

NHS Tayside

Cocaine use in Tayside

Health Needs Assessment

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1. Introduction

Drug related deaths have increased markedly in the past decade and are of considerable public health concern. The proportion of drug deaths where cocaine was implicated increased significantly in Tayside in 2017 and 2018, and appeared to represent a different pattern of drug use to the more commonly seen combination of opioids, benzodiazepines and gabapentinoids. This health needs assessment was conducted to explore this worrying trend further. It sought to examine surveillance data and evidence to inform local risk assessments of the prevalence and demographics of cocaine and crack cocaine use/users and the associated health harms in Tayside. A rapid evidence review of primary and secondary treatment measures for cocaine dependence was also undertaken and is presented at the end of the report to inform possible risk management strategies. Local data have been used where available, when not available national data have been considered.

2. Background

Cocaine is a naturally occurring and illicitly used psychostimulant drug. It is an alkaloid synthesised by and stored in the leaves of the plant, *Erythroxylum coca*. This plant is cultivated widely on the Andean ridge of South America.¹

Two distinct chemical forms of cocaine are typically used: hydrochloride salt (cocaine powder), and cocaine base (“crack” or “freebase”).

The powdered form of cocaine (cocaine hydrochloride), is produced by extracting the crude coca paste from the coca leaf, before purifying it to the ‘base form’ and then converting it into a hydrochloride salt using hydrochloric acid.¹ The salt usually forms as a white crystalline powder and is typically snorted but can also be dabbed on the gums or left under the tongue.² It is water soluble and in this form can be injected. However, cocaine powder cannot be smoked as it is destroyed at high temperatures resulting in negligible to no psychoactive effects.³

Crack cocaine is produced by further processing the cocaine hydrochloride salt by dissolving the salt in water and adding ammonia or sodium bicarbonate to make an alkaline solution (known as “cooking”). This mixture is then heated to produce a solid residue – crack cocaine – which is considered to be a purer form of cocaine. When a solvent is added to the mixture the final product is commonly referred to as ‘Freebase’. Crack cocaine is insoluble in water but can be smoked and vaporises at a lower temperature compared to cocaine hydrochloride. Crack cocaine can also be injected if a weak acid is used (commonly lemon juice).³

Cocaine can also be taken orally although this practice is less common in Scotland.² Injection, snorting, dabbing on gums, and smoking of cocaine increase the rapidity with which cocaine enters the brain compared to the oral form. People report taking cocaine for a variety of reasons including for the feeling of euphoria it can cause, increased energy, a feeling of social ease and friendliness, increased sexual stimulation, appetite suppression and decreased need for sleep.⁴

2.1 Polysubstance use

People who use cocaine often consume alcohol and tobacco and/or other illicit drugs concomitantly. Individuals report that taking cocaine in combination with alcohol often produces more intense feelings of ‘high’ beyond that achieved with either substance alone and therefore it is commonly

used in a wide range of nightlife settings. Additionally, cocaine is believed to make the effects of alcohol inebriation less intense and alcohol is reported to counterbalance the discomfort felt when coming down from a cocaine 'high', thus some people describe taking this combination to enable them to drink for longer.⁵

Cocaine is also often used alongside opioids by people with problematic drug use, at times simultaneously in a mixture known as a 'speedball'. Usually, speedballing involves both substances being injected but they can also be snorted and smoked together. As with alcohol, concurrent use of both heroin and cocaine is reported to intensify the desired effects of each substance whilst suppressing the unpleasant effects, although pharmacodynamic studies have not been able to prove this.^{5,6}

There are some reports that suggest that people in opioid substitution therapy who miss the high associated with heroin use turn to crack cocaine as a replacement.⁵

2.2 Mode of action

Cocaine acts at monoaminergic neurotransmitter transporters to block uptake of dopamine, noradrenaline and serotonin resulting in the drugs stimulant effects. Cocaine is also a vasoconstrictor and naturally occurring local anaesthetic.^{4,7}

The duration of cocaine's euphoric effects depend on the route of administration. The faster the drug is absorbed, the more intense the resulting 'high', but also the shorter duration of action. The 'high' from snorting cocaine powder occurs relatively slowly but can last for 15 to 30 minutes.⁸ Smoking crack cocaine, in contrast, is associated with an almost immediate 'high' but it may only last for 5 to 10 minutes.^{4,9}

Smoking crack cocaine radically transforms the effects of the drug; the rapidness and intensity of onset lead to a sensation or rush that is less frequently described by users of cocaine powder. People who use crack cocaine describe feelings of disassociation and pleasure similar to those associated with heroin. The initial pleasure is short, followed soon after by a harsh withdrawal involving anxiety, feelings of guilt and strong craving to use again.³

Cocaine's half life is short resulting in the need for frequent administration. Some cocaine is excreted in the urine, but the majority is metabolised to benzoylecgonine, ecgonine methyl ester, and other metabolites.^{4,10} Although cocaine has a short half life, elimination half lives of cocaine metabolites are longer.¹¹ Both cocaine and some of its metabolites are detectable on clinical toxicology testing, but it is not possible to distinguish between cocaine powder and crack cocaine use.

2.3 Adulterants and additives

Drugs are frequently cut with a variety of substances to increase profit margins. Some cutting agents are used purely to increase bulk by diluting the expensive drug with an inexpensive one and are visibly indistinguishable from the drug they are mixed with. Others produce a reaction similar to that of the illicit drug and some are thought to enhance the experience e.g. by extending the duration of drug action. Among all illicit substances, cocaine powder is one of the most adulterated.³ Samples on average contain three other compounds. In addition to inert diluents such as sugar, talc, plaster and starch, pharmacologically active adulterants are often found in cocaine

powder and crack cocaine including various local anaesthetics (e.g. benzocaine), analgesics (e.g. phenacetin in crack cocaine), and other licit and illicit stimulants.³

The antihelmintic drug levamisole has been the most common adulterant of cocaine products over the last decade followed by phenacetin. Both substances were identified by forensic laboratories and drug checking services in 40-70% of cocaine samples analysed in recent European studies.¹² The amount and ratio of cocaine to levamisole was highly variable. Some samples only had a trace of levamisole while in others there was a higher amount of levamisole compared to cocaine. On average 'cocaine' samples contained 49.7% cocaine and 7.9% levamisole.

Clinical drug screening services do not test for all adulterants. Some adulterants are picked up on the testing of drug seizures. However, cocaine seized on entry to the UK is predominately unadulterated. Adulterant toxicology for retail cocaine in the local area is sparse.

3. Seizures and market information

Cocaine enters the United Kingdom, largely from South America, as cocaine powder. In 2016, Colombia accounted for 68% of estimated global coca cultivation, Peru 21% and Bolivia 11%.¹³ Cocaine is transported from diverse departure points in South and Central America to Europe by various means, including passenger flights, air freight, private aircraft, yachts and other small vessels. However, the largest quantities appear to be smuggled in maritime freight, especially containers. The Caribbean, West and North Africa are important transit zones for cocaine coming into Europe.¹⁴

In 2017, the number of cocaine powder seizures and the quantity seized in the European Union reached the highest levels ever recorded, with more than 104,000 seizures reported, amounting to 140.4 tonnes. This represented a doubling of the quantity seized in 2016. The European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) reports that most of the seizures occurred in Belgium (45 tonnes), Spain (41 tonnes), France (17.5 tonnes) and the Netherlands (14.6 tonnes).¹⁴ In contrast, the number of seizures comprising crack cocaine remained low and stable in the countries that report them. This is partly explained by the fact that crack cocaine is often manufactured close to the point of retail.

Recent surges in cocaine availability across global drug markets reflect significant developments in global cocaine manufacturing with global coca bush cultivation at its highest for nearly 20 years. The increases in cultivation are largely in Bolivia, Colombia and Peru.³ In addition to increases in coca leaf harvesting, intelligence also suggests increased sophistication in manufacturing methods. The increased trafficking of cocaine to Europe appears to have been facilitated by the involvement of a greater number of organised crime groups including in the UK, and the increasing use of overseas territories close to South America. At the retail level, the use of encrypted communication applications and the deep web facilitate low volume sales direct to the consumer.³

Crack cocaine use has historically been mostly limited to large cities. However reports now suggest diffusion from larger cities to smaller regional cities and towns. 'County lines' drug dealing operations are reported as being a significant issue in the UK and thought to be contributing to the increasing availability and aggressive marketing of crack cocaine in the UK.¹⁵ 'Out of town' dealers form organised crime groups based in cities such as London, Liverpool, Manchester and Birmingham, and have expanded their operations to small cities and towns, often using violence to drive out local dealers and exploiting children and vulnerable people to sell drugs. Dealers use dedicated mobile phone lines to take orders from drug users with heroin, cocaine powder and crack cocaine being the most common drugs being supplied and ordered through these routes. On the whole drug users live in a different part of the UK from the dealer so 'drug runners' are 'recruited' to transport the drugs and collect payment.³

The purity of cocaine at a retail level has been increasing since 2010, particularly in the last few years, whilst the retail price of cocaine has remained stable meaning that availability and demand is at an all time high.³ In Tayside, low quality cocaine powder sells for approximately £40/gram which particularly targets younger people, and higher quality cocaine with an average street purity of 80% sells for approximately £80-100/gram.¹⁶

In Scotland, the number of seizures of cocaine powder and crack cocaine have been increasing in recent years [Table 1]. The largest quantity of cocaine powder seized occurred in 2016/17. As with the European data, the majority of cocaine seized is in powdered form, however, the quantity of crack cocaine seized in Scotland has been steadily increasing in recent years and was 6.7kg in 2017/18 [Table 2].¹⁷

Table 1: Number of Class A drug seizures in Scotland from supply crimes, by drug type, 2014/15 to 2017/18. Scotland [Source: Police Scotland]

Drug	2014/15	2015/16	2016/17	2017/18
Cocaine Powder	366	506	488	543
Crack Cocaine	3	25	85	70
Ecstasy-type substances	89	148	150	143
Heroin	553	737	815	826
LSD	3	6	9	3
Methadone	34	11	12	9
Morphine	3	18	3	6

Table 2: Quantity of Class A drug seizures in Scotland from supply crimes, by drug type, 2014/15 to 2017/18. Scotland [Source: Police Scotland]

Drug	Units	2014/15	2015/16	2016/17	2017/18
Cocaine Powder	kg	75.7	82.7	120.3	74.4
Crack Cocaine	kg	0	4.2	5.2	6.7
Ecstasy-type substances	tablets (000s)	15.1	13.4	8.6	25.4
Heroin	kg	106.1	74	54.1	118.6
LSD	tablets/other units (000s)	0.1	0	0.1	0.1
Methadone	litres	8.1	4.3	1.1	1.1
Morphine	litres	0.1	0	0.6	0

4. Prevalence of and patterns and trends in cocaine and crack cocaine use

The recent increase in the availability of higher purity cocaine in Europe's drug markets appears to be repositioning cocaine as the stimulant drug of choice. Cocaine is now the most commonly used illicit stimulant drug in Europe and is particularly prevalent in southern and western European countries. It is estimated that 18 million (5.4%) adults in the European Union (aged 15-64) have tried cocaine at some point during their lives. Among these are approximately 2.6 million (2.1%) young adults aged 15 to 34 who have used the drug in the last year.³

Cocaine has a more universal profile than other recreationally used drugs and is often perceived as a high status drug. It is also considered by users to be easier to control than other drugs. Historically cocaine use was associated with affluence with people taking it largely at the weekends in nightlife settings while managing to stay in employment. However, nowadays there is not one homogenous group of cocaine users, and its use is escalating in populations that previously did not report taking cocaine, such as those with no fixed address and prisoners.¹⁸

Based on motivation for use, there appears to be at least 2 broad groups of people that use cocaine: socio-economically marginalised users and socially integrated users.^{19,20} Within these categories there are further distinctions that can be made based on the different formulations of cocaine used.

