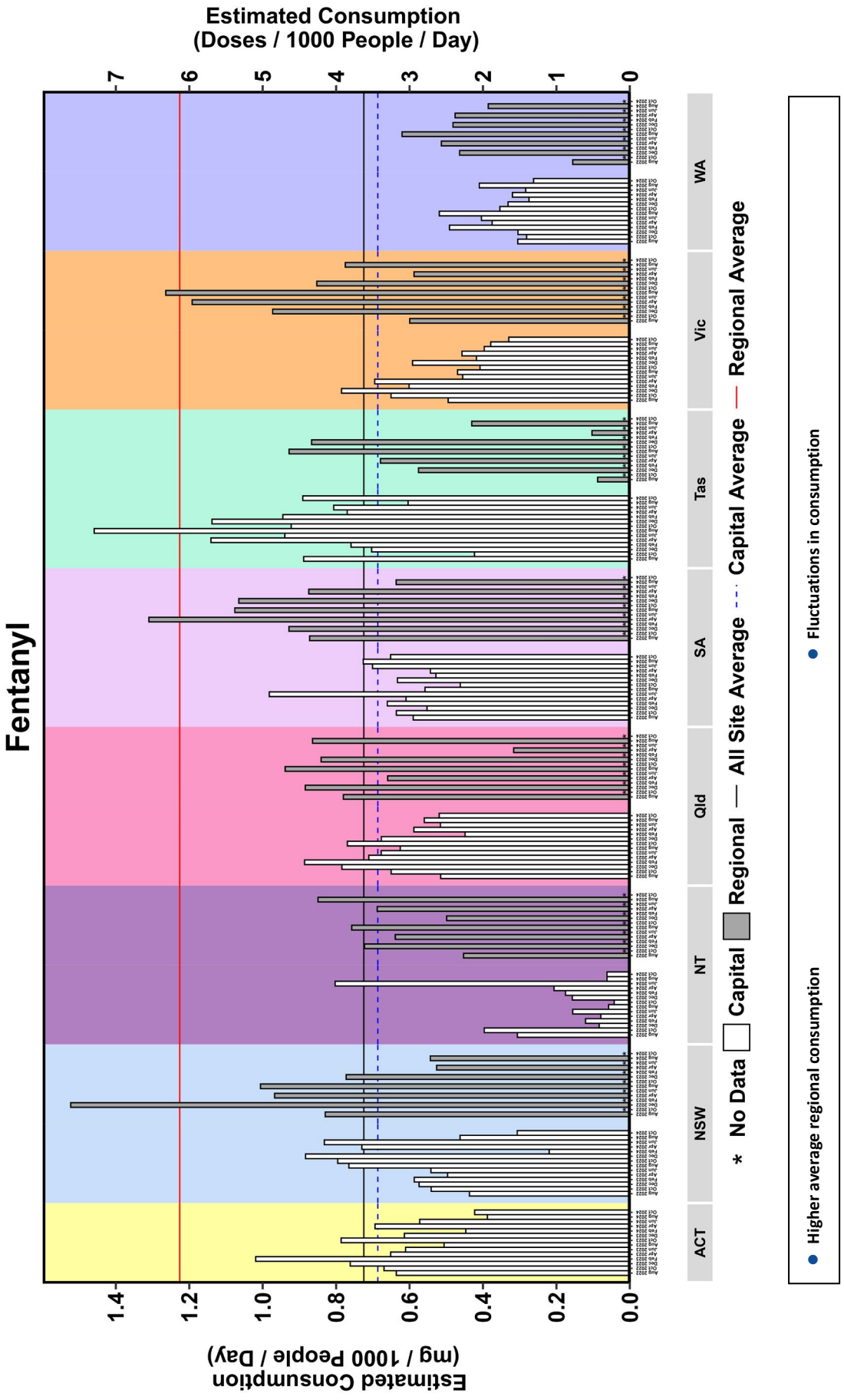


Figure 25: Estimated average consumption of fentanyl by state/territory, August 2022 to October 2024.

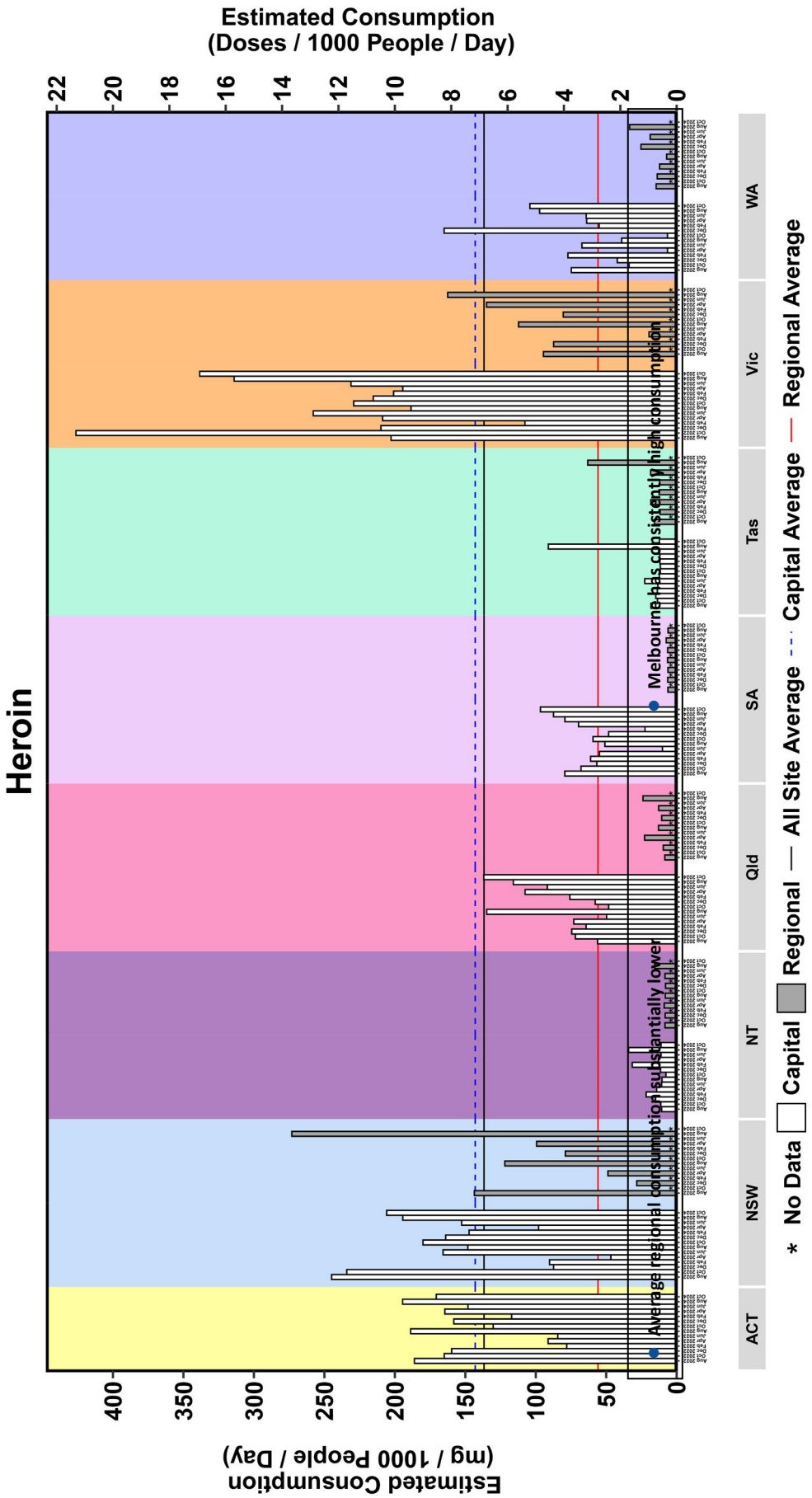
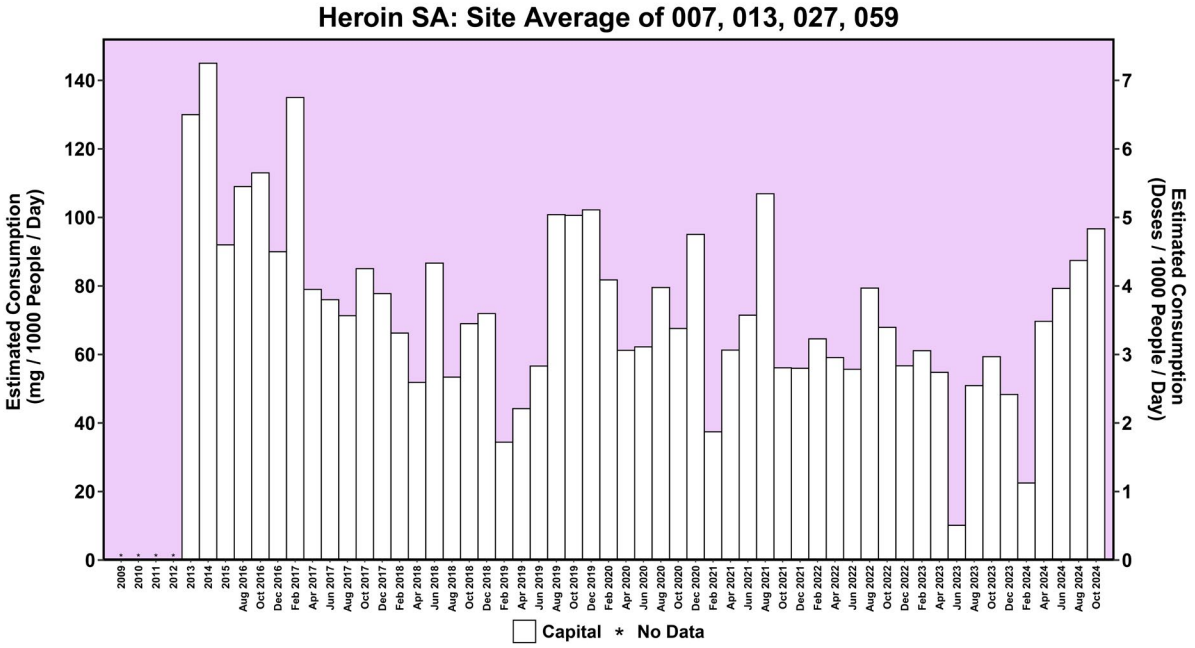


Figure 26: Estimated average consumption of heroin by state/territory, August 2022 to October 2024.

Figure 27: Change in heroin consumption for sites in Adelaide with historic data.



2.2.4 CANNABIS

Average regional cannabis consumption is higher than the capital cities (Figure 28). Regional parts of the Northern Territory, South Australia and Western Australia have cannabis consumption levels well above the national average. Hobart had the highest capital city consumption, reaching a record high level in August 2024.

Long-term cannabis data are available for Adelaide (Figure 29). The August 2024 results show cannabis consumption reached historical high levels and that consumption in Adelaide has been gradually increasing since 2011.

