'Ice Rushes', Data Shadows and Methylamphetamine Use in Rural Towns: Wastewater Analysis

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Abstract

Australia's world-class drug monitoring systems have difficulty gathering metrics in rural communities for reasons due to, among other things, the size of the country and problems with recruiting sufficient sample sizes. Some rural communities in data shadows (where few metrics on substance use exist) may benefit from wastewater analysis ('WWA') as a means of estimating per capita drug consumption. Wastewater analysis could be employed when debates rise about the consumption of particular drugs in certain communities. Other ways to use WWA are examined, including long-term monitoring of community drug consumption and intervention studies to test the effectiveness of health or law enforcement drug strategies. To explore the utility of WWA, this article references media coverage of methylamphetamine consumption in a small Tasmanian town, Smithton, and presents the results of the first Tasmanian WWA pilot study of methylamphetamine consumption, conducted in 2014–15.

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Introduction

Australia's criminal justice system, like those in many other countries, expends significant resources responding to illicit drug markets. Police services and intelligence agencies are tasked with the monumental role of enforcing national drug laws. Of all defendants finalised in Australian courts in 2015–16, an estimated 11 per cent (63,541 defendants) had illicit drug offences as their principal offence (ABS 2017a). Not surprisingly, drug offences place substantial demands upon corrective services as well; approximately 14 per cent of all inmates across the country were principally in custody for illicit drug offences as at 30 June 2016 (ABS 2017b).

Monitoring the illicit drug market enables the criminal justice system to, among other things: assess the effectiveness of law enforcement strategies and policies (Willis, Anderson & Homel 2011); gather intelligence on emerging trends (Stafford & Breen 2016; Sindicich & Burns 2014); and better understand the nexus between substance use and crime (Sweeney & Payne 2012). Monitoring systems are also crucial for health portfolios in understanding relationships between substance use and population-level disease, providing early detection of new health risks, determining priorities for harm reduction strategies and so forth (Hall & Degenhardt 2009). However, criminological and epidemiological objectives should not be thought of as disparate. Epidemiology provides essential empirical evidence on many of the harms that criminal drug laws are designed to address: physical and mental harms to the health of both the individual consumer and the broader community (see, for example, AIHW 2014).

Cannabis, MDMA ('ecstasy'), cocaine, heroin and methylamphetamine are major drugs of concern in Australia. This article solely focuses on methylamphetamine. This substance has notoriety in the public mind, particularly in the form of crystalline methylamphetamine, or 'ice'. The potential deleterious effects of heavy methylamphetamine use are not contentious. It is linked with psychoses (McKetin et al. 2010; Darke et al. 2008) and health problems such as heart attacks and strokes (Kaye et al. 2007; Degenhardt, Roxburgh & McKetin 2007). Ice use is also associated with violent behaviour and criminal activity, though the nature of these relationships is debated (McKetin et al. 2016).

Like other illicit drugs, methylamphetamine use in the population is difficult to measure because it attracts community stigma and it remains relatively clandestine (Groves 2014; Degenhardt & Hall 2012). In recent years serious concerns have been raised about the harms caused by methylamphetamine use in regional and rural areas of the country. Those who work in criminological and epidemiological portfolios have become accustomed to sensationalist coverage of drug use by mainstream media outlets. However, analysis of rural methylamphetamine use has also been undertaken by 'highbrow' media outlets (Smith and Phillips 2006, p. 826), notably the Australian Broadcasting Corporation's ('ABC's') *Lateline* ('"Ice" Destroying Rural Youth') and *Four Corners* ('Ice Rush'), which were both aired in October 2014 (ABC 2014a, 2014b).[1] These programs examined a number of rural towns, including Smithton in Tasmania's north-west. After interviewing key stakeholders with

[1] For more recent examples of media coverage of methylamphetamine see *Ice Wars*, ABC (aired 7 February 2017).

divergent views on methylamphetamine use in Smithton, the ABC programs concluded that the extent of the problem could not be determined.