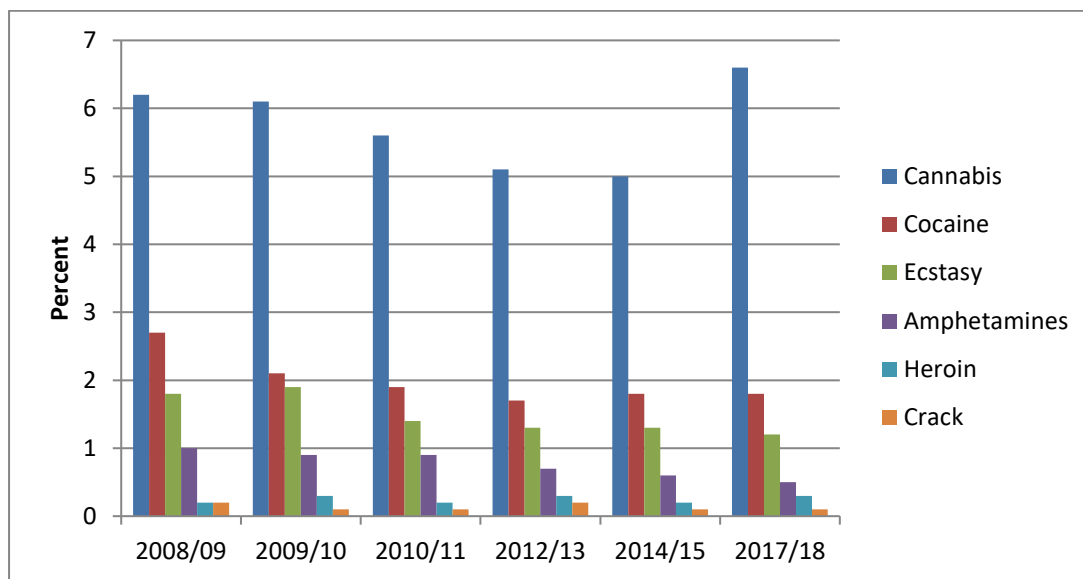
- Socio-economically marginalised users (such as people who are homeless and people with polysubstance problematic drug use) who often smoke crack cocaine and/or inject cocaine powder/crack cocaine, often in combination with other drugs e.g. opioids. The increasing trend of people injecting cocaine powder and crack cocaine is worrying. Transition to injection often marks progression to more severe levels of dependence and associated harm.
- More socially integrated users including:
 - Recreational/occasional users: people who largely have 'controlled' use of cocaine powder (usually snorted) and it is mostly associated with weekend/nightlife use and may be taken with alcohol. Most people manage to continue to hold down employment and they tend to use high purity cocaine. Increasing use in this way has also been reported amongst people who also use performance enhancing drugs (e.g. steroids).
 - People who use highly adulterated cocaine (usually snorted). Anecdotal local evidence suggests increasing numbers of teenagers/younger adults are accessing this type of cocaine.
 - A subset of recreational cocaine users who develop a more regular pattern of use that extends beyond party settings. This type of use can be associated with demanding work environments, and the use of cocaine powder is to cope with tiredness after weekend activities. This group of cocaine users is characterised by attempts to control the habit while slowly progressing towards dependence and many remain relatively hidden from services. Help is generally only sought after the person has developed severe health and social problems which appear with more frequent or heavy use.

4.1 Prevalence among adults

Collecting accurate information on illicit drug use is notoriously difficult because of its hidden and illegal nature. Surveys vary in terms of the number of participants and the degree to which they are representative of the population of interest and therefore some caution is needed in interpretation of estimates. In particular, due to the predominant marginalisation many crack cocaine users will not be captured by general population surveys.

The Scottish Crime and Justice Survey (SCJS) is a large scale social survey which asks people about their experiences and perceptions of crime.²¹ It is completed face-to-face in the homes of respondents with sections on more sensitive topics completed by the respondent themselves using the interviewer's laptop/tablet as part of the main interview. The survey participants are adults living in private residential households (including private and social rented housing). Participants are asked whether they have used illicit drugs in the last year. In 2017/18, 1.8% of respondents reported having used cocaine and 0.1% had used crack. It is likely these figures are an underestimate owing to the potential for selection and reporting biases within the study. This survey suggests there has been a small decrease in cocaine use over the last 9 years whereas crack use has remain low and stable [Figure 1]

Figure 1: Illicit drug use in the last 12 months in Scotland, 2008/09 – 2017/18 [Source: SCJS]



4.3 Prevalence among young adults and teenagers

The Scottish Schools Adolescent Lifestyle and Substance Use Survey (SALSUS) is conducted on a biennial basis, targeting secondary school pupils (aged 13 and 15 years) in local authority and independent schools. In 2010 and 2013, but not in 2015, data was gathered on types of drug used in this population and further divided by NHS board/local authority.

The most commonly used drug in this population of teenagers is cannabis. In 2013, 1.2% reported using cocaine and 0.7% reported using crack cocaine in Tayside – both of which represent a decrease compared to 2010.

Table 3: % of respondents who had used illicit drugs ever, 13 and 15 year olds in Tayside (Scotland), 2010 and 2013 [Source: SALSUS]

	2010 N=2283	2013 N=2248
Cannabis	9.3 (11.6)	8.4 (10.0)
Cocaine	2.3 (2.5)	1.2 (1.6)
Crack	1.4 (1.1)	0.7 (0.8)
Ecstasy	2.6 (2.3)	1.1 (1.5)
Amphetamines	1.9 (1.7)	0.8 (1.0)
Poppers	1.2 (1.7)	0.8 (1.0)
Mephedrone	4.3 (1.6)	0.8 (1.0)
LSD	1.0 (1.3)	0.8 (1.0)
Magic mushrooms	1.7 (1.7)	0.8 (1.1)
Ketamine	1.2 (0.8)	0 (0.7)
Synthetic cannabis including Spice1	0.6 (0.8)	1.0 (1.5)
Heroin	1.2 (1.0)	0 (0.7)
Methadone	1.1 (1.0)	0 (0.6)

((0 = less than 0.5 but not 0)

4.4 Prevalence and patterns of use among specific populations

4.4.1 People who injected drugs – local survey

People accessing a local third sector harm reduction service were asked to complete a survey about cocaine use. The majority of respondents were people who were accessing the injecting equipment provision (IEP) service. There were 168 respondents to the survey which ran for 3 months (January – March 2019). Response rate was reported to be good and clients only declined to complete the survey if they were short of time. Clients only completed the survey once.

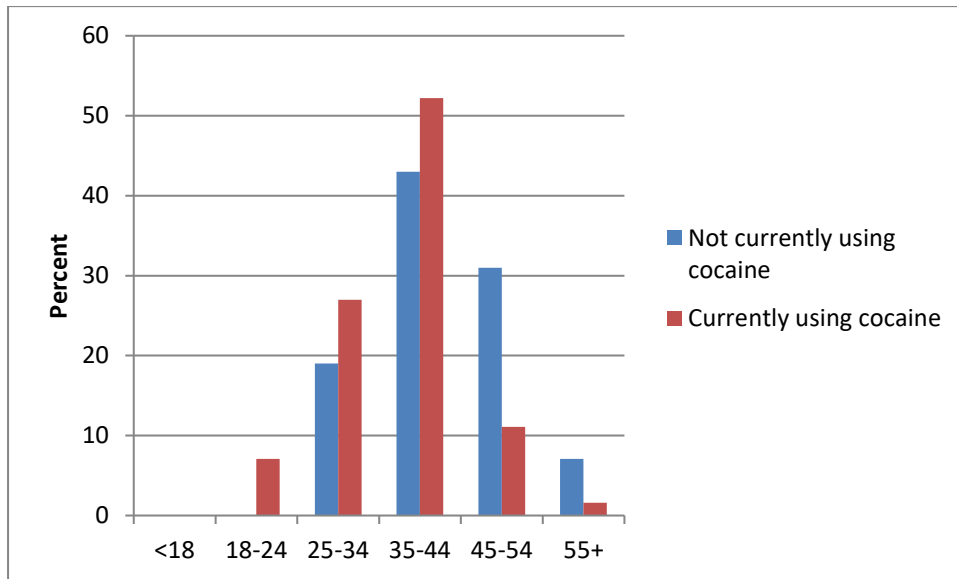
Of the 168 respondents, 75% reported currently using cocaine [Table 4]. Of those currently using cocaine 79.5% were male. This was similar to those who reported not currently using cocaine (76.2%). The mean age of respondents who were currently using cocaine was younger than the mean age of people not currently using cocaine.

Table 4: Demographics of survey participants (current cocaine use/no current cocaine use)

	Currently using cocaine	Not currently using cocaine
% using cocaine	75%	25%
Male (%)	79.5%	76.2%
Mean age of respondents	36.0 years	42.0 years

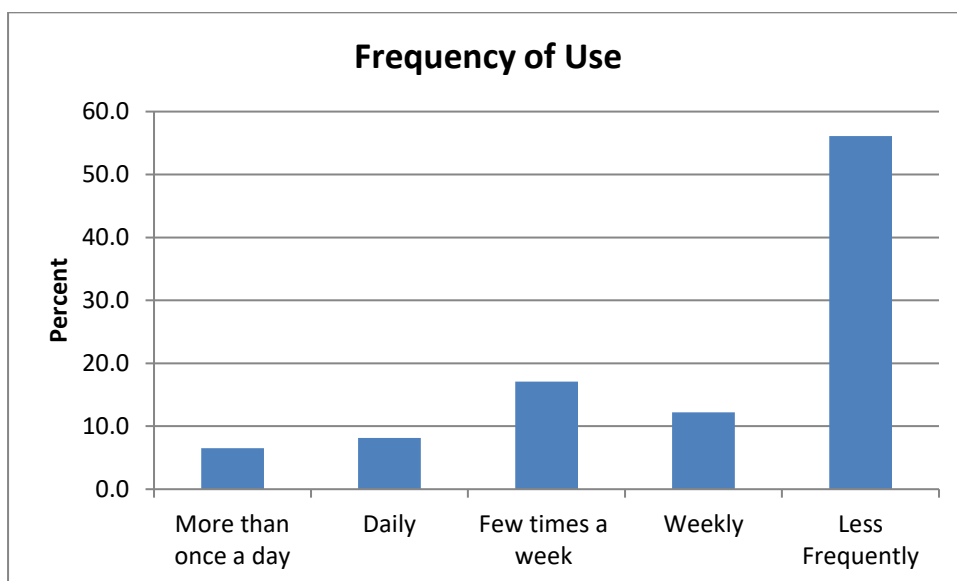
People reporting current cocaine use were a slightly younger population in general compared to those not currently using cocaine [Figure 2].