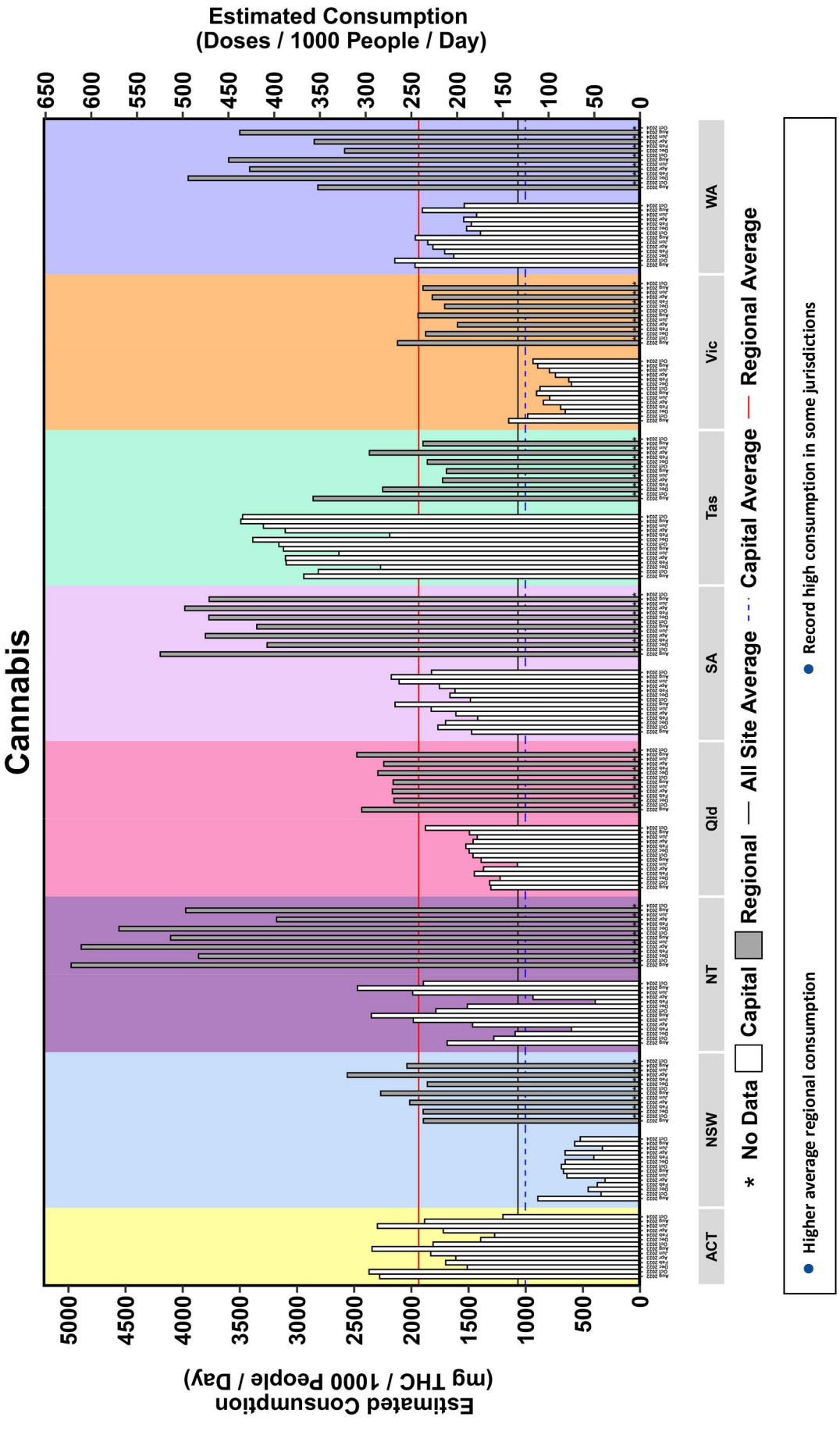
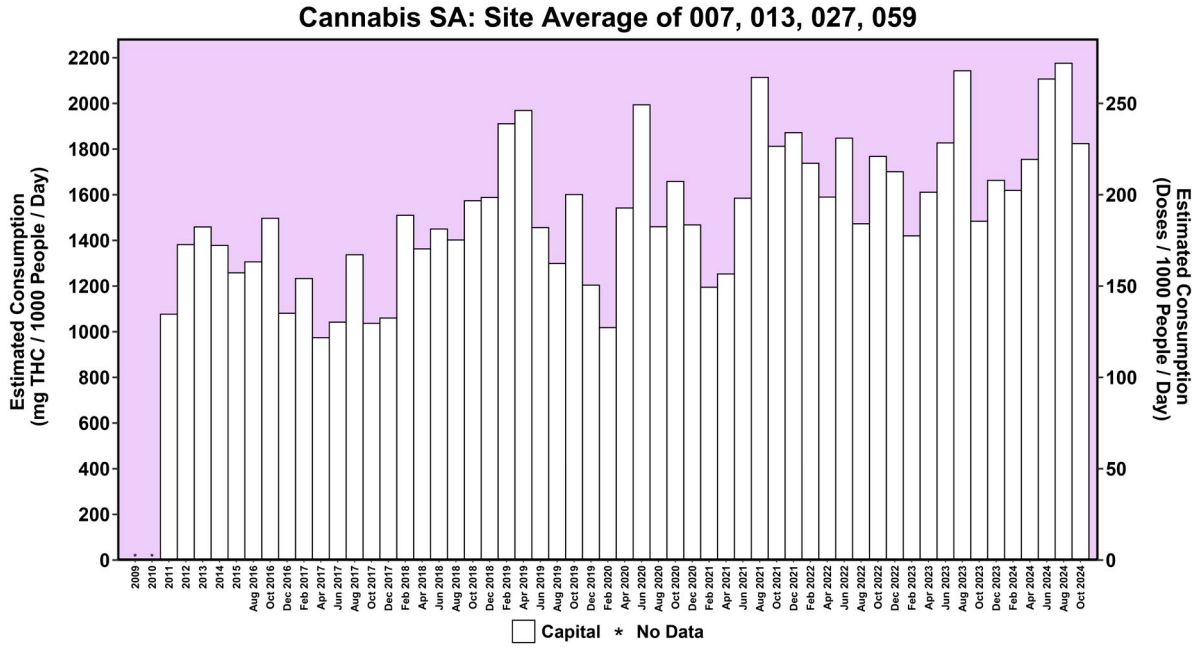


Figure 28: Estimated average consumption of cannabis by state/territory, August 2022 to October 2024.

Figure 29: Change in cannabis consumption for sites in Adelaide with historical data. Cannabis is detected via the THC metabolite, THC-COOH.



2.2.5 KETAMINE

Average capital city ketamine excretion exceeds that in regional areas (Figure 30). Excreted amounts have been increasing in most capital cities. The Northern Territory had the highest ketamine excretion nationally.

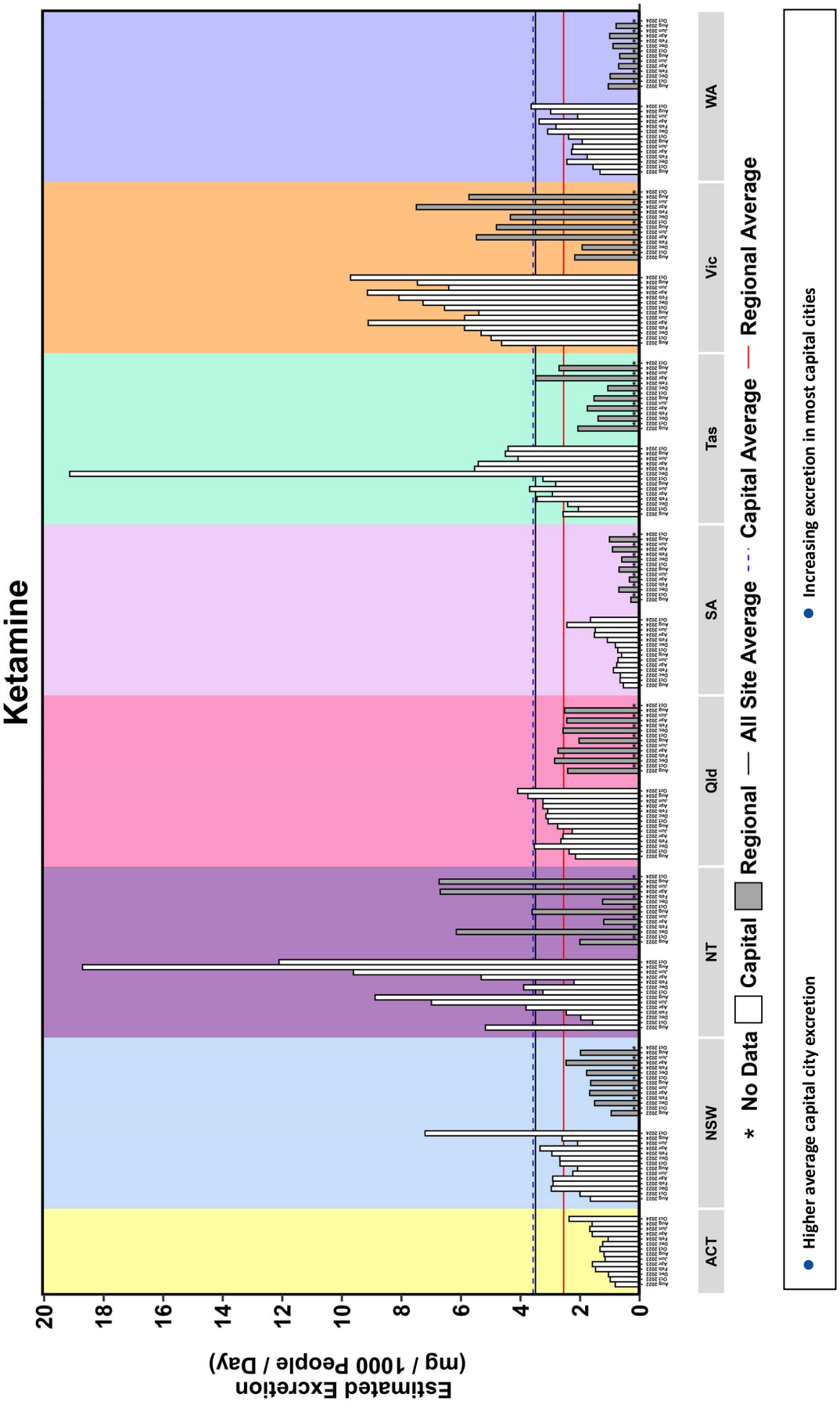


Figure 30: Estimated average excretion of ketamine by state/territory, August 2022 to October 2024.

2.3 NATIONAL CAPITAL CITY AND REGIONAL AVERAGES

To show national trends for the individual substances, all capital city and regional sites were combined for each substance (Figure 31 to 36). Fewer sites participated in October 2016 and to account for this, the average consumption in August and December 2016 was used to provide the overall October 2016 estimate. Regional sites are collected every second sampling period.

2.3.1 NICOTINE AND ALCOHOL

Average nicotine consumption is shown in Figure 31. Regional averages have been higher than capital city averages over the life of the Program. The August 2024 results have nicotine consumption around the long-term regional and capital city average levels. Consumption of nicotine has increased over the life of the Program.

Alcohol consumption has been relatively steady over the past 2 years (Figure 31). Average regional consumption has been above that of the capital cities in most collection periods. Consumption of alcohol has decreased over the life of the Program.

2.3.2 STIMULANTS

2.3.2.1 METHYLAMPHETAMINE

National methylamphetamine consumption trends are shown in Figure 32. Average capital city consumption in August 2024 was at a record level, exceeding December 2023. Regional consumption has almost doubled in the past 3 years and is at the highest level it has been since April 2020. Consumption of methylamphetamine has increased over the life of the Program.

2.3.2.2 COCAINE

Average cocaine consumption has been higher in capital cities compared to regional areas over the life of the Program (Figure 32). Cocaine consumption has increased substantially since the record low levels reported in August 2022 and also over the life of the Program.