At one end of the spectrum, it was suggested that there was no evidence that methylamphetamine use had increased in Smithton and that consumption there was no worse than in other parts of the country. At the other end it was suggested that one in ten Smithton residents were 'addicted' to ice (ABC 2014c). One reason that neither the stakeholders nor the ABC could definitively conclude whether there was a 'problem, a crisis or an epidemic' (ABC 2014c) is that Smithton lies in a data shadow. It is not included in any of the ongoing national drug monitoring systems that study: the general population (National Drug Strategy Household Survey); people who inject illicit substances (Illicit Drug Reporting Systems); people who use party drugs (Ecstasy and Related Drug Reporting System); and people who have been arrested (Drug Use Monitoring Australia).

This article has three main sections. The first explores research on drug consumption in regional and rural parts of Australia, with special reference to methylamphetamine. It explains what wastewater analysis ('WWA') is, examines recent findings of the first national WWA pilot study in Australia (Lai et al. 2016a), and discusses the usefulness of WWA in monitoring drug consumption in the general population. The article then presents findings from a pilot study in Tasmania involving 22 WWA samples from catchments servicing over 66 per cent of the Tasmanian population (>301,365 people), including samples from Smithton in 2014–15. With the Tasmanian data as a reference point, the article finally discusses the utility of WWA in (a) gathering better data on rural drug consumption, and (b) testing strategies to reduce drug-consumption in rural communities.

Methylamphetamine in rural areas

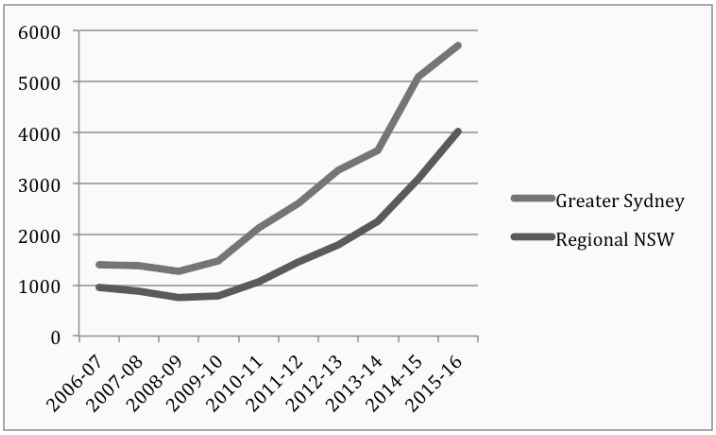
Quantifying the extent of substance use in rural and remote areas is challenging. Australia's geographical size and population spread makes studying substance use outside of urban and suburban population centres expensive and slow; in some contexts researchers may need to overcome additional challenges relating to 'talking to outsiders about drug issues' (Delahunty & Putt 2006, p. 3). Consequently, comparatively little is known about substance use in rural areas and the need for empirical research on rural populations has been recognised for some time (Gately, Ellis & Morris 2016; Wallis et al. 2009; Delahunty & Putt 2006). Some might argue that the lack of criminological research on rural substance use is not only due to practical hurdles, but to an inherent urban-centric bias within the discipline of criminology (Carrington, Donnermeyer & DeKeseredy 2014), at least in its modern form (DeKeseredy 2016). This important issue is relevant to this article but beyond its scope.

What is known about methylamphetamine consumption in rural places in Australia? The *National Ice Taskforce Final Report* (Commonwealth of Australia 2015) was based on a variety of information sources, including interviews with a series of experts across the country and over 1300 public submissions. The report indicated that methylamphetamine is being trafficked to both urban and rural areas of Australia, with some remote communities targeted using aggressive strategies to stimulate demand, such as providing periods of cheap supply.

A range of other sources indicate that use of methylamphetamine is not solely an urban phenomenon. For example, police records of incidents involving the possession or use of

methylamphetamine[2] have been mapped across 28 New South Wales ('NSW') local government areas ('LGAs') (BOCSAR 2016). Setting aside urban areas for a moment, these data indicate marked rises in the annual number of possess/use incidents in some regional areas. For example, in the Riverina, the number of incidents rose from 89 in the 2011–12 financial year to 228 in 2015–16. Similarly, over the same time period, the numbers in Coffs Harbour–Grafton rose from 52 to 205. Figure 1 shows the total number of incidents recorded in LGAs in greater Sydney and regional NSW between 2006–07 and 2015–16.