Figure 2: Age profile of respondents (current cocaine use/no current cocaine use) [Source: bespoke local harm reduction survey]



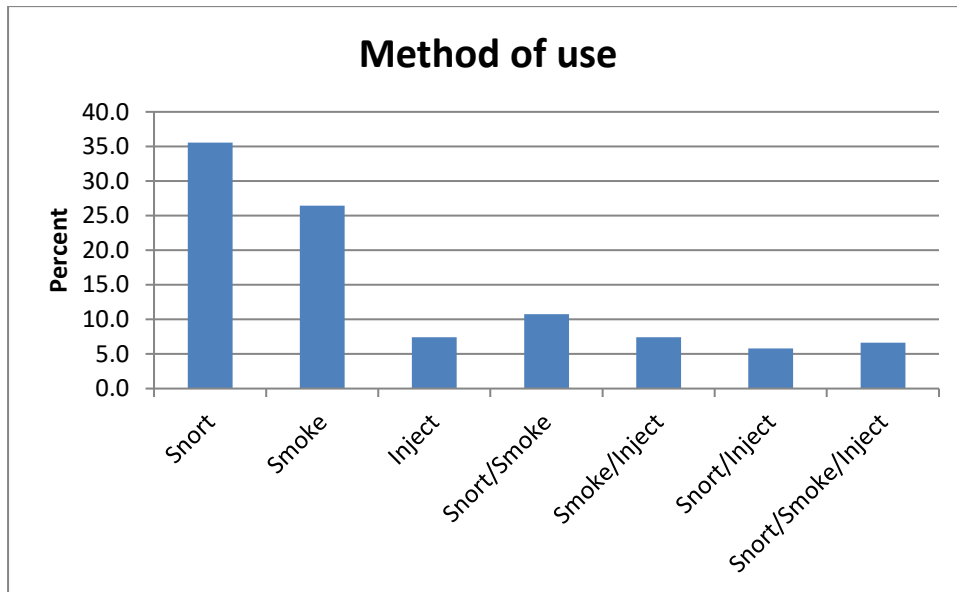
43.9% of respondents who were using cocaine reported using it at least weekly [Figure 3].

Figure 3: Frequency of use for respondents who reported “currently using cocaine”. [Source: bespoke local harm reduction survey]



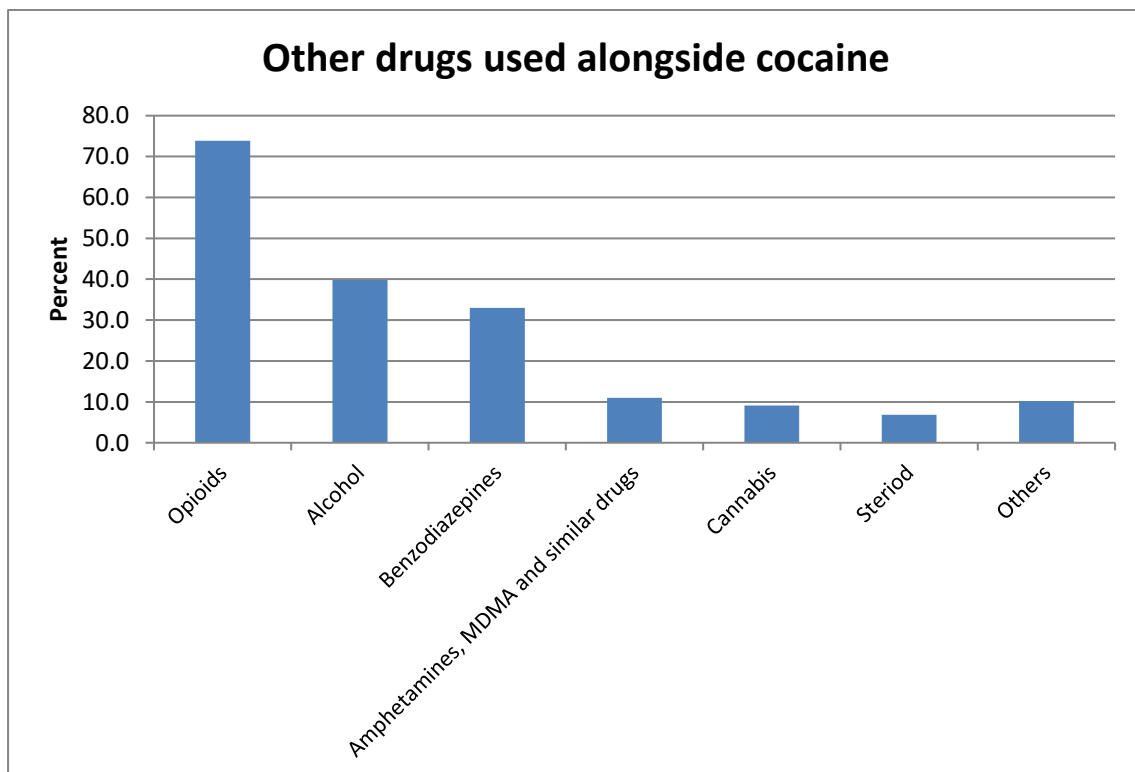
The commonest method of use was snorting (35.5%), followed by smoking (26.4%). Using cocaine solely by injection was less common (7.4%), although a further 19.8% reported injecting cocaine some of the time in addition to other routes [Figure 4].

Figure 4: Method of use for respondents who reported “currently using cocaine”. [Source: bespoke local harm reduction survey]



70.4% of respondents reporting current cocaine use stated that they used cocaine in addition to other substances (although not necessarily concomitantly). Opioids were the most commonly reported drug used alongside cocaine (73.4%), followed by alcohol (39.8%), and benzodiazepines (33.0%) [Figure 5].

Figure 5: Other substances reported to be used alongside cocaine. [Source: bespoke local harm reduction survey]



39.3% of respondents who reported currently using cocaine said they were using more cocaine than they had in previous years. Reasons for this given included increased availability (57%) and cocaine being of better quality (13%).

4.4.2 People who inject drugs – Needle Exchange Surveillance Initiative

The Needle Exchange Surveillance Initiative (NESI) is a cross-sectional survey of the prevalence of blood borne viruses and injecting risk behaviours among people who inject drugs attending Injection Equipment Provision (IEP) services in Scotland.²² Data has been gathered since 2008/2009. In 2017/18, 2130 people were interviewed across Scotland.

In 2017/18, 29% of participants across Scotland reported injecting cocaine powder in the previous six months, an increase from 13% in 2015/16. Injecting heroin and cocaine together increased from 4% to 9% between 2015/16 and 2017/18, and injecting crack cocaine increased from 3% to 6%. The greatest increase in illicit drug injection in recent years occurred with cocaine [Figures 6 and 7].

Figure 6: Drugs reported to have been injected in the previous six months, Scotland, 2008/2009 – 2017/2018 [Source: NESI]

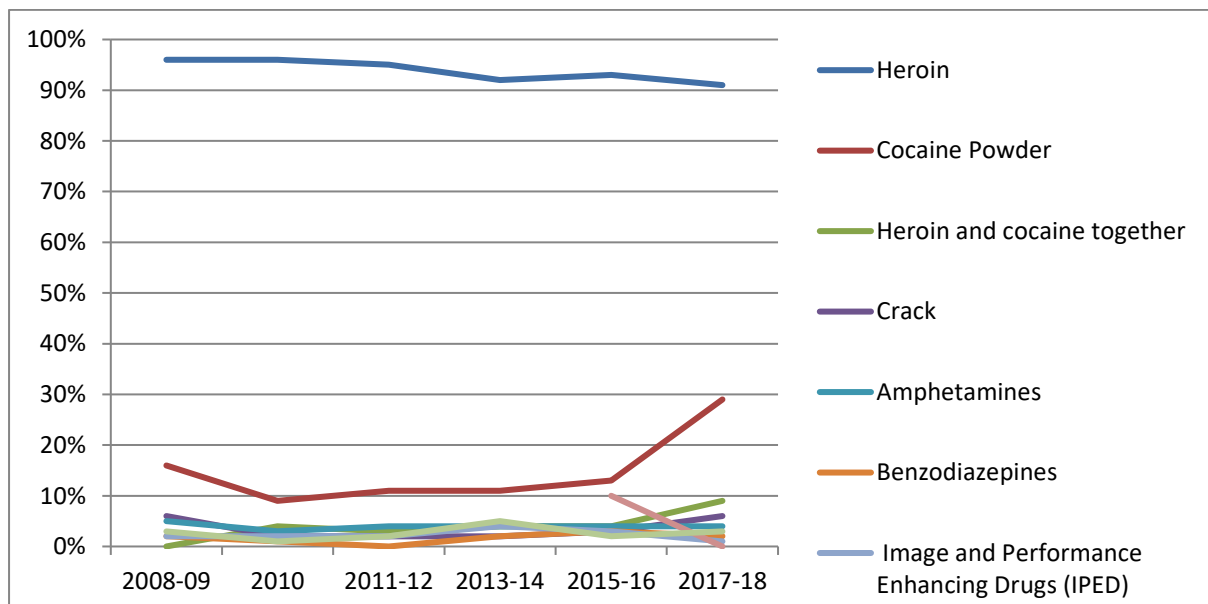
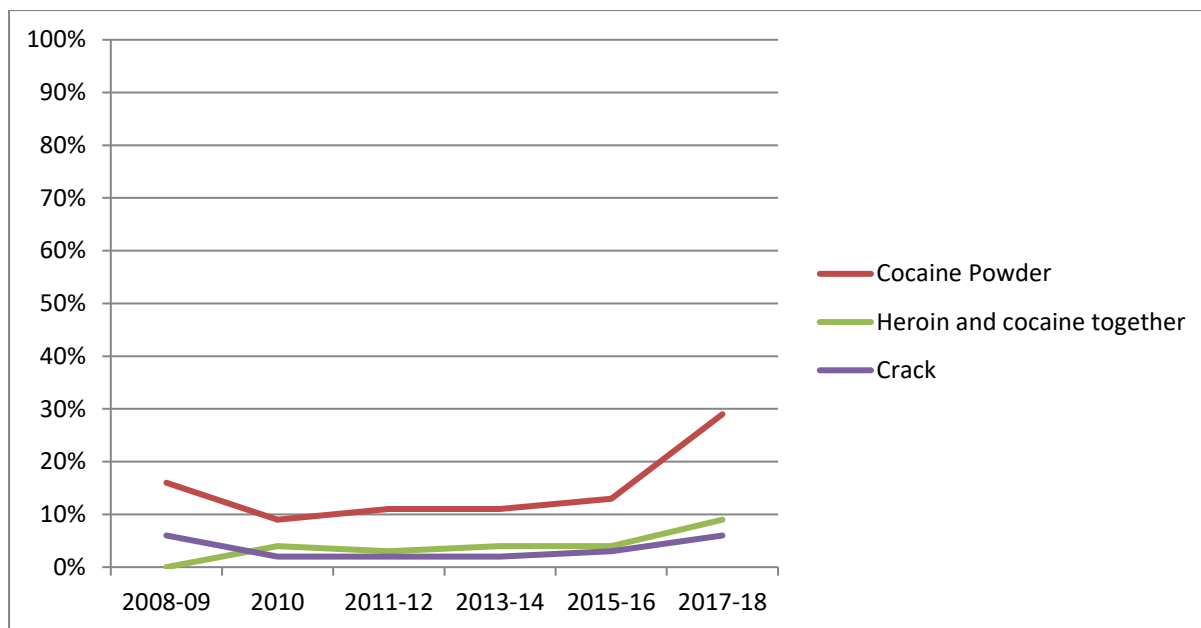
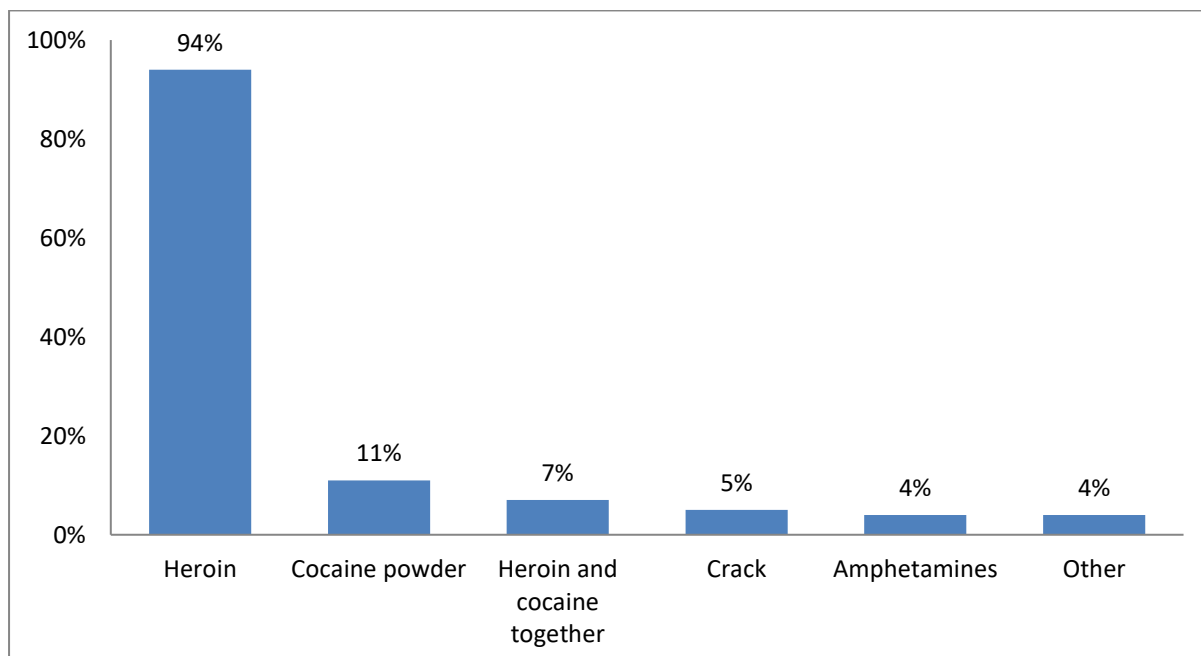