2.3.2.3 MDMA

Average MDMA consumption was higher in the capital cities than in regional areas in August 2024 (Figure 33). Following highs in December 2019, consumption decreased substantially until April 2022, since when it has gradually increased. There was record high capital city MDMA consumption in October 2024, matching levels reported in December 2019. Regional MDMA consumption has not increased to the same extent. MDMA consumption has been variable over the life of the Program.

2.3.2.4 MDA

Average MDA excretion is generally higher in regional areas compared to the capital cities (Figure 33). MDA excretion remained beneath the respective long-term averages in August 2024 and has decreased over the life of the Program.

2.3.3 OPIOIDS

2.3.3.1 OXYCODONE

Average oxycodone consumption is consistently higher in regional areas than in the capital cities (Figure 34). Consumption of the drug has been relatively stable over the past 3 years, with only small changes between reporting periods. Oxycodone consumption has decreased over the life of the Program.

2.3.3.2 FENTANYL

Average fentanyl consumption in regional areas has generally exceeded that of the capital cities (Figure 34). Consumption of fentanyl has decreased since August 2023 and over the life of the Program.

2.3.3.3 HEROIN

Average heroin consumption is higher in the capital cities than in regional areas (Figure 35). There was record high regional heroin consumption in August 2024. Heroin consumption has increased over the life of the Program.

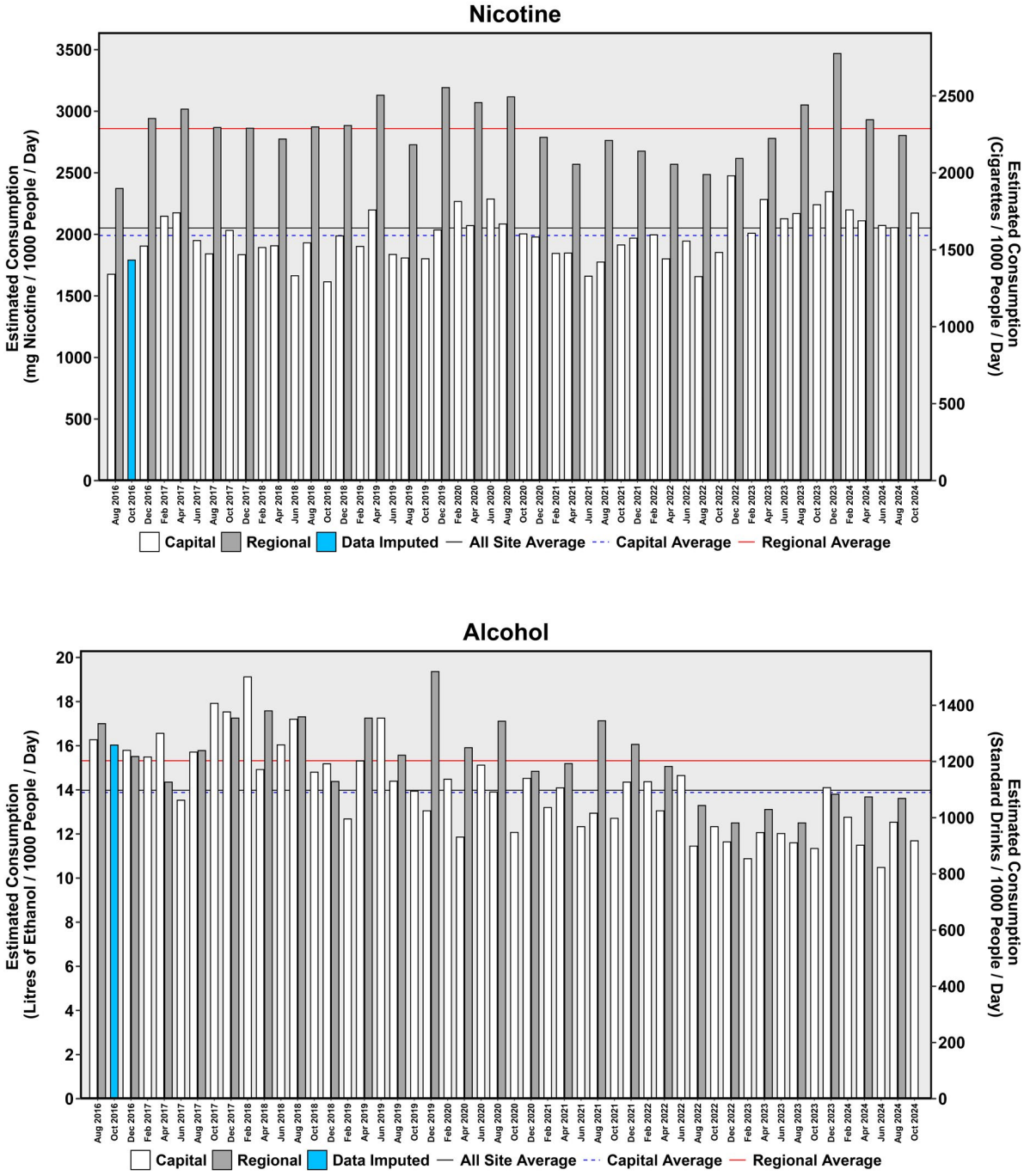
2.3.4 CANNABIS

Average cannabis consumption is substantially higher in regional areas than in capital cities (Figure 35). The latest results are generally consistent with a relatively flat trend stretching back 2 years. Cannabis consumption has increased over the life of the Program.

2.3.5 KETAMINE

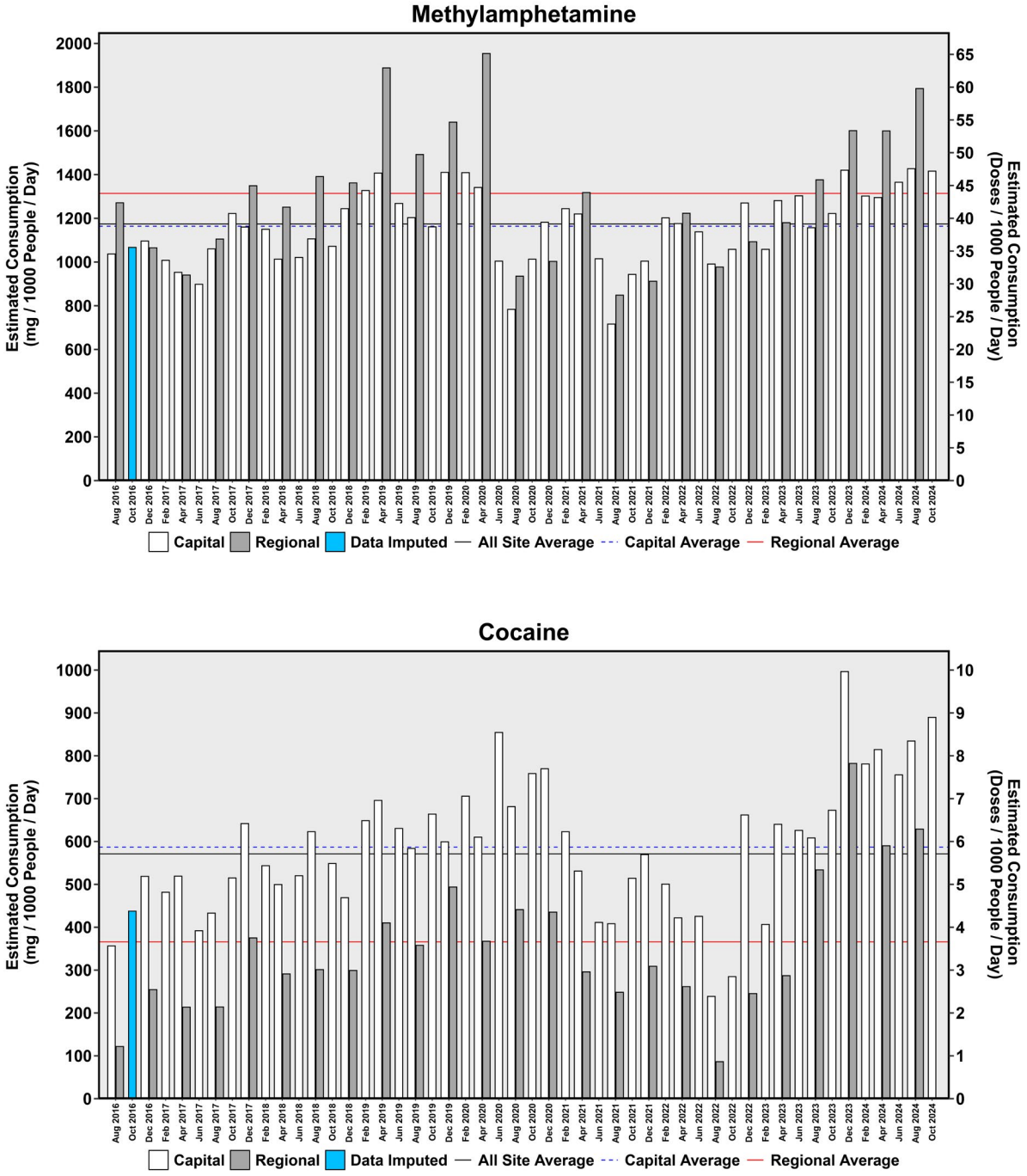
Ketamine excretion in regional areas is lower than the capital cities (Figure 36). Excretion levels in the capital cities reached record high levels in October 2024. Regional consumption declined slightly in August after the April 2024 record, but remained above the long-term average. Ketamine excretion has increased over the life of the Program.

Figure 31: The population-weighted average of all sites for nicotine and alcohol.