Figure 1: Amphetamine-related policing incidents (possession or use), greater Sydney and regional NSW, 2006–07 to 2015–16



Source: Adapted from BOSCAR (2016).

The BOCSAR data show a tripling of amphetamine-related incidents in both greater Sydney and regional NSW over the six years between 2009–10 and 2015–16. As Willis, Anderson and Homel (2011) point out, interpreting police records such as these can be difficult. Among other things, it can be difficult to disentangle whether observed fluctuations reflect changes in the drug market, or changes in police strategies and resources. However, arguably the scale of the trends in NSW is so substantial that it is probably attributable in part to an increase in methylamphetamine consumption.

Some studies have examined rural methylamphetamine use using survey methods. To understand the prevalence and nature of substance use in Aboriginal and Torres Strait Islander Communities, Delahunty and Putt (2006) interviewed police officers in rural (*n*=493) and urban (*n*=299) areas in South Australia, Western Australia ('WA'), the Northern Territory ('NT') and Queensland. At the time this research was conducted the findings indicated that amphetamine use was problematic in some rural communities, but that the prevalence of use was lower than in urban areas. Conversely, the police participants' reports suggested higher rates of use of both cannabis and inhalants in rural settings. Delahunty and Putt (2006) appear to be the first researchers to underscore the potentially large profits that can be made in trafficking illicit substances into rural and remote regions.

Recent self-report data for Australia are available through the National Drug Strategy Household Survey ('NDSHS), the primary monitoring system for substance use in the general

[2] BOCSAR uses the term 'amphetamine'; other sources report on the use of 'amphetamine-type substances' (Gaffney et al. 2010, p. 14). However, both terms are practically equivalent to methylamphetamine due to the almost exclusive use of the latter in Australia (AIHW 2014).

community, which is conducted every three years. In 2013, the NDSHS interviewed 23,855 people aged 14 years and over and had a 49 per cent response rate (AIHW 2014). The 2013 survey categorised regions into major cities, inner regional, outer regional and remote/very remote (see further AIHW 2014, p. 86). Participants reported 'recent use' (that is, use in the preceding 12 months) of any illicit substance, including non-therapeutic use of pharmaceuticals. The rate of recent substance use was comparable across regions and even slightly higher outside of the larger population centres: major city 14.9 per cent, inner regional 14.1 per cent, outer regional 16.7 per cent, and remote/very remote 18.7 per cent. The findings on methylamphetamine were less informative. Rates of recent methylamphetamine use were similar in major cities (1.8 per cent), inner regional areas (1.7 per cent) and outer regional areas (2.1 per cent). The rate for remote/very remote places was 4.5 per cent. However, because of the hurdles associated with recruiting a sufficient number of participants in remote/very remote places, the AIHW (2014, Table A8.1 NDS-2013-specific-population-groups) cautioned against interpreting this figure because it has a relative standard error greater than 50 per cent.

Another method used to estimate the community's consumption of illicit drugs is WWA. This involves collecting wastewater from wastewater treatment plants over a 24-hour period and analysing the samples with liquid chromatography–mass spectrometry. Although the WWA field only commenced in 2005 (Zuccatto et al. 2005), it is now an established international method and forms part of the ongoing drug monitoring systems in Europe (Ort et al. 2014). Wastewater analysis monitoring across Australia has recently been implemented with funding from the Australian Criminal Intelligence Commission.

The process of collecting wastewater, analysing the samples, and estimating population drug consumption – typically in milligrams per day per 1000 people – has been explained elsewhere in detail (Prichard et al. 2012). There appears to be relatively broad agreement that WWA provides data that usefully complement existing drug monitoring systems, many of which rely on self-reported information from substance users. Like any method, it has limitations that are important to understand. Critically, WWA cannot provide information about individuals, only trends in overall usage within populations. This means that WWA alone cannot inform policy-makers about how frequently individuals use different substances, the quantities they use, their preferred routes of administration (for example, snorting, injecting, smoking) or the harms associated with their substance use behaviours. Wastewater analysis can monitor changes in population drug consumption, but alone it cannot determine whether increases in consumption are being driven by more people using a drug or existing users increasing their intake (van Nuijs et al. 2011) or a combination of these factors.