Figure 7: Prevalence of cocaine injecting in previous six months, Scotland, 2007/2009 – 2017/2018 [Source: NESI]



In 2017/2018 in Tayside, 94% of participants reported injecting heroin in the last 6 months, 11% reported injecting cocaine powder, 7% reported injecting heroin and cocaine together, and 5% reported injecting crack [Figure 8].

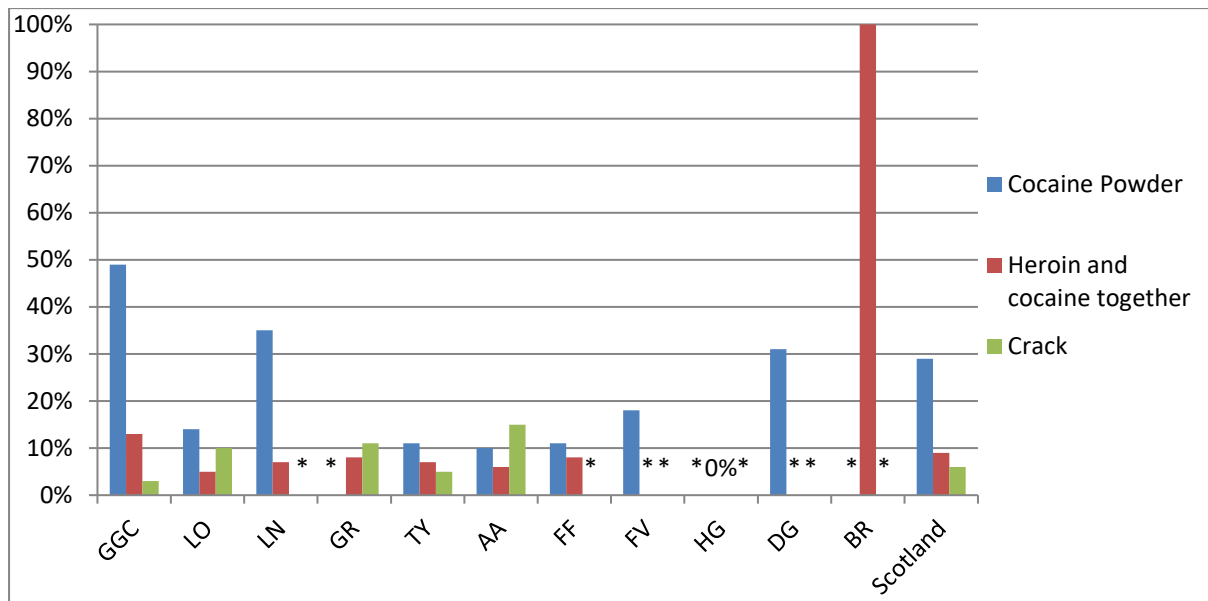
Figure 8: Dugs injected in previous 6 months in Tayside, 2017/18 [Source: NESI]



('Other' includes benzodiazepines, image and performance enhancing drugs, antihistamines, ketamine, ecstasy and other opioids).

The Scottish average for recent injection of cocaine powder, heroin/cocaine together, and crack was 29%, 9% and 6% respectively. Compared to some other main land territorial Health Boards, a smaller proportion of people reported injecting cocaine/crack in Tayside [Figure 9].

Figure 9: Percentage of respondents reporting injecting cocaine, heroin/cocaine, crack in previous 6 months, by Health Board, 2017/2018 [Source: NESI]

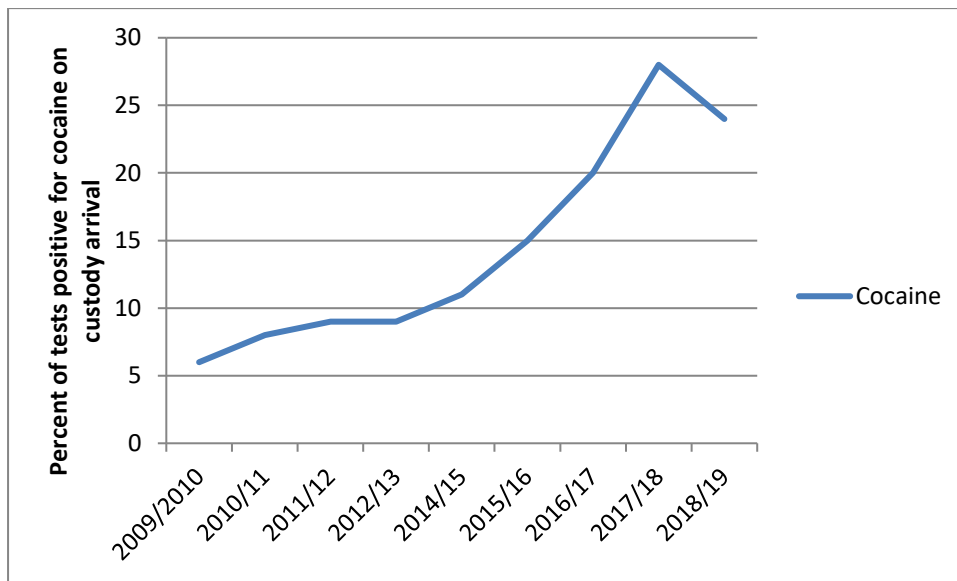


*data suppressed due to small numbers

4.4.3 Prevalence in people who commit offences and in prisoners

Addiction Prevalence Testing is conducted across all Scottish prisons annually.²³ One month each year, prisoners arriving in custody are voluntarily tested for the presence of illicit drugs. Over the last decade there has been an overall upward trend in the detection of cocaine on arrival in custody [Figure 10]. Of note, however, as described before, cocaine has a short half life and is often used in binges, therefore whilst observing the trend in increase is useful, the actual proportions are likely to be an underestimate of the actual prevalence of cocaine use in this population.

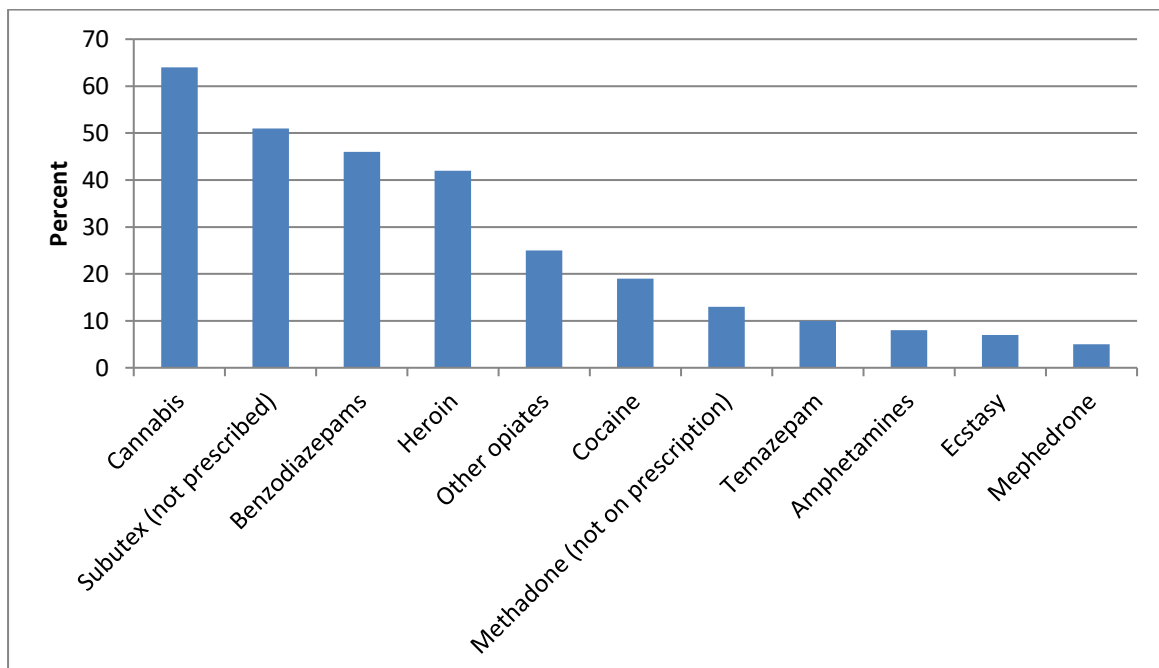
Figure 10: Addiction Prevalence Testing for people entering Scottish prisons, percent of tests positive for cocaine. 2009/10 – 2018/19.