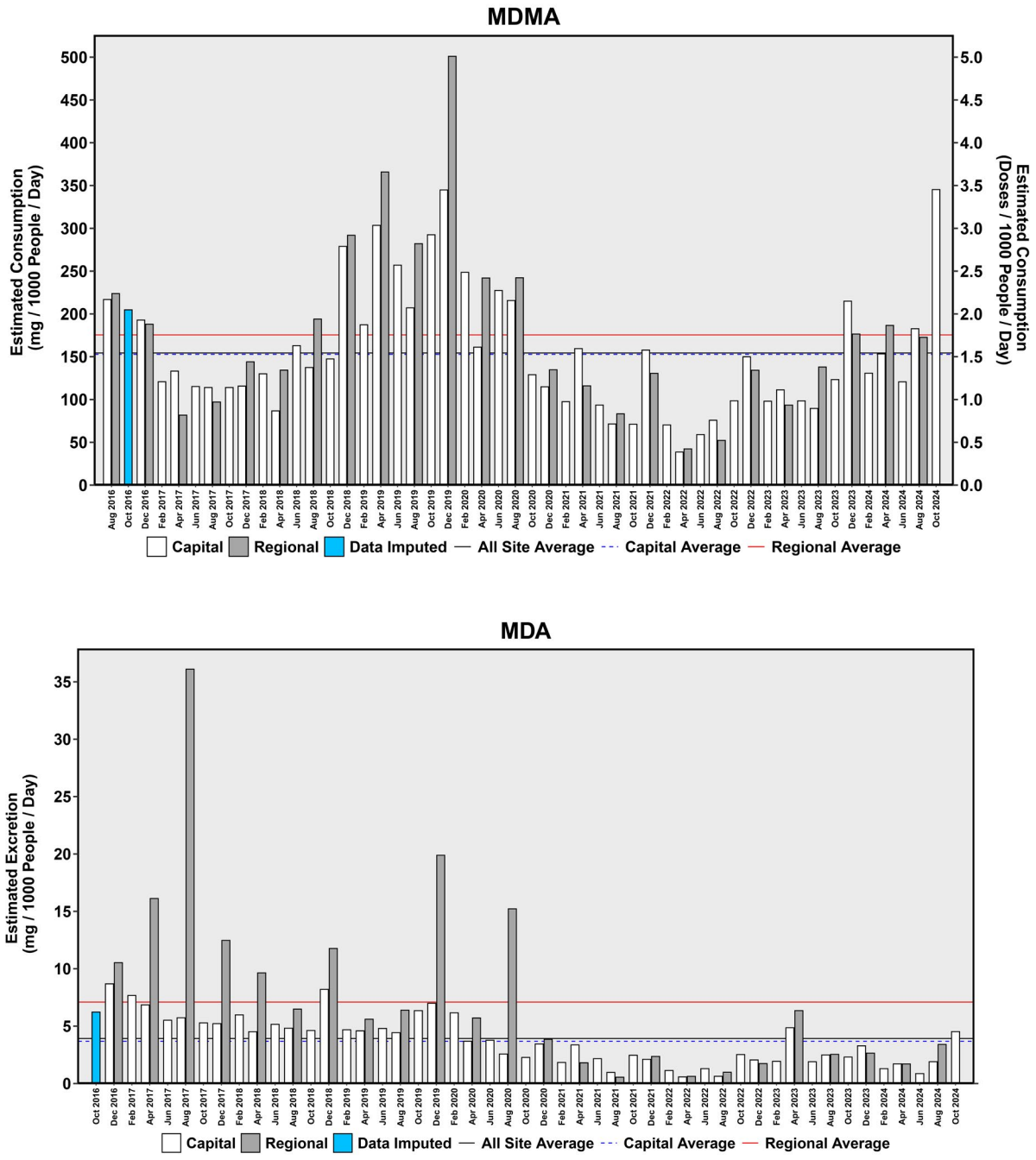
As Queensland and New South Wales capital city sites were not sampled in October 2016, their average consumption in August and December 2016 was used to provide the overall October estimate.

Figure 32: The population-weighted average of all sites for methylamphetamine and cocaine.



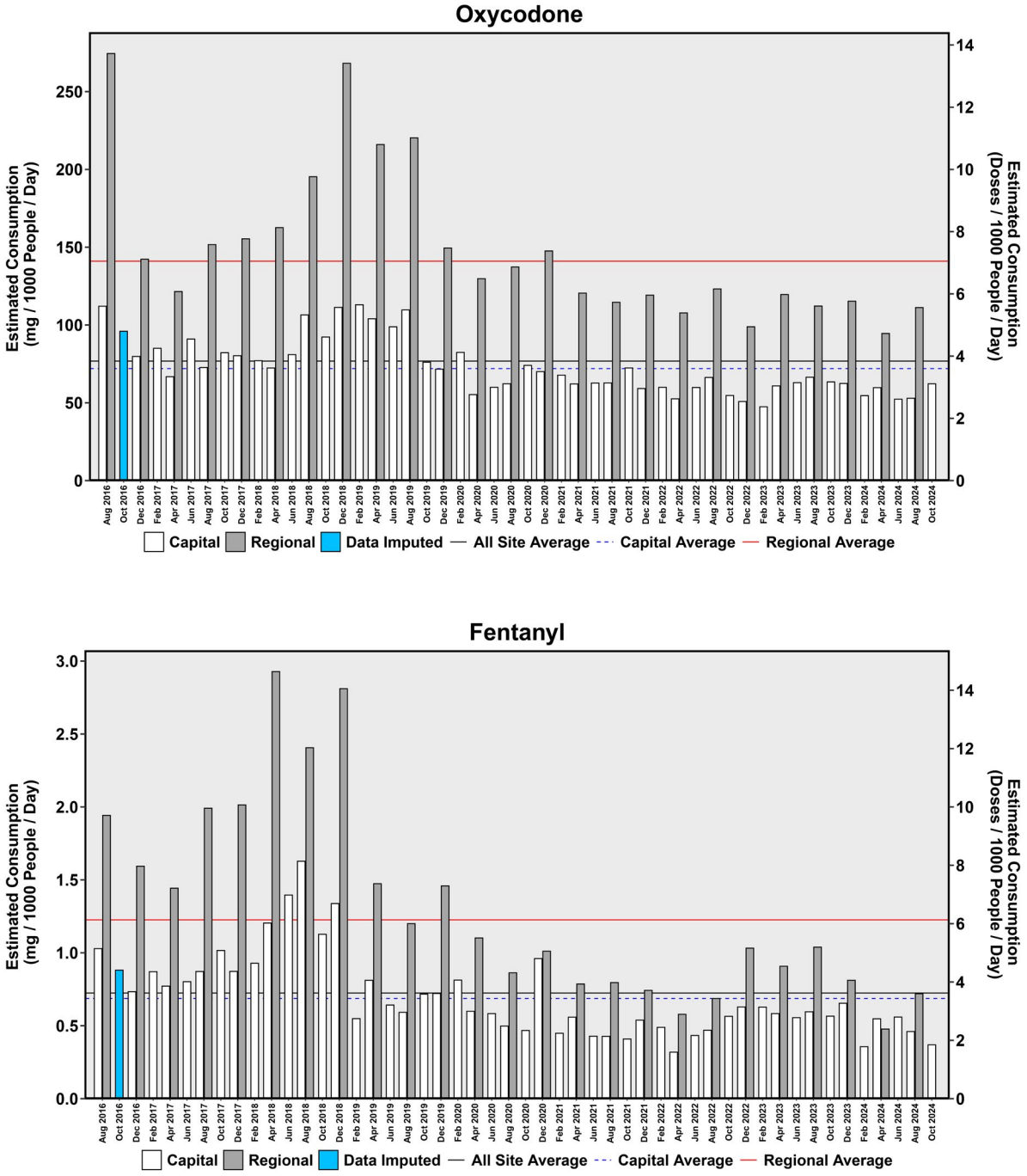
As Queensland and New South Wales capital city sites were not sampled in October 2016, their average consumption in August and December 2016 was used to provide the overall October estimate.

Figure 33: The population-weighted average of all sites for MDMA and MDA.



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 34: The population-weighted average of all sites for oxycodone and fentanyl.



As Queensland and New South Wales capital city sites were not sampled in October 2016, their average consumption in August and December 2016 was used to provide the overall October estimate.

Figure 35: The population-weighted average of all sites for heroin and cannabis.

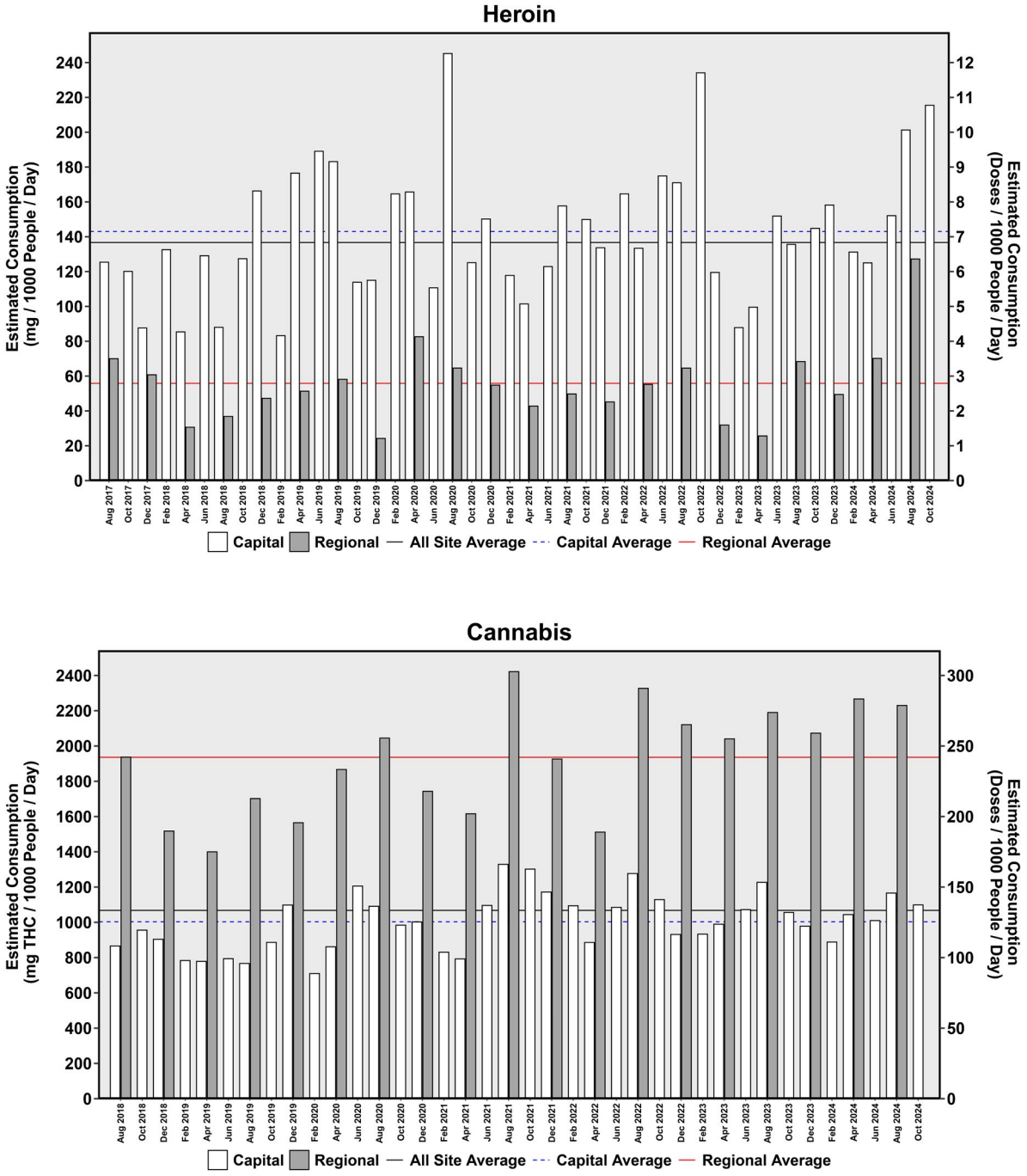
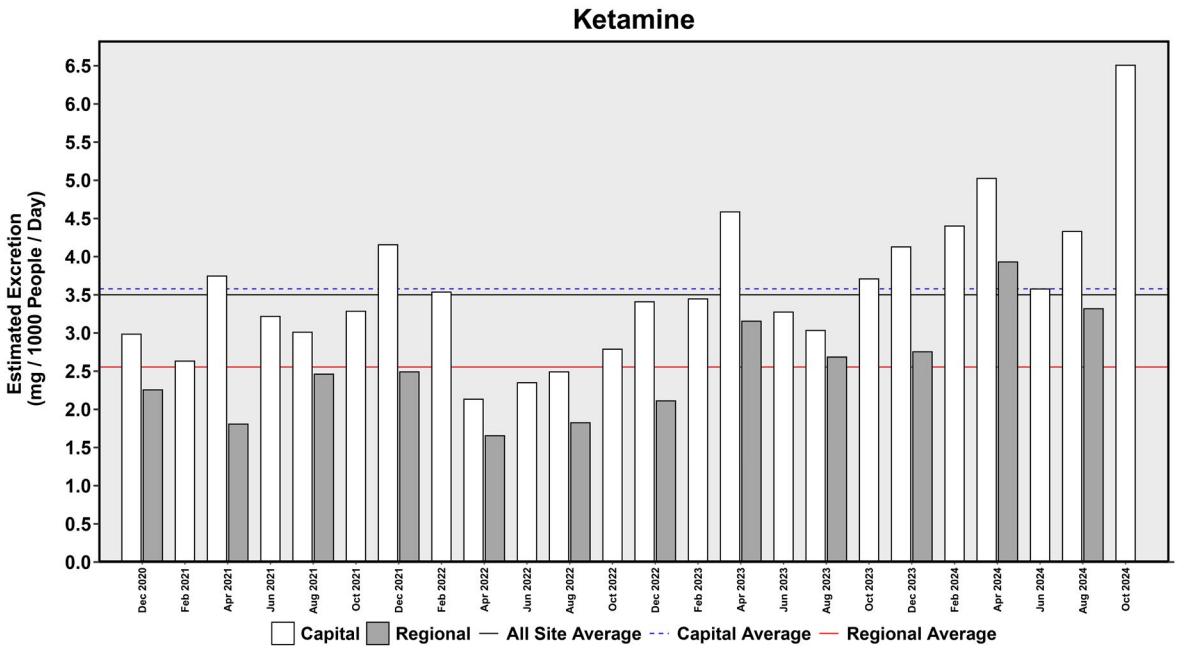


Figure 36: The population-weighted average of all sites for ketamine.