A related complication is the effect of drug purity on WWA. If WWA data are interpreted without reference to information on drug purity, then fluctuations in purity could be misinterpreted as indicating that more people are using the drug (Bruno, van Dyken & Prichard 2014). Additionally, for analytical reasons some drugs are difficult to study with WWA, notably cannabis and heroin (Prichard et al. 2012). Here it is important to note that current standard WWA analyses cannot presently distinguish between consumption of 'ice' (crystalline methylamphetamine) and other forms of methylamphetamine.

Finally, small populations present additional challenges in estimating per capita consumption in WWA research. This is because the estimates of consumption are based on the average rate at which particular chemicals are excreted from the human body (see Prichard et al., 2012, p. 3). The average excretion rate is reasonably reliable for larger groups but much less reliable with smaller groups because individuals can differ markedly in their capacity to metabolise illicit drugs. Another challenge which cannot be overlooked for small populations

is the difficulty of collecting representative samples from the influent streams. Small populations are most susceptible to large flow variations and thus high frequency flow proportional sampling is necessary to ensure flow fluxes are adequately sampled. Additionally, smaller populations may have few people who consume a particular substance and as such toilet flushes by such consumers may be inadequately sampled if high frequency sampling is not conducted (Castiglioni et al. 2013).

In large populations WWA has advantages in understanding broad trends over time that overcome the accepted limitations of self-report methods. In comparison to these methods, WWA is comparatively efficient and cost effective; it also captures information on hundreds of thousands of people over 24-hour cycles (Prichard et al. 2012). Furthermore, whereas people who use illicit substances may be difficult to recruit (Degenhardt et al. 2011) or disinclined to participate in a self-report study (Hall & Degenhardt 2009; Harrison 1997), WWA captures data from large portions of populations within the boundaries of sewage treatment plant catchments. Finally, WWA can be used to accurately identify dozens of substances, including methylamphetamine, cocaine, MDMA, ketamine (Thai et al. 2016), alcohol (Mastroianni, de Alda & Barcelo 2014) and tobacco (Castiglioni et al., 2015).

Several WWA studies have estimated drug consumption in the general population of Australia (eg Tscharke et al., 2015; Irvine et al. 2011). Lai and colleagues (2016a) compared methylamphetamine in wastewater in two Queensland population centres, one urban and the other semi-rural, using a total of 1,203 wastewater samples collected between 2009 and 2015. Over the time period examined, consumption of methylamphetamine increased fivefold in the urban setting and threefold in the semi-rural area.

The same research team also recently published the results of the first national WWA pilot study (Lai et al., 2016b) with samples collected over about one week in mid-2015 in the NT, Queensland, NSW, Victoria, the Australian Capital Territory ('ACT') and WA. Using population data from the Australian Bureau of Statistics, Lai et al. (2016b) reported that the catchments included in the pilot study served approximately 40 per cent of all Australians. The results indicated that consumption of methylamphetamine was higher and more consistent across all sites than consumption of cocaine or MDMA. Three of the 14 sites were classified as rural. Consumption rates of methylamphetamine in these sites was comparable to the majority of the urban sites. The same pattern was not observed for cocaine and MDMA, the consumption rates of which were very low in the rural catchments.

The next section of this article presents new results from separate WWA analyses conducted in Tasmanian sites, including in Smithton.

Tasmanian WWA methylamphetamines pilot study

The purpose of this section is to illustrate the potential utility of WWA in studying methylamphetamine use – or certain other substances of concern – in a rural setting. This section presents original findings on methylamphetamine consumption in Tasmania. Table 1 gives an overview of some of the key features of the pilot study in Tasmania. The first column lists the seven sites. Following established ethical conventions (Prichard et al. 2016) the locations of the sites are anonymised and only broad population indicators are provided to protect anonymity.