(NB: data for 2013/14 not available)

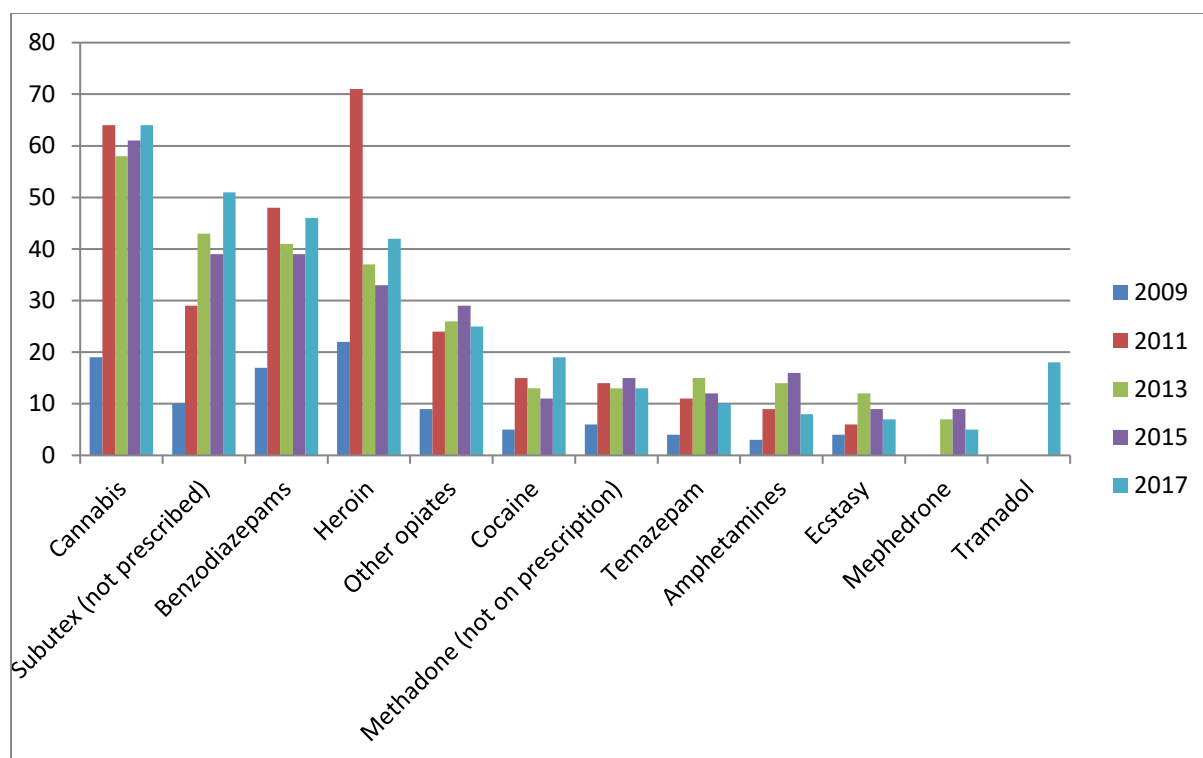
People incarcerated in 15 Scottish Prisons are also invited to participate in the Scottish Prison Survey each year.²⁴ In the survey, prisoners are asked whether they have used illegal drugs while in prison in the last month. Of the 2443 prisoners that responded in 2017 (46% response rate), 22% said “yes”. 19% of those that replied “yes” reported having used cocaine [Figure 11].

Figure 11: Illicit drugs used in the previous month in prisoners reporting recent illicit drug use in Scottish prisons, 2017 [Source: Scottish Prison Survey]



In 2009, recent cocaine use in Scottish prisons was 5%; in 2017 it was 19%. [Figure 12]

Figure 12: Trend of illicit drugs used in the previous month in prison in prisoners reporting recent illicit drug use, Scottish Prisons, 2009-2017 [Source: Scottish Prison Survey]



4.4.4 Clinical Toxicology Laboratory testing

Drug toxicology screening of urine samples is undertaken locally to determine the presence of illicit and prescribed drugs. Two types of tests are currently used in Tayside: immunoassay testing and gas chromatography/mass spectrometry (GC/MS). Immunoassay testing is a rapid test using antibodies to detect the presence of drugs that is useful for screening samples but lacks sensitivity and specificity. Gas chromatography/mass spectrometry (GC/MS) is considered the gold standard for comprehensive drug screening and provides greater sensitivity and specificity, as well as more detail on the specific drugs taken (rather than group of compounds) and corresponding metabolites.

For this health needs assessment, clinical toxicology data was obtained from NHS Tayside laboratories. The data showed that the proportion of samples where cocaine has been detected on both immunoassay and GC/MS testing has increased [Figures 13 - 15]. GC/MS results may be influenced by a change in specific requests for cocaine testing between 2008-2018, but this should not be influencing immunoassay detection rates.

Figure 13: Prevalence of drug types undertaken for drug screening Tayside clinical toxicology laboratories (immunoassay), 2008-2018.

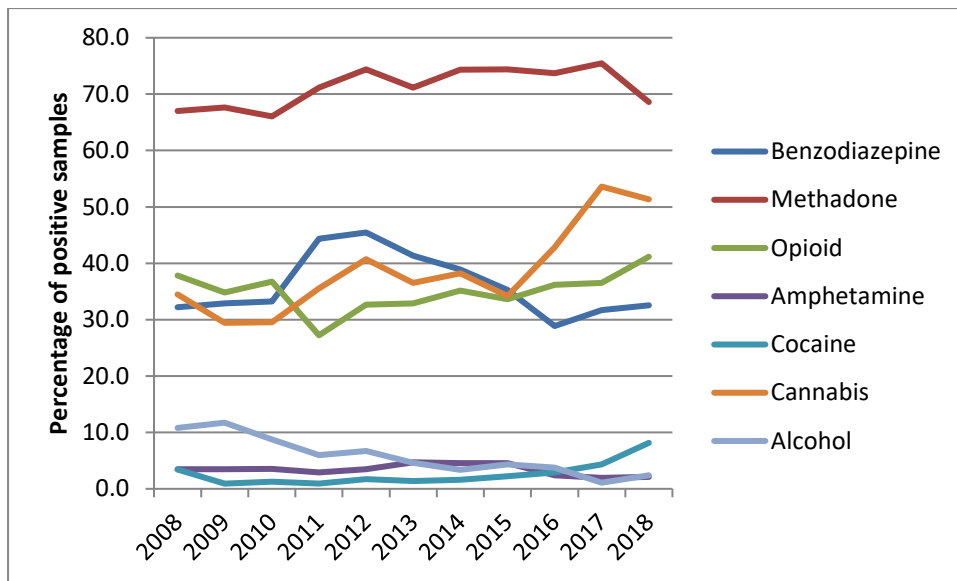


Figure 14: Prevalence of cocaine detected by immunoassay on samples sent to Tayside clinical toxicology drug screening, 2008-2018.

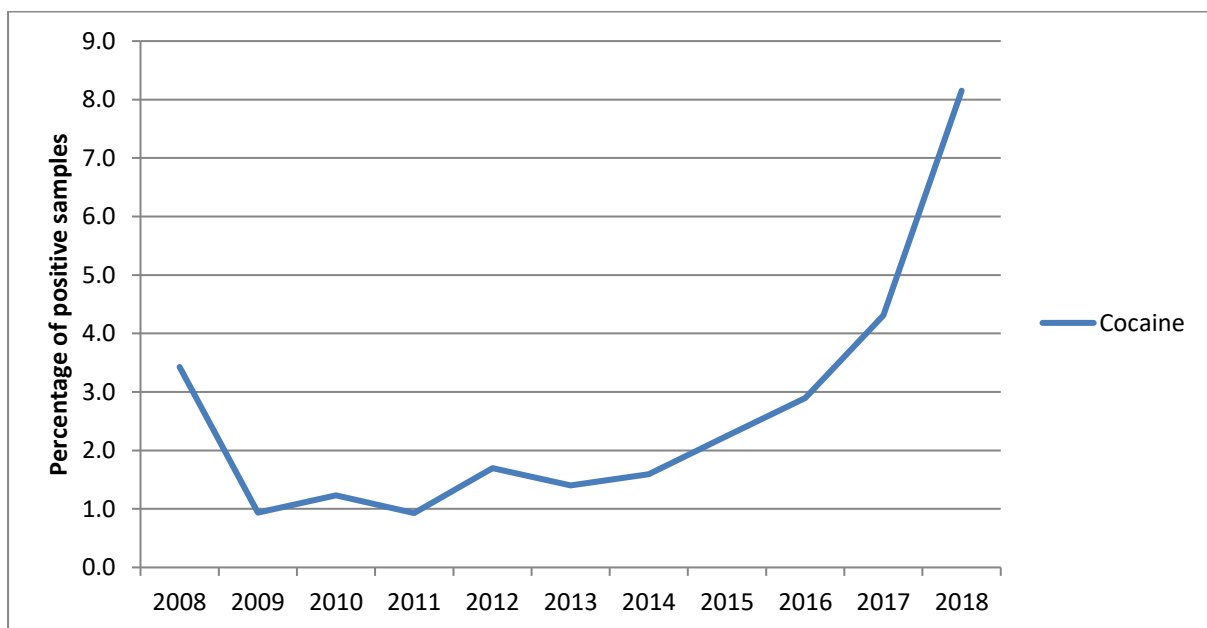
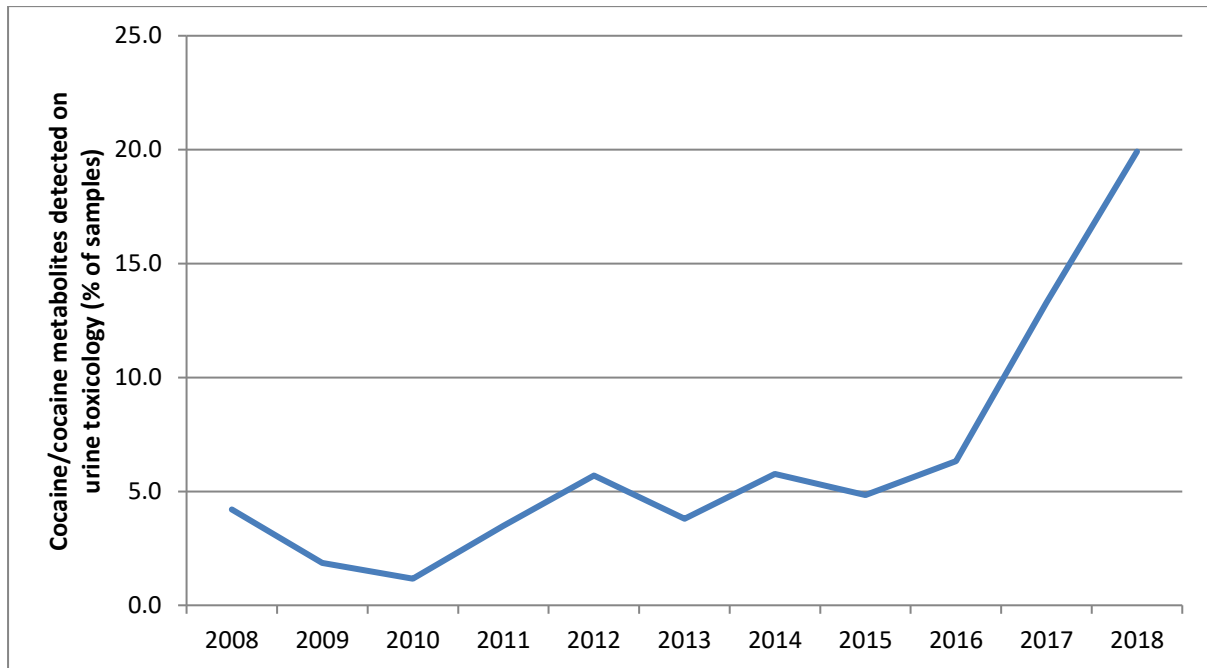


Figure 15: Prevalence of cocaine or cocaine metabolites detected by gas chromatography/mass spectrometry on samples sent to Tayside clinical toxicology drug screening, 2008-2018



(NB: The presence of cocaine, or its major metabolites, indicates use within the past 4 days)

4.4.5 *People accessing needle exchange service for steroid use*

Since October 2018, an IEP service in Tayside has been providing tailored health assessments to people who inject steroids. At the time of assessment, clients are asked about any other substances used. As of July 2019, 79 clients who provided information on this, 67.1% reporting having used other substances. Of these 88.7% reported using alcohol, 66.0% reported using cocaine, including 41.5% who reported using both cocaine and alcohol.