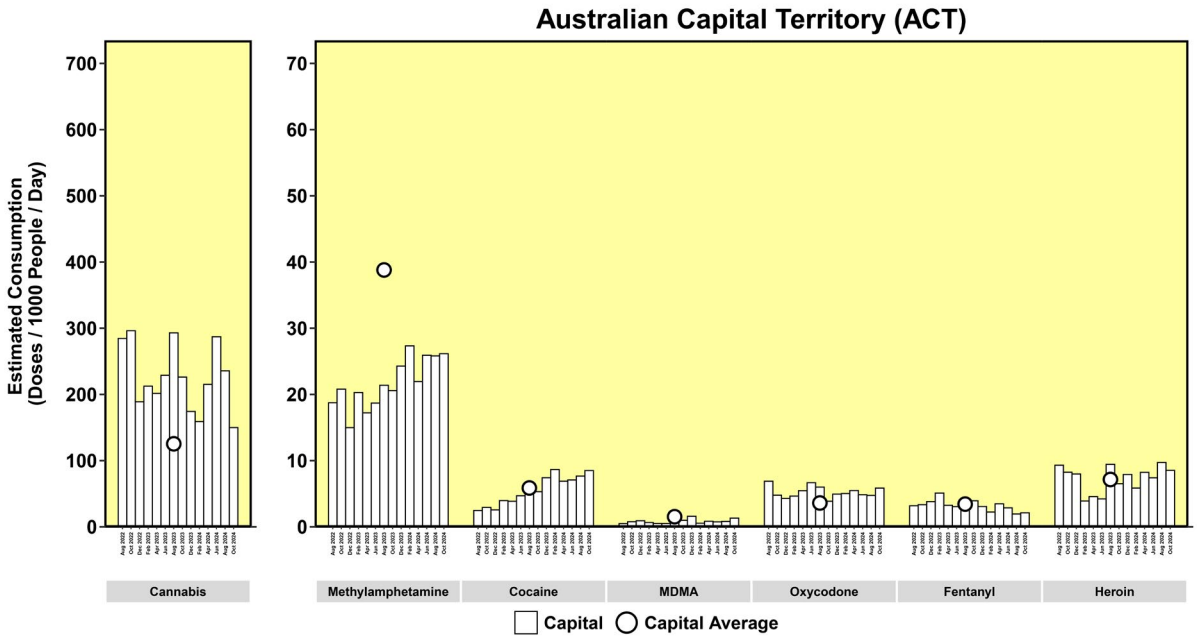
2.4 DRUG PROFILE FOR EACH STATE AND TERRITORY

Drug consumption is reported as the number of doses consumed to compare the scale of consumption of different drugs within the same state or territory and plotted on the same figure. In the absence of clear pharmacokinetic excretion data for MDA and ketamine, these compounds are excluded from the section as they are reported as the amount excreted.

The population-normalised dose amounts (excretion factors listed in Appendix 1) show that alcohol and nicotine remained consistently the highest consumed substances in all states and territories.

In terms of the remaining substances with available dose information, cannabis ranked the highest in all jurisdictions (Figure 37 to Figure 40). The scale of cannabis consumption is substantially higher than the other substances included in the figures. Due to this, the graphs have been divided into 2 parts so all drugs remain visible. Following cannabis, methylamphetamine is by far the next highest-ranking drug included in the Program. Subsequent rankings differ by jurisdiction.

Figure 37: Profile of average drug consumption by state or territory, August 2022 to October 2024 for capital city sites and to August 2024 for regional sites, Australian Capital Territory and New South Wales. 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 state or territory. The circles represent the cumulative national average of all time points for the respective drugs.



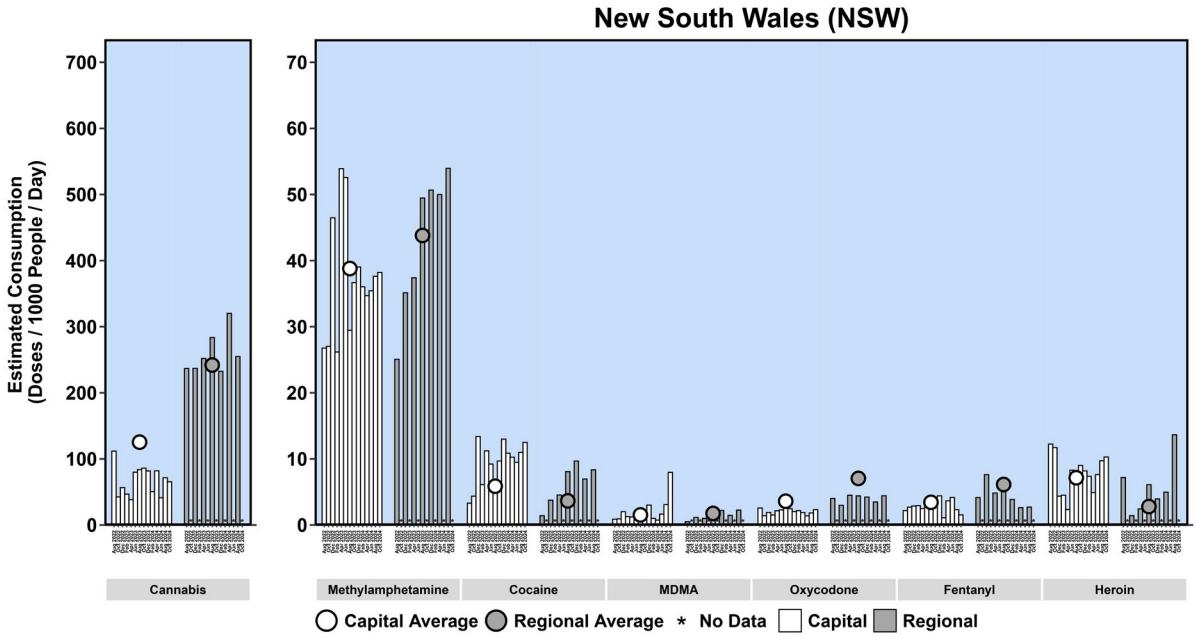
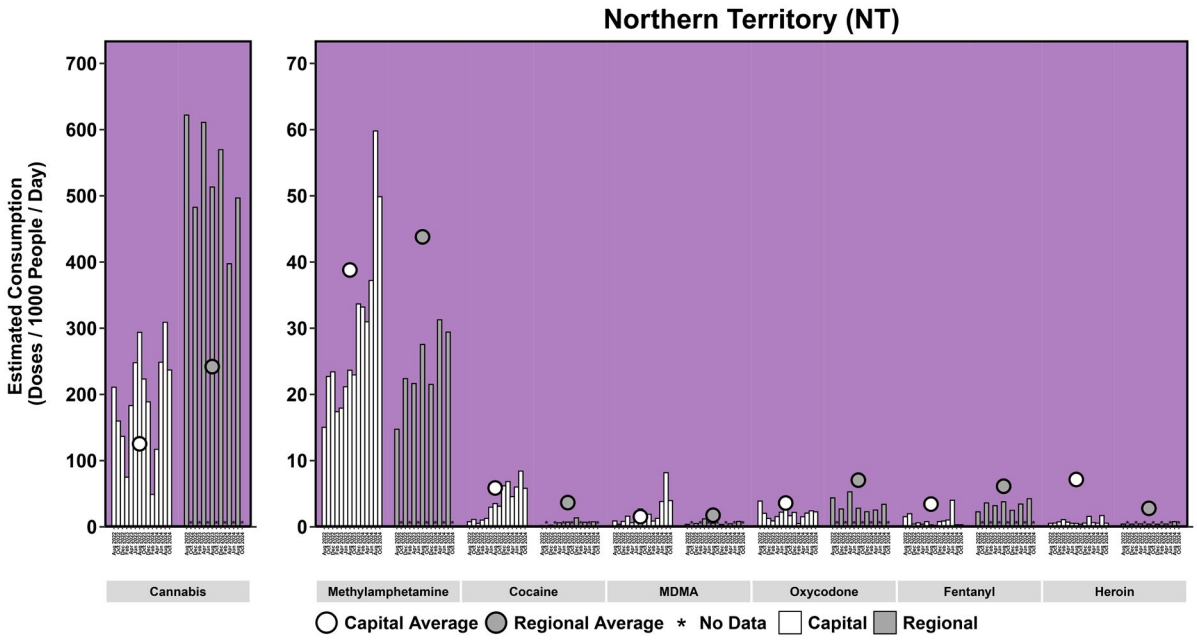


Figure 38: Profile of average drug consumption by state or territory, August 2022 to October 2024 for capital city sites and to August 2024 for regional sites, Northern Territory and Queensland. Consumption is shown as the number of doses per 1,000 people per day to allow comparison of drugs of different types within the same state or territory. The circles represent the cumulative national average of all time points for the respective drugs.