Table 1: Estimated methylamphetamine consumption (mg/day/1000 people) Tasmania

	Population	No of samples	Sampling period	Mean consumption ±95% (CI)
Tas A	>5,000	7	08/01/2014–17/07/2015	95±8
Tas B	<300*	3	01/04/2014–05/06/2014	128±46
Tas C	>10,000	2	26/06/2014–22/07/2015	252±105
Tas D	>5,000	6	14/12/2014–02/07/2015	146±212
Tas E	>80,000	3	10/12/2013–08/04/2014	110±65
Tas F	<300*	3	07/05/2014–13/08/2014	12±6
Tas G	>5,000	4	05/03/2014–22/07/2015	105±92
Tasmania excluding Tas B and F	~301,365	22	10/12/2013–22/07/2015	**142±64

* Very low populations; data to be treated with low confidence.

** Mean of raw data from 22 samples, not grand mean of sites.

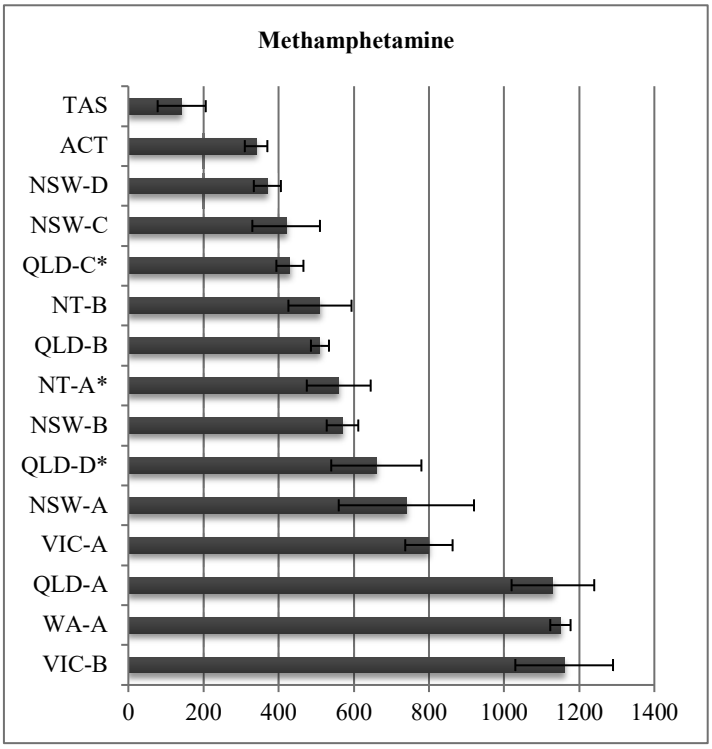
Twenty-eight 24-hour composite samples were collected between 2013 and 2015 at sewage treatment plants with the assistance of water authorities. The collected samples were analysed for methylamphetamine by liquid chromatography coupled to tandem mass spectrometry as previously described by Lai et al. (2016a). The small number of samples collected at each site was the main limitation of the pilot study and, for this reason, comparisons between sites should be made with caution. In addition, Tas B and F have estimated populations of fewer than 300 people and consequently the findings from these sites are not considered reliable. Nonetheless, they are included here because they are useful to the discussion below.

The final column in Table 1 shows the estimated milligrams of methylamphetamine consumed per day per 1000 people. Leaving aside Tas B and F, the table indicates that mean consumption was similar in Tas A, D, E and G; these sites ranged between 95 mg to 146 mg over the period of sampling. The estimated mean consumption from the two Tas C samples was higher (252 mg). The name of this location cannot be revealed, but it is important to state it was not Smithton. The average across the Tasmanian sites, excluding Tas B and F, was 142 mg. This is arguably the most robust figure presented in the table because it is based on 22 samples from wastewater treatment plants that collectively serve about 300,000 people.

The results presented in Table 1 do little to resolve the Smithton methylamphetamine question. The discussion here is necessarily limited because the locations included in the study cannot be revealed. But even if the data applicable to Smithton could be provided, the findings would be indeterminate because of the study's inherent limitations. Although sampling occurred over 2013–15 when Smithton's methylamphetamine consumption was in the limelight, only a handful of samples were collected from the community. Clearly, in between the days on which samples were collected, Smithton's methylamphetamine consumption could have fluctuated (upwards or downwards). In addition, for the reasons outlined above about WWA's incapacity to provide information about individuals, the Smithton samples cannot shed light on the extent of methylamphetamine *dependence* within the town. In other words, WWA could never address the claims about the extent of ice 'addiction' in Smithton.