5. Health problems related to cocaine and crack cocaine use

Cocaine has been associated with a range of medical complications. The health impacts of cocaine vary depending on whether it is acute or chronic use, and also differ according to the route of administration, dose, and frequency of use.²⁵ Polydrug use together with the various impurities and cutting agents often found in retail cocaine increases the risk of adverse health effects further.

5.1 Cocaine related deaths

The EMCDDA has noted a number of countries where cocaine use has been associated with recent increases in drug related deaths. Drug related deaths are rarely cause by cocaine alone. Polydrug intoxication is the norm, with cocaine commonly identified among other substances such as heroin, other opioids, amphetamines, benzodiazepines and alcohol. The EMCDDA has also noted that there is likely to be underreporting of cocaine related deaths, for example where cocaine use has caused a myocardial infarction or stroke that has lead to death but the cocaine use was either not known to or reported by the medical practitioner.³

5.2 Acute and chronic health effects of cocaine use

5.2.1 General health

People who use cocaine can suffer from general poor health and aches and pains, as well as specific pains in the shoulders and numbness in hands. Nutritional status is often poor and weight loss can result.²⁶

5.2.2 Dependence

Cocaine has a strong reinforcing action, causing a rapid psychological dependence. One study of 2259 cocaine users (both people who use cocaine powder and crack cocaine users) found that 20.9% progressed to dependence, and half of these cases occurred within four years of onset of use.²⁷ In another study of 1080 individuals who had used cocaine in the last 2 years, O'Brian *et al.* found that 5% to 6% had become dependent. In this study, injection of cocaine and smoking crack cocaine appeared to be associated with a greater risk of dependence as result of the more immediate and more intense but short lasting effects compared to intranasal use.²⁸ Due to the short duration of effects and its intensity, crack cocaine patterns of use tend to be heavier in terms of both frequency and quantity.²⁹ The risk of dependence among users of crack cocaine has been estimated to be two to three times greater than among cocaine powder users.³⁰ It is reported that unlike heroin, crack cocaine dependence does not necessarily involve daily use; crack cocaine is often used in binges that may last for days until physical or economic exhaustion.³

In Europe, since 2014, the number of new clients entering treatment for cocaine problems, although still relatively low, has increased by over 35% with around two-thirds of countries noting an increase.¹⁴

5.2.3 System specific health problems

Cardiovascular disorders

Acute cardiovascular manifestations of cocaine use include chest pains, increased heart rate and raised blood pressure. Chest pain is one of the most common symptoms reported by people who

use cocaine; however only a small proportion is attributable to myocardial ischaemia or infarction.^{31,32}

Although most cases of cocaine induced chest pain are non ischaemic, myocardial infarction remains the single most frequently reported cardiac complication of cocaine use. Acute cocaine use, and less commonly long term use, has been implicated as a trigger of acute myocardial infarction as a result of vasospasm in patients free from coronary artery disease and more frequently in patients with underlying coronary atherosclerosis.³³

Other cocaine related cardiac problems include arrhythmias, myocarditis, endocarditis, cardiomyopathy, and aortic dissection. Extra-cardiac causes of chest pain have also been reported such as pneumothorax and pneumoperitonium, related to inhalation or smoking cocaine.³⁴

Cerebrovascular disorders and neurological impairment

Acute and chronic cocaine use may cause either ischaemic or haemorrhagic stroke. Cocaine related seizures occur most often after chronic use but also may occur after the initial use of cocaine via any route of administration.³⁵ Most cocaine related seizures occur within minutes of drug use. Cocaine induced seizures are usually single, generalised tonic clonic seizures, although multiple seizures and status epilepticus can occur.³⁶

Psychiatric manifestations

People use cocaine for effects which include euphoria and elevated mood. However, cocaine use may cause significant acute toxicity which can manifest as neuropsychiatric effects including dysphoria, agitation, anxiety, restlessness, insomnia, suicidal thoughts, paranoid psychosis, auditory hallucinations and depression. Cocaine induced delirium is common.²⁵ A depressed mood is common after the initial rush and in the long term depressive symptoms may develop and is particularly associated with crack cocaine use.²⁵

Respiratory disorders

Pulmonary oedema, pulmonary infarction and haemoptysis can occur after acute use. In the long term pulmonary hypertension can develop.^{37,38} Specific respiratory disorders related to smoking/inhaling crack cocaine are detailed in section 4.3 below. Eosinophilic pneumonia associated with other forms of cocaine use are also well described.³⁹ Pneumothorax, pneumomediastinum, pulmonary oedema, pulmonary haemorrhage, bronchiolitis obliterans, pulmonary artery medial hypertrophy have all been associated with cocaine/crack use.³⁴

Gastrointestinal, genito-urinary and obstetric disorders

Vasoconstriction as a result of cocaine use can lead to mesenteric ischaemia or infarction.⁴⁰

Acute renal failure can occur as the result of rhabdomyolysis and direct toxicity. Renal artery spasm/thrombosis/embolism can also occur, leading to renal colic and/or kidney infarction.^{41,42} In pregnancy cocaine use can lead to acute complications of placental abruption and spontaneous abortion.⁴³ In the longer term cocaine use increases the risk of premature birth and poor foetal growth. In men, vasoconstriction due to cocaine use can cause testicular infarction.⁴⁴

5.3 *Specific effects related to the preparation of cocaine and route of administration*

Snorting/nasal insufflations

Insufflating cocaine causes vasoconstriction of the blood vessels in the nasal passage. Regular snorting of cocaine can lead to sinusitis, loss of sense of smell, ischaemic necrosis of the septal cartilage leading to perforation of the nasal septum, hoarseness and swallowing difficulties.^{45,46}

Extensive destruction of the osteocartilaginous structures of the nose, sinuses and palate is increasingly being seen as complications of cocaine use and often mimics other diseases such as tumours, infections and immunological diseases. Systemic changes such as positive antineutrophil cytoplasmic antibody (ANCA) tests have also been reported.^{47, 48}

Smoking/inhalation

The lungs are the principal organs exposed to the combustion products of smoking crack. Acute respiratory symptoms usually develop within a few hours of use but in some cases symptoms may develop within minutes.³⁴ Acute respiratory complaints include:

- Cough with sputum
- Chest pain with or without shortness of breath
- Haemoptysis
- Exacerbation of asthma

A hypersensitivity pneumonitis (Crack Lung) can develop within 48 hours of smoking crack cocaine, causing dyspnoea, wheeze, cough and haemoptysis.³⁷

If highly volatile solvents are used to manufacture crack cocaine, there is an increased risk of burns to mouth, throat and hands.

As cocaine is a local anaesthetic, when someone smokes cocaine, it diminishes their ability to detect any foreign bodies that may also enter their lungs (e.g. ash, pieces of metal gauze, water vapour, parts of pipes). In addition the cough reflex (which would remove these foreign bodies) is suppressed.^{24, 34} Persistent foreign bodies in the lungs can cause pneumonia and empyema.

Injecting

Injecting cocaine powder or crack cocaine is particularly harmful. Due to its half life, cocaine tends to be injected more frequently than heroin and cocaine causes local vasoconstriction making it harder for the person who is using cocaine to find a suitable injecting site. Furthermore, the local anaesthetic properties of cocaine means localised damage to the skin and veins can occur without the person being aware, leading to localised and systemic infections.⁴⁹

More frequent injecting may also lead to increased risk taking in injection practices e.g. sharing of equipment resulting in an increased risk of blood borne virus transmission.

In 2015, an outbreak of HIV was identified among people who injected drugs in Glasgow. A cross sectional study found that between 2011 and 2018, HIV prevalence in a sample of people who injected drugs in Glasgow City Centre rose from 1.1% to 10.9%.⁵⁰ During the same period the prevalence of cocaine injecting in the same sample rose from 37% to 77%. HIV infection was found to be more likely among people who injected drugs and who had been homeless in the past 6

months (3.0, 95%CI 1.7-5.0; $p < 0.0001$), had been incarcerated more than five times since they began injecting (2.1, 1.2-3.7; $p = 0.0098$); and had injected cocaine within the past 6 months (6.7, 3.8-12.1; $p < 0.00001$).