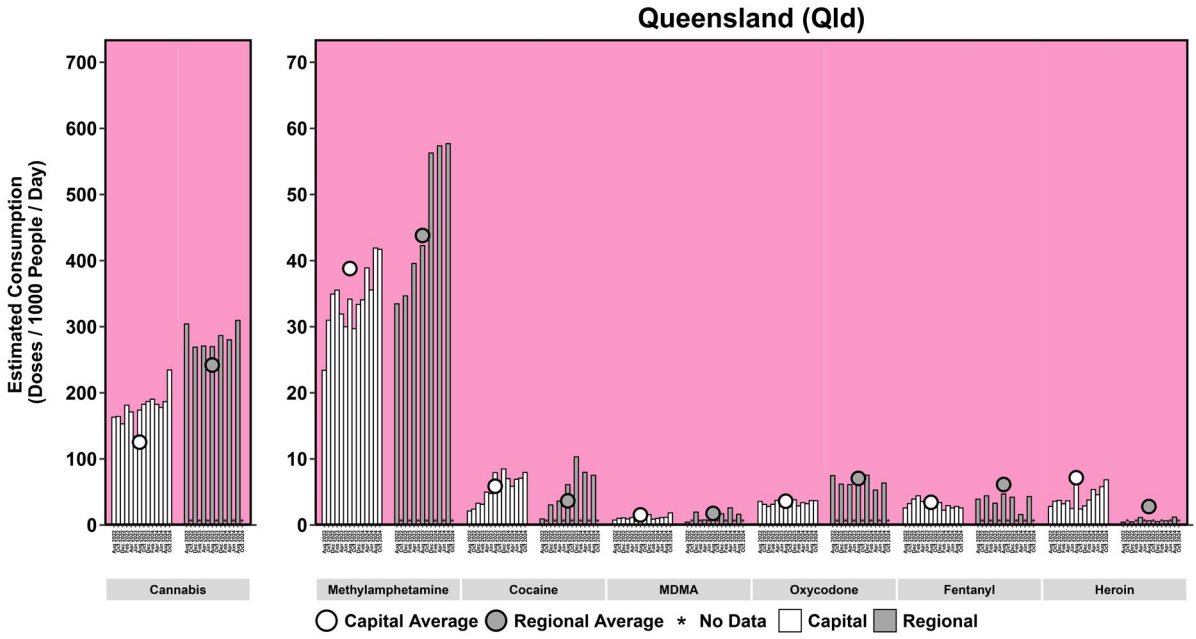
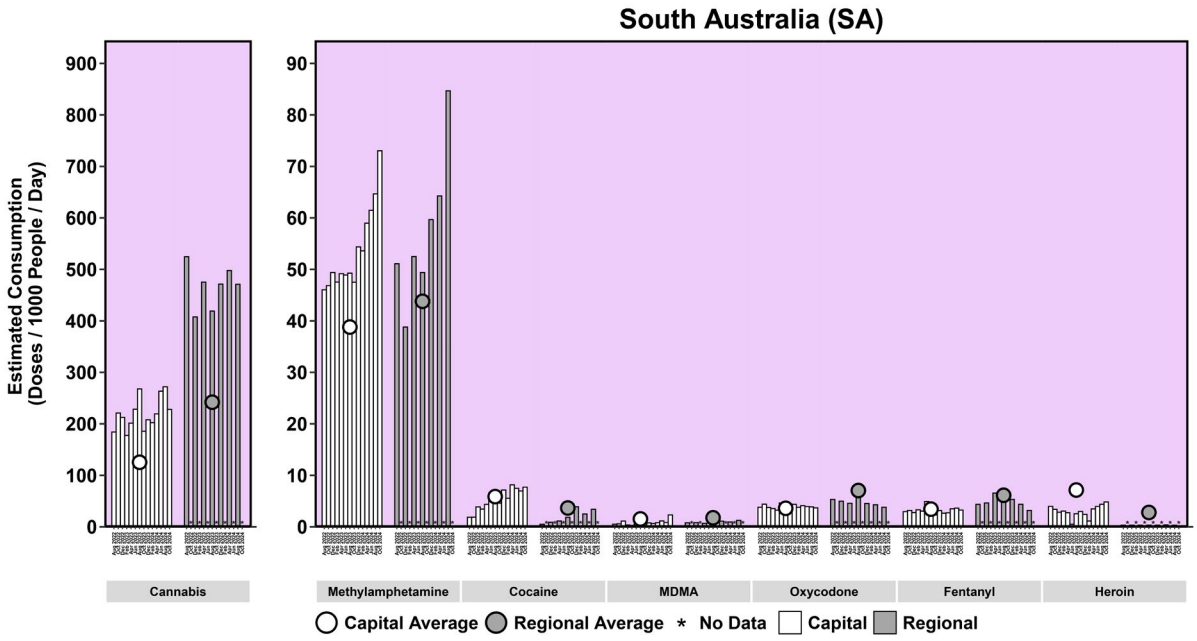


Figure 39: Profile of average drug consumption by state or territory, August 2022 to October 2024 for capital city sites and to August 2024 for regional sites, South Australia and Tasmania. Consumption is shown as the number of doses per 1,000 people per day to allow comparison of drugs of different types within the same state or territory. The circles represent the cumulative national average of all time points for the respective drugs.



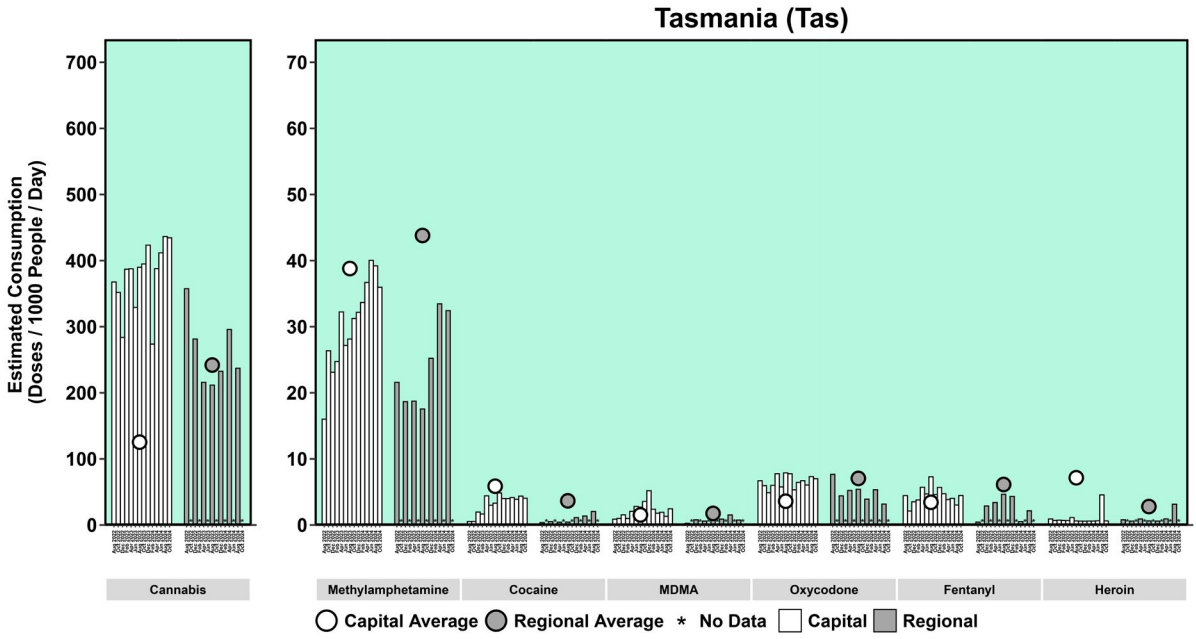
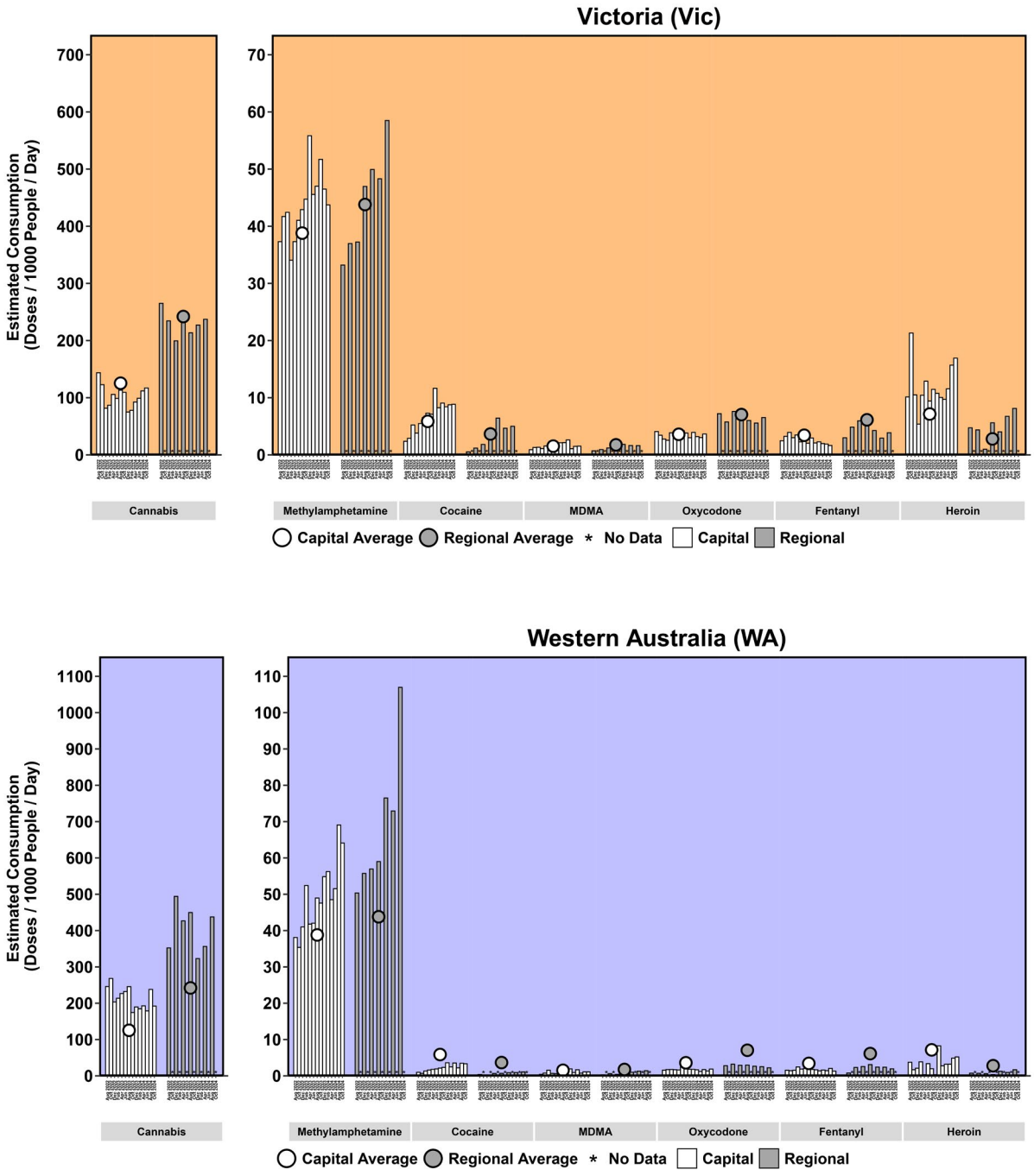


Figure 40: Profile of average drug consumption by state or territory, August 2022 to October 2024 for capital city sites and to August 2024 for regional sites, Victoria and Western Australia. Consumption is shown as the number of doses per 1,000 people per day to allow comparison of drugs of different types within the same state or territory. The circles represent the cumulative national average of all time points for the respective drugs.



3: ACKNOWLEDGEMENTS

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

The University of South Australia would like to thank our funding partners, the Drug and Alcohol Services South Australia (DASSA), for their permission to use historical and current data from South Australia. The University of Queensland thanks the research staff and PhD students at The Queensland Alliance for Environmental Health Sciences (QAEHS) for their assistance for sample processing. We also thank the members at QAEHS for assistance with preparing and shipping sampling bottles to the various plants and those members, past and present, who helped establish this field at the university. QAEHS would like to acknowledge the financial support of the Queensland Department of Health.

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

The symbols/images used in Figure 41 in the report were provided courtesy of the Integration and Application Network, University of Maryland, Center for Environmental Science (ian.umces.edu/symbols).

4: 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	0.1[##]	8[**]
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 following 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.

** A dose of 8 mg THC has been suggested to provide the desirable effect for the average user, regardless of the route of administration (Freeman and Lorenzetti, 2020). This takes into consideration that not all the available THC in a joint or edibles is inhaled or absorbed by the lung or the intestine and enters the blood stream.