However, when the data are considered as a whole, they do have bearing on the debate about Smithton in 2014. Figure 2 presents the estimated mean consumption of methylamphetamine in Tasmania per 1000 people (142 mg) and compares this with the 14 Australian sites included in Lai et al.'s (2016b) pilot study, which was conducted in 2015.

Figure 2: Mean methylamphetamine consumption (mg/day/1000 people) by location



* Regional area. Figures for all sites except Tasmania adapted from Lai et al. (2016b).

The WWA data presented in Figure 2 indicate that in the periods of sampling Tasmania's estimated methylamphetamine consumption rates were much smaller than those from other jurisdictions. Estimated consumption in Tasmania was half that of the ACT and about one-eighth that of sites in Victoria (Vic B), WA (WA A) and Queensland (QLD A).

How do these results compare with the NDSHS? The NDSHS data – dating back to 1998 and including the 2013 tranche – indicate that Tasmania is very similar to other jurisdictions in terms of participants' reported use of any drug in the preceding 12 months (AIHW 2014, Table 7.9 NDS-2013-state-and-territory-comparisons). However, comparisons cannot confidently be made with regards to methylamphetamine because the NDSHS data for Tasmania had relative standard error of 25 per cent to 50 per cent (AIHW 2014, Table 7.12 NDS-2013-state-and-territory-comparisons). The same statistical problem affected data on use of most illicit drugs in the Tasmanian NDSHS survey, with the exception of cannabis, because of a combination of the small sample size in regional areas and the low prevalence of illicit drug use in these areas.

During 2013–15, could the Tasmanian methylamphetamine market have been smaller than in other jurisdictions proportionate to population size? Researchers have not addressed this

specific issue to date. However, two factors that may limit the market are Tasmania's demography and the fact that it is an island. This means that drugs have to be manufactured locally or trafficked to Tasmania by air or sea. Tasmania has a small population of 519,000 people (ABS 2016). As at 2012, 58 per cent of Tasmanians lived outside of the capital city, Hobart (ABS 2013). This is the highest percentage of all Australian jurisdictions. Consequently, Tasmania probably does not provide an attractive business model from an organised crime perspective. Since the population is small and dispersed, the pool of potential consumers of methylamphetamine is small and geographically dispersed. These features, combined with the island factor, might inhibit large-scale trafficking for rapid profits.

None of these arguments precludes the possibility that methylamphetamine consumption might have increased since 2015 – if not across Tasmania, at least in particular Tasmanian communities. And in small communities, like Smithton, heavy use by a few individuals may have a bigger impact (for example, through property offences and offences related to public disorder) than in large communities. Having said that, it is interesting to consider how the ABC might have covered the Smithton story in 2014 had it had access to the WWA data presented in this article. Reflecting on the question posed at the outset as to whether methylamphetamine in Smithton was a 'problem, a crisis, or an epidemic' (ABC 2014c), we suggest that on balance the WWA data support the 'problem' thesis and arguably discount the 'epidemic' thesis.

Implications and potential applications

The ambit of this article is larger than Smithton and Tasmania. Its purpose is to unpack what WWA may have to offer many rural communities in Australia – at least those with defined sewerage systems and wastewater treatment plants. Wastewater analysis is an additional tool that can be used periodically to address public health debates about the extent of drug use in rural areas. So, for example, if concern begins to rise about methylamphetamine consumption in a particular town, WWA could be used to gather regular samples over a period of months at the town and at other sites for comparative purposes. Such data could assist rural communities to move beyond uncertainty when expert opinion is divided on the extent of a drug problem.

Wastewater analysis could also be used routinely in rural settings to monitor the consumption of methamphetamine and other substances over time. If water authorities and local governments are invested in the long-term utility of WWA, for a small cost they can regularly collect and preserve samples from wastewater treatment plants following accepted protocols. The samples can be analysed as needed. This in-kind support significantly reduces the cost of WWA research. It would also benefit rural communities that wanted to monitor trends in consumption of drugs, alcohol, tobacco and so forth. Some rural communities may find WWA empowering inasmuch as they would be less dependent on agencies located in capital cities to gather policy-relevant data.