Crack cocaine

Severe physical and mental health problems are common in people who use crack cocaine. For example, numerous studies have identified crack cocaine use as an independent risk factor (either directly related to use or indirectly), of several chronic infectious diseases including hepatitis C, HIV, and tuberculosis.^{51,52,53} Rates for these illnesses are commonly higher among people who use crack cocaine as opposed to other illicit drugs. People who use crack cocaine have disproportionately elevated rates of psychiatric problems – including depression, anxiety, personality disorders, and suicidal ideation - and are often disconnected from social, health or treatment services.^{54,55}

5.4 Health effects of concomitant cocaine and alcohol use

Cocaethylene is structurally similar to cocaine. It is formed by the liver when cocaine and ethanol (alcohol) co-exist in the blood. Unlike benzoylecgonine, cocaethylene is an active metabolite of cocaine. Cocaethylene has similar pharmacological properties to cocaine but has a longer elimination half life. As alcohol, a central nervous system depressant, may mask the stimulant effects of cocaine and vice versa, both cocaine and alcohol use is likely to increase. As a result the use of concomitant use of cocaine and alcohol is associated with a higher risk of cardiovascular adverse events.^{4, 56}

5.5 Health effects of concomitant use of cocaine and heroin/polydrug use

It is a misconception that the effects of a depressant (e.g. heroin) counterbalance the effects of a stimulant (e.g. cocaine). Opioids, in combination with other substances like cocaine, are commonly associated with fatal and non-fatal overdoses.⁵⁷

5.6 Health effects of adulterants

Cutting drugs with other materials may cause additional health consequences. For example, the acute adverse effects of levamisole include nausea, diarrhoea and dizziness. Prolonged exposure can cause fever, insomnia, headache and convulsions.⁵⁸ Levamisole suppresses the production of white blood cells resulting in neutropenia and agranulocytosis.⁵⁹ Chronic use of levamisole in cocaine has been reported to be associated with systemic vasculitis (Levamisole Induced Vasculitis).⁴⁸

Phenacetin has been documented to have carcinogenic and nephritic adverse effects.²⁵

6. Prevalence of and patterns and trends in health harms associated with cocaine and crack cocaine use

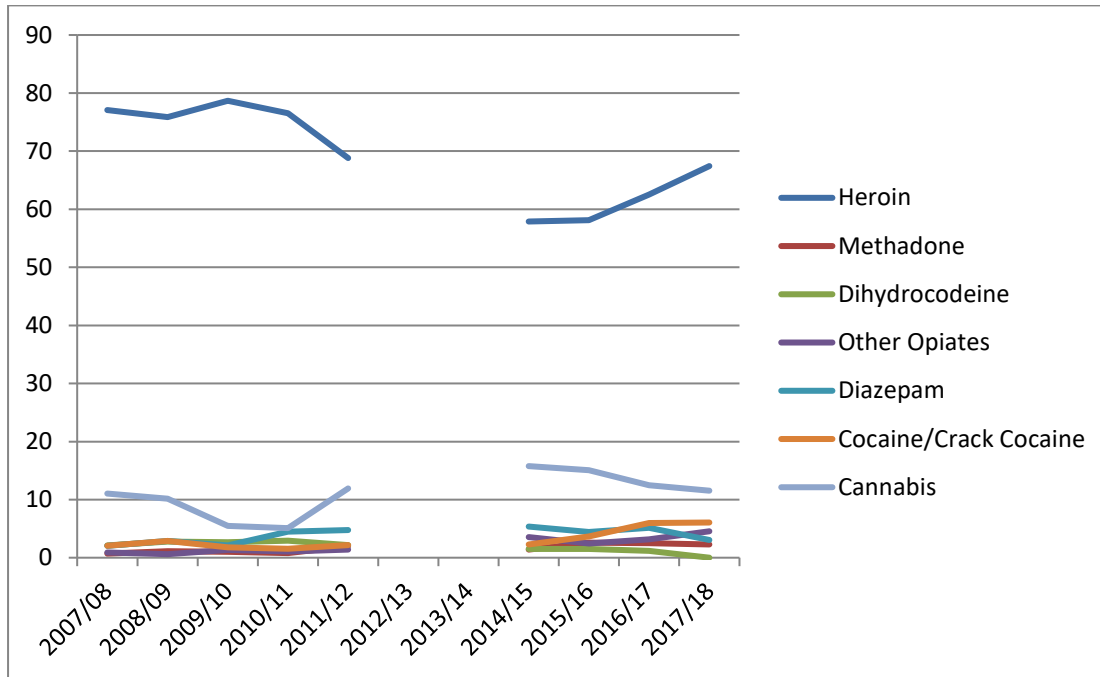
6.1 Treatment demand data

6.1.1 People accessing drug treatment services – Scottish Drugs Misuse Database (SDMD)

The SDMD is an important and widely used national information source, hosted by NHS Information Services Division (ISD), which provides data on clients seen at a broad range of specialist substance misuse services across Scotland.⁶⁰

For one field in the database, new clients are asked what their main drug use is and only one drug is recorded per person - other drug use is recorded elsewhere. In 2017/18, heroin remained the most common principal drug used in Tayside [Figure 16].

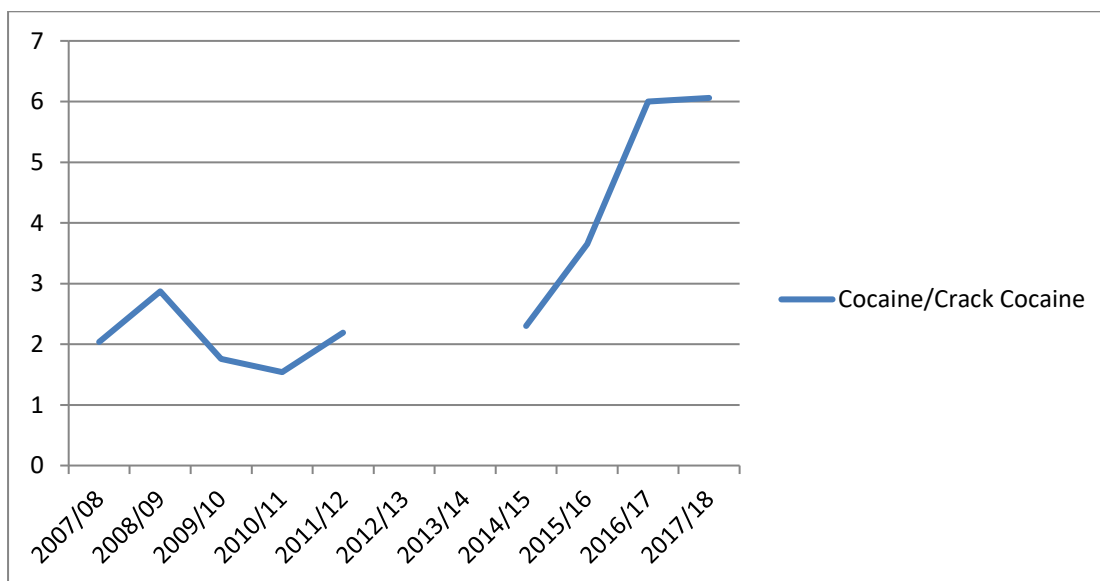
Figure 16: Principal illicit drug used by clients accessing drug treatment services in Tayside [Source:SDMD]



(no data for 2012/13 and 2013/14)

Cocaine/crack was reported as being the principal drug used by 6.0% of clients in Tayside in 2017/18, compared to 2% ten years previously [Figure 17].

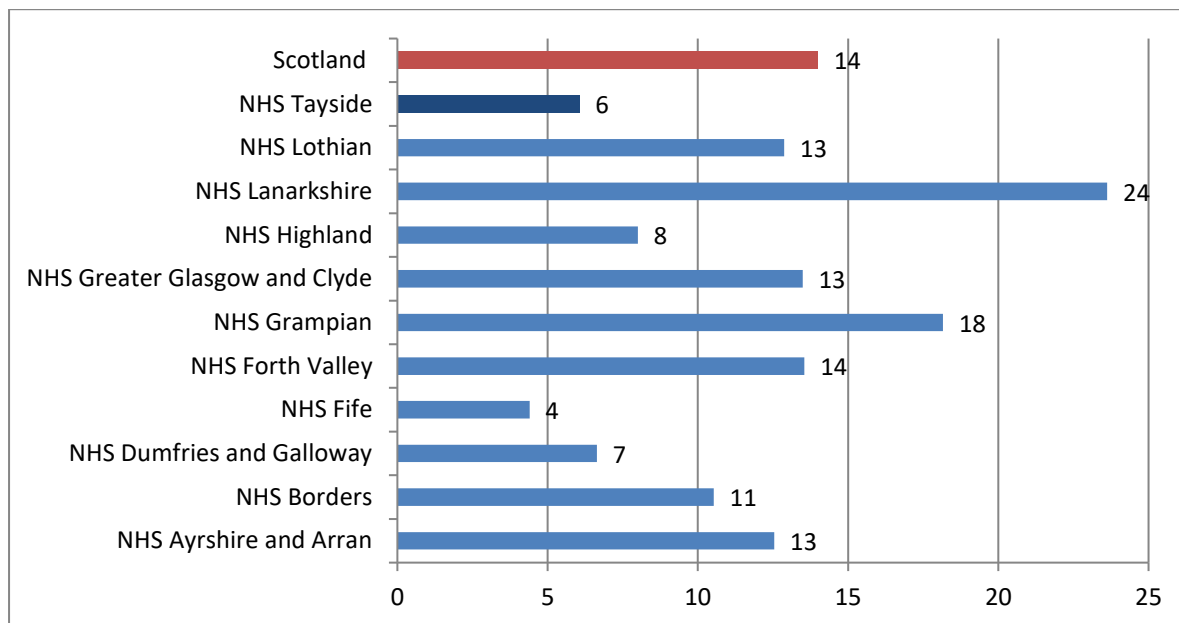
Figure 17: Cocaine/crack reported as principal illicit drug used, Tayside, 2007/08-2017/18



(no data for 2012/13 and 2013/14)

Compared to other mainland territorial Health Boards, a smaller proportion of the people in Tayside reported cocaine as the principal drug used when accessing drug treatment services [Figure 18].

Figure 18: Cocaine/crack reported as principal illicit drug used by Health Board (%), 2017/18 [Source: SDMD]



6.2 Hospital admissions data

Compared to opioids, hospital admissions to acute general hospitals for cocaine use is relatively low [Figure 19]. Nonetheless, if cocaine admissions are considered in isolation, there has been a steady increase in rate over the last 20 years [Figure 20]. Hospital admission data is reliant on comprehensive discharge summaries and coding. It is recognised that hospital statistics are likely to significantly under-record drug related morbidity, and anecdotal local evidence suggests that for some drug related admissions, discharge summaries will detail the pathology but often do not refer to the underlying cause (e.g. nasal septum injury without specifying cocaine as the cause).²⁵

Figure 19: Acute general hospital admissions in Tayside secondary to opioid/cannabinoid/cocaine use, 1996/1997 – 2017/18, European age standardised rate [Source: Drug-Related Hospital Statistics, ISD Scotland]