Between 23% (edibles) and 31% (smoked) of an ingested dose of cannabis is excreted in faeces as the metabolite, THC-COOH, and another 3% in urine in free or conjugated form (Wall and Perez-Reyes, 1981). Recent research shows that the particulate fraction of wastewater can contain upwards of 40% of the total excreted THC-COOH load (Campos-Manas et al, 2022). Experiments by the authors of this report on wastewater from around Australia show that the water-soluble fraction of THC-COOH on average is about 33% of the total load, inclusive of the bound glucuronide which deconjugates in the sewer. Therefore, a correction factor of 10% has been applied in this report to convert the measured excreted load to consumed amounts. This number was derived as follows: of THC consumed, 30% enters the sewer as THC-COOH (Wall and Perez-Reyes, 1981). This load partitions with approximately 67% adsorbed to particulates and 33% dissolved in the water fraction on average (unpublished data). Therefore, the measured amount in water represents 10% of the original amount of THC consumed. This approach represents a reasonable average based on local data and may need to be refined further as more research becomes known. It should not be considered a universal correction factor for cannabis due to the differences between wastewater and infrastructure in other countries.

APPENDIX 2: SAMPLING DETAILS OF EACH SITE FOR AUGUST AND OCTOBER 2024

Sites	Location	Aug 2024	Oct 2024	Population
ACT: 009	Capital	7	7	> 150,000
NSW: 021	Capital	7	–	30,000 to 150,000
NSW: 003	Capital	7	7	> 150,000
NSW: 006	Capital	7	7	> 150,000
NSW: 071	Capital	7	–	> 150,000
NSW: 008	Capital	7	7	> 150,000
NSW: 115	Regional	7	–	30,000 to 150,000
NSW: 016	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
NSW: 025	Regional	7	–	> 150,000
NSW: 040	Regional	7	–	< 30,000
NSW: 051	Regional	7	–	< 30,000
NSW: 068	Regional	7	–	> 150,000
NT: 010	Capital	7	7	30,000 to 150,000
NT: 078	Regional	7	–	< 30,000
Qld: 011	Capital	7	7	> 150,000
Qld: 002	Capital	7	7	> 150,000
Qld: 005	Capital	7	7	> 150,000
Qld: 012	Regional	7	–	> 150,000
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	5	–	< 30,000
Qld: 042	Regional	7	–	30,000 to 150,000
Qld: 053	Regional	7	–	< 30,000
Qld: 077	Regional	7	–	< 30,000
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: 007	Capital	7	7	> 150,000
SA: 119	Regional	7	–	< 30,000
SA: 017	Regional	7	–	< 30,000
SA: 063	Regional	7	–	< 30,000

APPENDIX 2 (CONTINUED)

Sites	Location	Aug 2024	Oct 2024	Population
Tas: 019	Capital	5	5	30,000 to 150,000
Tas: 004	Capital	5	5	< 30,000
Tas: 041	Capital	5	5	< 30,000
Tas: 018	Regional	5	–	30,000 to 150,000
Tas: 048	Regional	5	–	< 30,000
Vic: 001	Capital	7	7	> 150,000
Vic: 067	Capital	7	7	> 150,000
Vic: 114	Regional	7	–	30,000 to 150,000
Vic: 121	Regional	7	–	< 30,000
Vic: 122	Regional	7	–	< 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
Vic: 037	Regional	7	–	> 150,000
Vic: 046	Regional	7	–	30,000 to 150,000
Vic: 061	Regional	7	–	30,000 to 150,000
Vic: 062	Regional	7	–	< 30,000
Vic: 066	Regional	7	–	30,000 to 150,000
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: 120	Regional	7	–	< 30,000
WA: 129	Regional	7	–	< 30,000
Regional Sites		39	–	
Capital Sites		22	20	
Total Sites		**61**	**20**	
Regional Samples		267	–	
Capital Samples		148	134	
Total Samples		**415**	**134**	
Cumulative Samples		**12,135**	**12,269**	

APPENDIX 3: PROPORTION OF SAMPLES ABOVE LOD (%) FOR EACH DRUG AND PERIOD ASSESSED[5]

Drug	Location	Aug 2024	Oct 2024
Alcohol	Capital	100	100
Alcohol	Regional	100	–
Amphetamine	Capital	100	93
Amphetamine	Regional	100	–
Cannabis	Capital	100	100
Cannabis	Regional	100	–
Cocaine	Capital	100	100
Cocaine	Regional	96	–
Fentanyl	Capital	84	76
Fentanyl	Regional	90	–
Heroin	Capital	81	83
Heroin	Regional	61	–
Ketamine	Capital	100	100
Ketamine	Regional	91	–
MDA	Capital	80	99
MDA	Regional	84	–
MDMA	Capital	100	100
MDMA	Regional	99	–
Methylamphetamine	Capital	100	100
Methylamphetamine	Regional	100	–
Nicotine	Capital	100	100
Nicotine	Regional	100	–
Oxycodone	Capital	100	100
Oxycodone	Regional	100	–

5 Percentage detections for previous collection periods are available in Appendix 4 of Report 6 and Appendix 3 of Reports 7 to 23.

APPENDIX 4: METHODS

Wastewater-based monitoring of drug consumption is based on the principle that any substance that is consumed (irrespective of whether it is swallowed, inhaled/smoked, or injected) is excreted in urine or faeces. 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 substance or metabolite is flushed into the sewer network, it will arrive at a wastewater treatment plant, assuming the point of excretion forms part of a wastewater catchment (Figure 41).

Information on the drugs currently being monitored and their metabolites of interest is contained in Appendix 1. The first NWDMP report (available on the ACIC website) also provides an in-depth description of the methodologies and calculations used. Collectively, waste products in the sewer system arrive at a WWTP. There, samples can be collected over a defined sampling period, typically sub-sampled over the course of a day. First, the concentration of a target substance in the wastewater sample is measured in the samples. Next, information on the amount of wastewater entering the WWTP, the population serviced by the plant, as well as information about the substance metabolism are used to calculate consumption estimates. Estimates have units of mass (milligrams) per day per 1,000 people (mg/day/1,000 people) or doses per day per 1,000 people (doses/day/1,000 people). Sites of different land area can be compared directly when estimates are expressed per 1,000 population. As many thousands of people contribute to each sample, it is not possible to identify drug consumption from individuals. The method is considered non-invasive and privacy is assured.

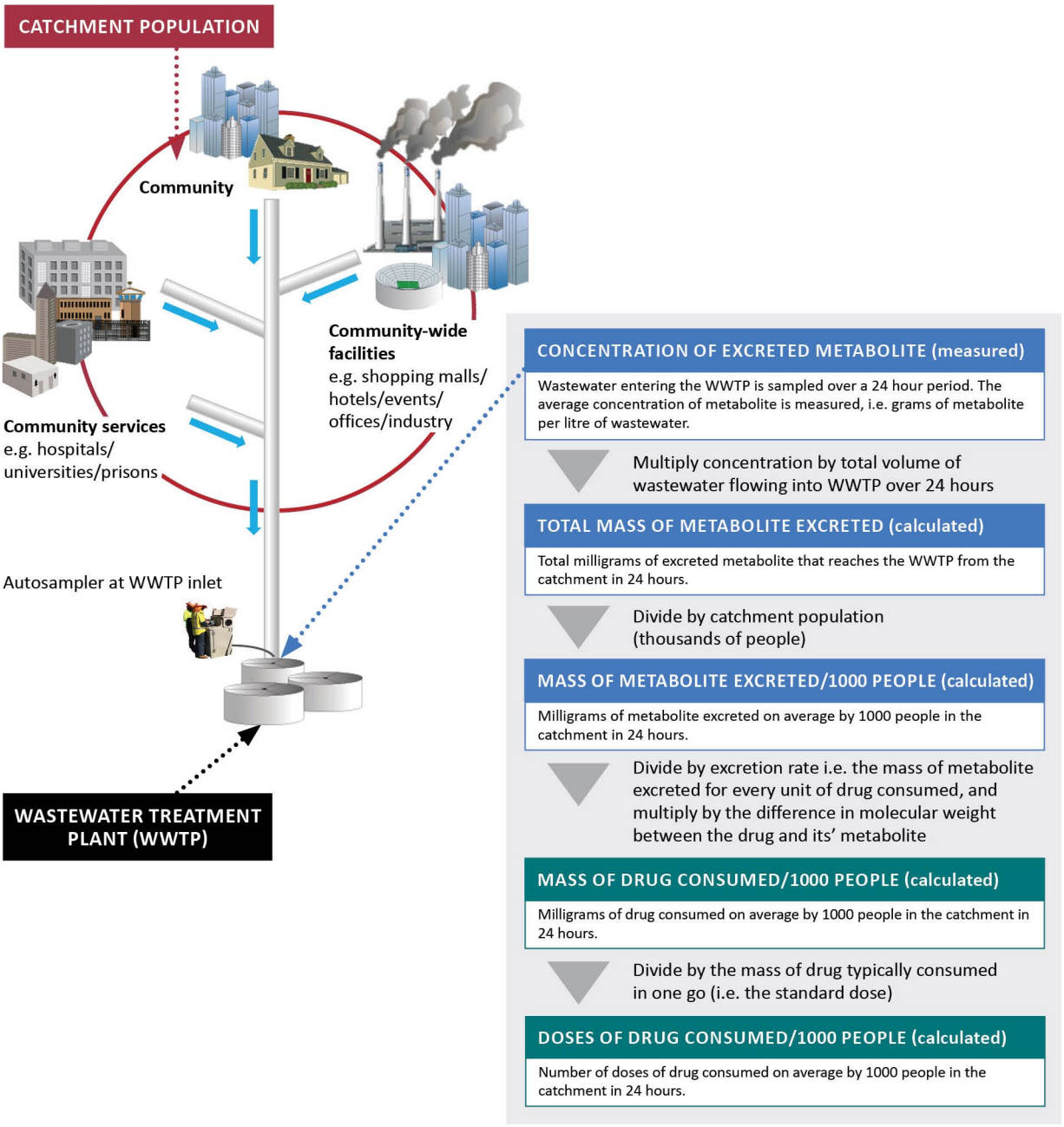
After consumption, drugs can either pass through the body unchanged, or be converted into metabolites. Methylamphetamine is partially metabolised and excreted as amphetamine, while part of a MDMA dose is converted to MDA. The relationships between these compounds have been well studied and have been accounted for in this report (Pizarro et al. 2002; Khan & Nicell 2011). MDA is a drug but also a metabolite of MDMA. Since the proportion of MDA excreted after MDMA consumption is known, the proportion of MDA coming from MDMA metabolism was subtracted from the total measured amount of MDA. Similar calculations are conducted for methylamphetamine and amphetamine, where amphetamine coming from methylamphetamine consumption is subtracted from the total amount of amphetamine. Due to the lack of information of MDA elimination following MDA ingestion, consumption estimates cannot be calculated, so therefore MDA is reported as excretion. Similar to MDA, ketamine results are also reported as the amount (mg) of drug excreted per day per 1,000 people as no suitable scientific information is available to convert amounts excreted to amounts consumed in wastewater.

After wastewater containing the drugs and their metabolites transits the sewer, samples are collected at the inlet of a wastewater treatment plant over 24 hours using autosamplers that collect time or flow proportional samples. Wastewater treatment plant operators aid with collecting the samples from the influent autosampler. Each sample is then preserved using 2 different preservatives to prevent decay of the drugs or their metabolites and kept frozen until analysis. A few sites in regional Western Australia are not able to collect the preservative used for the detection of the cannabis metabolite and so no data for the drug is reported for those sites.