As the number of samples collected from a particular site increases over time, so does statistical power. This means that a greater array of statistical tests can be conducted and greater confidence can be placed in the validity of the results. With an adequate dataset, statisticians could attempt to measure whether particular events or changes within a rural town had any impact on drug consumption. For instance, analyses could examine whether drug consumption decreased after a sudden increase in jobs, or increased with the construction of a new highway.

Wastewater analysis could be used as a tool to prospectively evaluate 'interventions'. The idea of using WWA in an intervention design was proposed by the authors in the context of prison research (Prichard et al. 2010). Interventions to reduce drug consumption in a rural

town could take many forms (although their common objective would be to reduce the adverse health, social and economic consequences of substance use). For example, an intervention operated by law enforcement agencies would probably focus on supply reduction, such as disrupting drug trafficking nodes critical to the local market. Health-focused intervention strategies would focus on demand reduction via public education campaigns, and counselling and drug treatment and rehabilitation programs for problem users.

Relevant agencies would cooperate with WWA researchers to determine the sites of interest. The WWA researchers would monitor the town before, during and after the intervention to determine if the intervention had an impact on drug consumption and how long the effect lasted. Two empirical strategies could provide a control. First, the study could employ an A-B-A-B design, so that the period of baseline monitoring (A) and the intervention (B) was repeated twice. This would provide an internal control, namely the removal of the intervention; any change in consumption observed after the second intervention period would strengthen the argument for a causal influence of the intervention. The second option would be to monitor other rural towns as control groups; these towns would be matched by demographic, geographic and economic profiles.

Rural towns may be empirically ideal for WWA intervention studies, particularly if they are an hour or more drive from other population centres. Semi-remote and remote rural towns help to control for population movement. To explain further, in a city serviced by multiple wastewater treatment plants, drugs may be consumed in one catchment (such as a nightclub) and then excreted in another (such as a person's home). This potential disconnect between places might mask the effects of an intervention, depending on its size and duration. In contrast, WWA intervention studies could be used with greater confidence in rural towns because of the 'continuity of place' between the intervention, the drug consumption and the drug excretion.

It is likely that as the field of rural-WWA-research continues new challenges will be encountered. For example, it is feasible that the usefulness of WWA could be limited in particular rural communities where septic tanks are used by significant portions of the residents.[3] However, in our view it is worthwhile to investigate if, how and where WWA may be a useful tool in the rural context.

Conclusion

Australia is the world's sixth-largest country geographically, but only about 12 per cent of Australians live outside of major cities and inner regional areas (ABS 2008). Consequently, there are significant challenges in using traditional survey research methods to examine drug consumption in rural parts of the country. For rural communities connected to the public sewerage system, WWA has good potential as a new empirical tool to estimate community drug consumption efficiently and anonymously. Wastewater analysis is now an accepted and useful method for monitoring substance use in the community, as demonstrated by Lai et al.'s (2016a) study of 14 Australian sites, capturing 40 per cent of the population. That study, combined with the results of the Tasmanian pilot study presented in this article, illustrates the capacity of WWA to provide metrics on substance use in rural settings.

Although the Tasmanian data constitute preliminary research only, they nonetheless underscore several useful points. Some rural communities may come to view WWA as a practical form of research that can inform particular debates, like that which unfolded about

[3] Data on septic tanks systems are not readily available. Statistics from 2002 indicated that 4 per cent of NSW households (n=103,100) had a septic tank and were not connect to the public sewerage system (ABS 2002).

Smithton in 2014. Clearly WWA could also be used over a longer time frame to gather trend data regarding the consumption of a wide variety of substances over time, including alcohol and tobacco. It is definitely true that WWA is best used in conjunction with traditional methods of studying drug consumption, including self-report methods and analyses of police data. However, given the numbers of communities in data shadows outside of the catchment of Australia's ongoing drug monitoring systems, the reality is that robust studies of many small rural communities are unlikely to occur using traditional research methods. The isolated and relatively closed nature of some rural communities provide useful opportunities for testing the efficacy of particular intervention options with WWA. These designs may allow law enforcement and health agencies to determine if strategies to reduce drug consumption are effective and worth resourcing.

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