Wastewater samples are then sent frozen via overnight courier to analytical labs at the University of South Australia and The University of Queensland laboratories where they are analysed. The steps include filtration of the samples followed by an enrichment or concentration step. Sample extracts are then injected into the analytical instruments to determine the concentration of each of the specific drugs or metabolites. Some drugs are at high enough concentrations where a concentration

step is not necessary, and are directly injected into the instrumentation. The instrumental analysis consists of chromatographic separation and compound specific detection by Liquid Chromatography Mass Spectrometry (LC-MS/MS). A summary of the extraction and analytical methods is given in Report 1. Methods to extract and analyse the cannabis metabolite are outlined in Tscharke et al. (2016). The excretion and dose information used in the calculations can be found in Appendix 1. Drug consumption estimates for each catchment population were calculated from these measured concentrations using daily flow volumes provided by the wastewater treatment plants and estimates of the catchment population size by evaluating census data vs. catchment maps, together with excretion and dose data on the drugs of interest obtained from the scientific literature (Figure 41).

Figure 41: Schematic of the population catchment area and methodology used to convert concentrations to consumption estimates.



SAMPLE COLLECTION AND PREPARATION

Daily composite samples were collected by treatment plant staff on 7 consecutive days, or where 7 days was not possible, across as many consecutive days as possible. Weekend samples in many of the Tasmanian sites were not 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). Small revisions may be made to historical data when more accurate data become available, for example when updated flow measurements supplied by wastewater utilities or population estimates become available.

PRESENTATION OF DATA AND INTERPRETATION OF GRAPHS

Reported averages: All consumption averages for state/territory or Australia-wide 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 consumption, the consumption data for each WWTP was multiplied by the respective population, 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). Per capita alcohol consumption has previously been reported by the Australian Bureau of Statistics (ABS) based on population numbers for people aged 15 and over. The consumption values presented in this report will underestimate consumption determined for an adult-only population. For consistency, data from other studies were recalculated where necessary using the estimated total population.

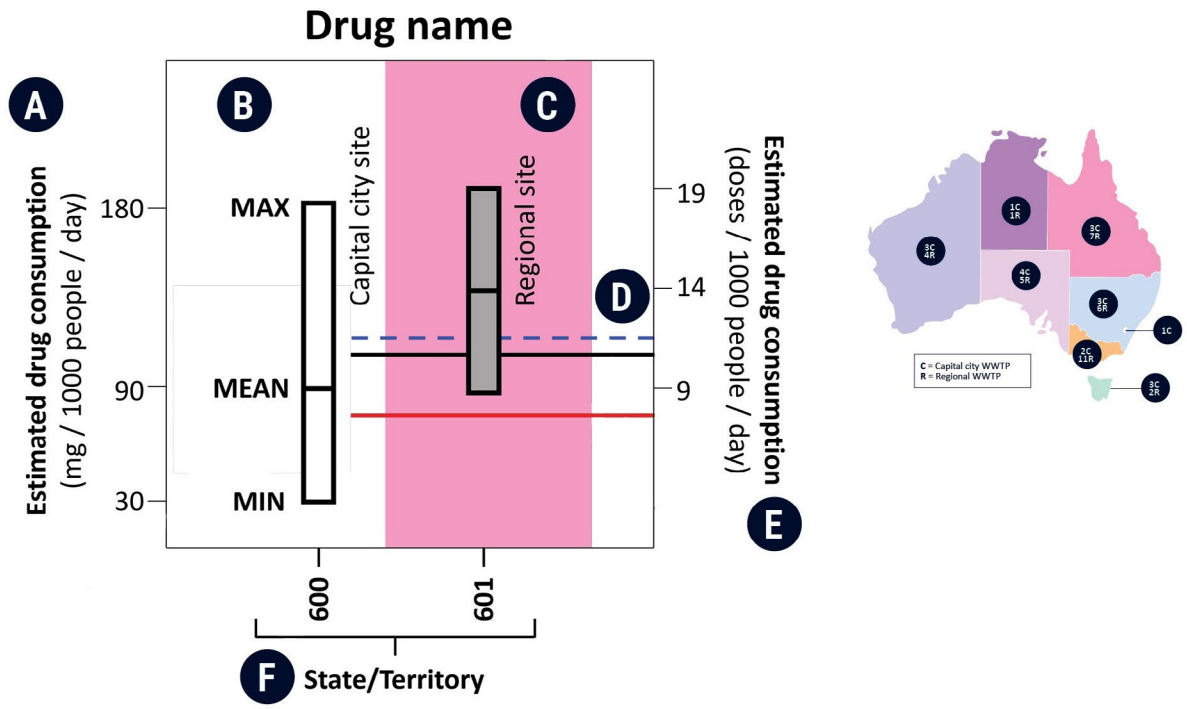
Graphical presentation of data: An overview of how the data is presented in the graphs for the individual sites is given in Figure 42. This includes information on interpreting the consumption data presented on the vertical axes in all graphs in this report. To improve readability of graphs with higher results in one site, we have reduced the graph height and labelled the higher value on the bar (values obtained from the left axis). 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 cases of MDA and ketamine, the amount of MDA and ketamine excreted following their consumption is not known, and therefore the drugs 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. From Report 19, cannabis results were also presented as doses per day per 1,000 people, similar to other drugs. This has to be considered when referring to historical reports where results were shown only as mg consumed per day per 1,000 people. In addition, the calculation of cannabis used a different excretion rate prior to Report 19. From Report 19 all current and historical data have been revised and are comparable within the report.

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 is included in Appendix 3.

Weekly pattern of drug use: The pattern of drug consumption over the sampling week for the sites in this report cannot be elucidated from the data included. We present the maximum, minimum and average (for individual sites as illustrated in Figure 42) and only population-weighted average values for all other graphs. Consistent patterns of drug consumption in Australia from previous wastewater studies indicate that some substances such as cocaine, MDMA and alcohol have significantly higher consumption on weekends. Other drugs such as methylamphetamine, oxycodone and fentanyl tend to have smaller differences between days of the week (Lai et al. 2015, Tscharke et al. 2016).

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

Figure 42: Explanation of the graphs used for individual sites. General concepts relevant to all graphs in the report are also outlined (unique site codes, explanation of vertical axes, colour coding).



A

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).

B

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 the 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.

C

COLOURS help identify the State or Territory that the data related to (colours are consistent between figures).

D

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 with 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.

E

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 1 day, the maximum was 19 and average was 14 per day over the sampling period (for every 1,000 people).

F

UNIQUE NUMBER allocated to each WWTP to maintain confidentiality. WWTP names will not be disclosed publicly.

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CONCLUSIONS

CONCLUSIONS

For the 24th report of the NWDMP, wastewater analysis was conducted in August (capital city and regional sites) and October 2024 (capital city sites only). The Program identified variations in patterns of drug consumption over time and within and between jurisdictions. Consistent with previous reports, findings show that of the substances monitored with known doses, nicotine and alcohol remain the most consumed licit drugs in Australia. Cannabis was the most consumed illicit drug in Australia, followed by methylamphetamine.[7]

METHYLAMPHETAMINE

When comparing data for April and August 2024, the population-weighted average consumption of methylamphetamine increased in both capital city sites and regional sites. Average capital city methylamphetamine consumption then decreased from August to October 2024. Average regional methylamphetamine consumption exceeded capital city consumption. In August 2024, Perth had the highest estimated average capital city consumption of methylamphetamine, while Western Australia had the highest average regional consumption.

COCAINE

When comparing data for April and August 2024, the population-weighted average consumption of cocaine increased in both capital city and regional sites, with capital city consumption the highest on record high. Average capital city cocaine consumption further increased from April to October 2024. Average capital city cocaine consumption continued to exceed average regional consumption. In August 2024, Sydney had the highest estimated average capital city consumption of cocaine, while New South Wales had the highest average regional consumption.

3,4-METHYLENEDIOXYMETHYLAMPHETAMINE (MDMA)

When comparing data for April and August 2024, the population-weighted average consumption of MDMA increased in capital city sites and decreased in regional sites. Average capital city MDMA consumption further increased from August to October 2024 to the highest level on record (equal with the level in December 2019). Average capital city MDMA consumption exceeded regional consumption. In August 2024, Darwin had the highest estimated average capital city MDMA consumption, while New South Wales had the highest average regional consumption.

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 2024, MDA excretion[8] increased in both capital city and regional sites. Average capital city MDA excretion further increased from August to October 2024. Average regional MDA excretion exceeded capital city excretion. In August 2024, Hobart had the highest estimated average capital city excretion and South Australia the highest average regional excretion of MDA.

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

8 The term excretion (as opposed to consumption) is used for MDA and ketamine in this report due to the absence of clear information in the scientific literature around suitable factors to estimate consumption of the substances in wastewater.

HEROIN

When comparing data for April and August 2024, the population-weighted average consumption of heroin increased in both capital city and regional sites, with regional consumption the highest on record. Average capital city heroin consumption then further increased from August to October 2024. Average capital city heroin consumption continued to exceed average regional consumption. In August 2024, Melbourne had the highest estimated average capital city consumption and New South Wales the highest average regional consumption of heroin.

CANNABIS

When comparing data for April and August 2024, the population-weighted average consumption of cannabis increased in capital city sites and decreased in regional sites. Average capital city cannabis consumption then decreased from August to October 2024. Average regional cannabis consumption exceeded average capital city consumption. In August 2024, Hobart had the highest estimated average capital city consumption of cannabis, while the Northern Territory had the highest average regional consumption.

KETAMINE

When comparing data for April and August 2024, the population-weighted average excretion of ketamine decreased in both capital city and regional sites. Average capital city ketamine excretion then increased from August to October 2024 to the highest levels on record. Average capital city ketamine excretion exceeded regional ketamine excretion. In August 2024, Darwin had the highest estimated average capital city excretion of ketamine and the Northern Territory the highest average regional excretion.

OXYCODONE

When comparing data for April and August 2024, the population-weighted average consumption of oxycodone decreased in capital city sites and increased in regional sites. Average capital city oxycodone consumption then increased from August to October 2024. Average regional oxycodone consumption continued to exceed average capital city consumption. In August 2024, Hobart had the highest estimated average capital city consumption of oxycodone, while Victoria had the highest average regional consumption.

FENTANYL

When comparing data for April and August 2024, the population-weighted average consumption of fentanyl decreased in capital city sites and increased in regional sites. Average capital city fentanyl consumption then further decreased from August to October 2024. Average regional fentanyl consumption exceeded average capital city consumption. In August 2024, Adelaide had the highest estimated average capital city consumption of fentanyl, while Queensland had the highest average regional consumption.

NICOTINE

When comparing data for April and August 2024, the population-weighted average consumption of nicotine decreased in both capital city and regional sites. Average capital city nicotine consumption then increased from August to October 2024. Average regional nicotine consumption continued to exceed average capital city consumption. In August 2024, Darwin had the highest average capital city consumption of nicotine and Northern Territory[9] the highest average regional consumption.

ALCOHOL

When comparing data for April and August 2024, the population-weighted average consumption of alcohol increased in capital city sites and decreased in regional sites. Average capital city consumption then decreased from August to October 2024. Average regional alcohol consumption exceeded average capital city consumption. In August 2024, Darwin had the highest average capital city consumption of alcohol and the Northern Territory[10] the highest average regional consumption.

NEXT REPORT

The 25th report of the NWDMP is scheduled for public release in the first half of 2026.

9 As the Northern Territory only has 2 participating sites, results may not be representative of the Territory as a whole. The 2 sites cover approximately 25% of the population of the Northern Territory.

10 Ibid.