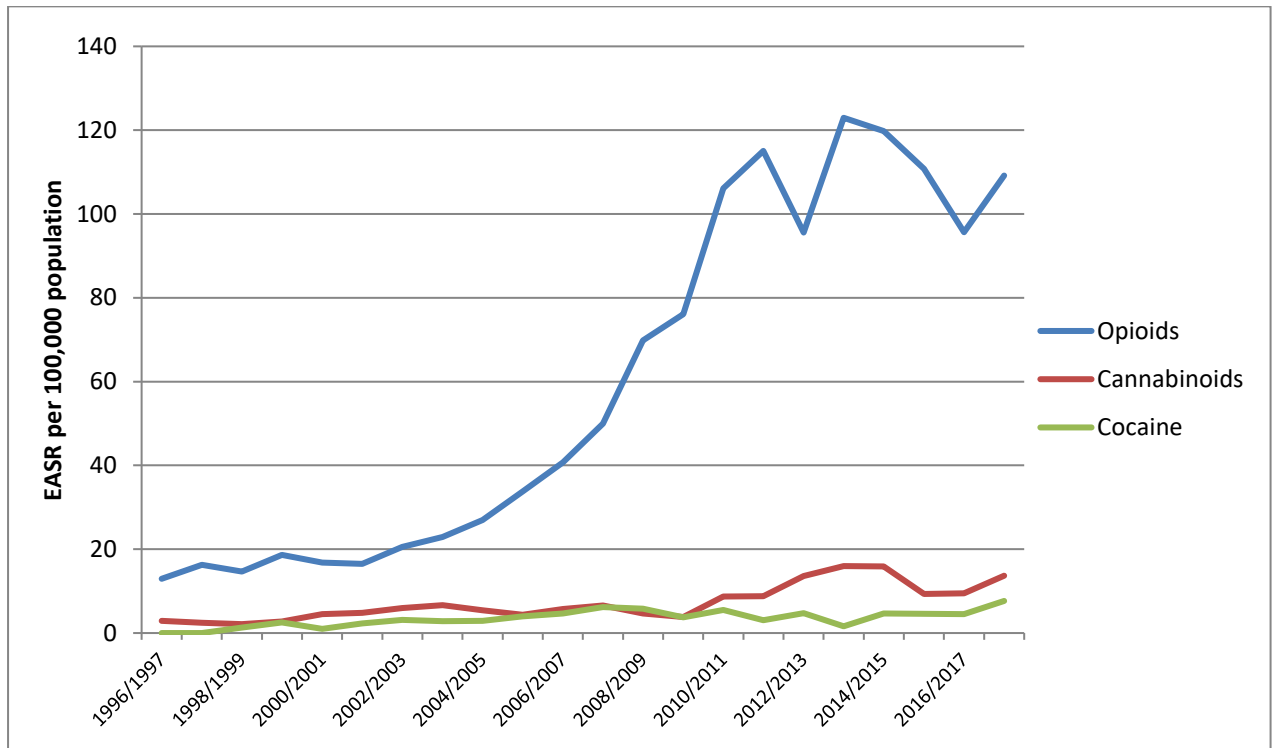


Figure 20: Acute general hospital admissions in Tayside secondary to cocaine use, 1996/1997 – 2017/18, European age standardised rate [Source: Drug-Related Hospital Statistics, ISD Scotland]



A case study exploring the otolaryngological manifestations of ‘Cocaine-induced Midline Destructive Lesion’ and ‘Levamisole Induced Vasculitis’ reported on 9 patients from Dundee and Glasgow between 2016 and 2019. The mean age was 37 years (range 25-49) and 8 were male.⁴⁸

6.3 People who inject drugs – local survey [see also section 3.3.1 for more details]

19.8% of respondents reported health-related problems after taking cocaine. Of these 75% provided details on the types of problems experienced: 54.3% reported physical health problems including seizures, cellulitis, palpitations, chest tightness and overdose; 16% reported mental health problems including paranoia. There were also reports of social problems (debt and relationship issues) and general concerns expressed over what cocaine was cut with.

6.4 Drug death data

In Tayside in 2017 and 2018 there were 26 drug deaths where cocaine was implicated in the death (representing 11% and 20% of drug deaths in 2017 and 2018 respectively). In 2016, cocaine had only been implicated in 1.8% of deaths.⁶¹

The proportion of drug-related deaths where cocaine has been implicated has also been increasing nationally. In 2016, cocaine was implicated in 12% deaths, rising to 21% in 2018.⁶²

In Tayside, for all deaths associated with cocaine use, multiple substances were identified on post mortem toxicology (range 3 – 14 substances).

Of the 26 deaths associated with cocaine use, 92.3% were associated with concurrent opioid use, 57.7% with benzodiazepine use (excluding etizolam), 61.5% with etizolam use, and 57.7% with pregabalin/gabapentin consumption.

Based on these 26 cases alone it appears that drug deaths associated with cocaine use are more common in men, affect a slightly younger age group and the person affected is less likely to have been in contact with services at their time of death [Table 5]. However, it is not possible to draw definitive conclusions from these cases.

Table 5: Comparison between drug deaths associated with cocaine use and drug deaths not associated with cocaine use: Contact with services at time of death, sex and age, 2017 and 2018 combined.

	Cocaine or cocaine metabolites found on post mortem	Cocaine or cocaine metabolites NOT found on post mortem
Contact with services at time of death	42%	56%
Male	84.6%	72.8%
Mean age (years)	36.2	41.1

6.5 Suicides

In the three years between 2016-2018, there were 19 suicides in Tayside where cocaine use was involved, (as determined from toxicology findings or narratives obtained by the police). Suicides that were associated with cocaine use represented 9.6% of all suicides for this period. In 8 cases cocaine was detected on post mortem toxicology. Suicides associated with cocaine use were more commonly associated with more violent circumstances of death (e.g. hanging). However, this observation is based on small numbers and may be confounded by factors such as sex and age.

6.6 Non fatal overdose data

NHS Tayside's harm reduction service has a data sharing agreement with Scottish Ambulance Service (SAS). Since December 2016, SAS has been providing details of any call outs they have attended for non fatal overdoses.

Between December 2016 and September 2019 there were 1743 non fatal overdoses reported to the harm reduction service by SAS. Of these, 117 were associated with cocaine use (6.7%), representing 96 individuals. However, this is likely to be an underestimate as it relies on information provided by the patient/friends/family/bystander or the SAS finding the substances when they attended (and not clinical testing).

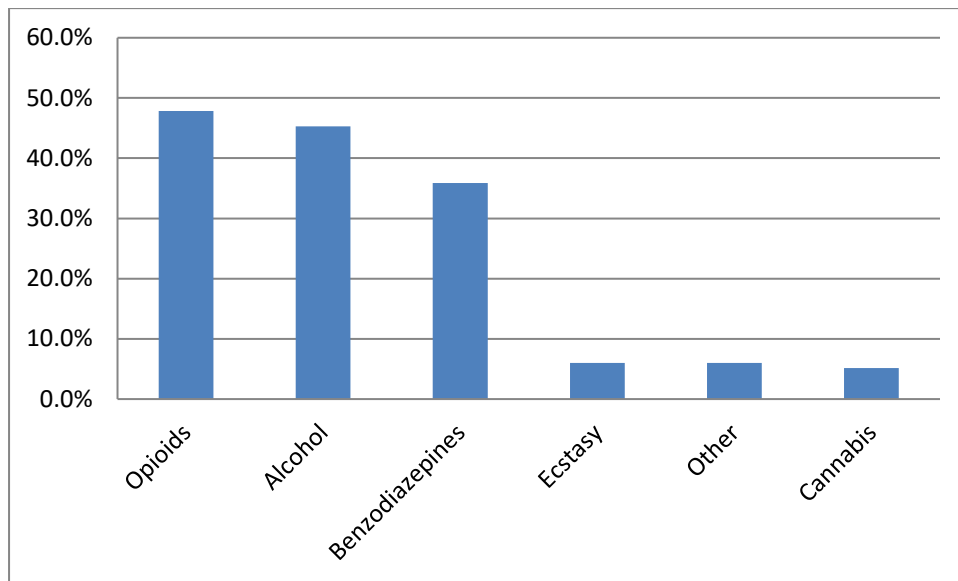
There were 34 non fatal overdoses associated with cocaine use in Angus, 64 in Dundee and 19 in Perth & Kinross.

The mean age of people with a cocaine associated non fatal overdose was 31 years, 79.5% were male.

30% of people who had a cocaine associated non fatal overdose during the period were known to Tayside specialist substance misuse services.

85.5% of cocaine associated non fatal overdoses involved polysubstance use. Combinations of opioids, alcohol, benzodiazepines, ecstasy, amphetamines, new psychoactive substances, LSD, cannabis in addition to the cocaine were reported [Figure 21]

Figure 21: Non fatal overdoses involving cocaine in Tayside: Other substances associated, December 2016 – September 2019.



In 17.9% of incidents, concomitant use of alcohol and cocaine alone was reported.

7. Interventions in cocaine and crack cocaine use

Despite increasing cocaine related treatment demand, targeted prevention and treatment programmes for cocaine and crack cocaine users are currently limited in availability and underdeveloped across Europe. An EMCDDA survey of over 100 European professionals working in addiction services identified a need for improved access to existing drug treatment services for young cocaine users and polydrug users using cocaine; improved cooperation between drug services and mental health services; closer coordination with emergency departments; and more targeted cocaine related harm reduction responses.³ The importance of cocaine related training opportunities and guidelines for professionals was also highlighted especially in addressing moderate and severe cocaine and crack cocaine dependence.

Some initial programmes to target support for people who use cocaine specifically have begun across Europe. Some clinics have extended their opening hours to increase engagement with individuals with cocaine powder addictions. In Belgium a specific cocaine programme using a combination of a community reinforcement approach and contingency management has been introduced.³

7.1 Treatment interventions

7.1.1 Psychosocial

Psychosocial treatment for crack/cocaine use is considered to be the most efficacious treatment option currently available, although the evidence is largely based on low quality studies and it has only been shown to have superior efficacy over other measures in the short term. Interventions such as cognitive behavioural therapy, motivational interviewing and brief interventions, and contingency management are the most commonly applied psychosocial interventions when supporting people seeking help for cocaine or crack dependence.³

Contingency management (CM) is a general behavioural intervention technique used in the treatment of drug dependence that aims to alter drug use by systematically arranging consequences. The main elements of CM interventions are targeted contingency, behavioural reinforcers and monitoring.⁶³ The ultimate goal of CM is to promote social reintegration by sustaining compliance, abstinence and/or attendance at work. In CM rewards (e.g. cash, vouchers, other privileges) are contingent on successfully performing a particular activity (e.g. substance-negative urine sample). The duration of CM can vary. Studies looking at 8 week programmes through to 52 weeks have been reported.^{64, 65} CM has been used in different substance use disorders, such as cannabis, opioids and cocaine, methamphetamine, alcohol, polydrug abuse and nicotine. However, the application of CM has raised particular ethical concerns in Europe. Nonetheless the National Institute for Health and Care Excellence (NICE) and Public Health England have both recognised the value of CM.^{66,67}

A systematic review conducted by the EMCDDA included 38 studies of people with opioid dependence (n=20), cocaine dependence and receiving methadone therapy (n=14), cocaine dependence on its own (n=3) and methamphetamine dependence (n=1).⁶³ The review found that CM was useful for reducing drug use among people with cocaine dependence and who were receiving methadone therapy for reducing and abstaining from cocaine use but did not improve retention in treatment. Similarly for cocaine only dependence, CM had a positive effect in reducing cocaine use but not in retaining people in treatment. There is however limited economic analyses of these interventions.

A narrative review of treatment interventions for crack cocaine use found superior efficacy of CM over conventional treatment for achieving periods of drug abstinence in people who were dependent on crack cocaine.⁵⁵ This review recognised the need for focus on developing and tailoring psychosocial treatment more effectively for the distinct high risk needs of people with crack cocaine dependence, with the aim of not just increasing treatment efficacy but also uptake and retention.

7.1.2 Pharmacological

Symptomatic pharmacological treatment and management of psychiatric disorders are the most commonly applied medical treatments for cocaine addiction.

There is limited evidence supporting the use of disulfiram and antidepressants for the treatment of cocaine dependence. Antipsychotics, anticonvulsants and dopamine agonists have not been shown to be effective at reducing use of cocaine and/or improving abstinence.⁶⁸

Research to assess the effectiveness of stimulant medications such as modafinil and bupropion as cocaine substitutes is ongoing, as is research into a cocaine vaccine.^{5, 68}

7.2 Secondary prevention interventions

7.2.1 Psychosocial/behavioural interventions

The narrative review by Fisher *et al.* of secondary prevention interventions for crack cocaine dependence found targeted prevention measures (e.g. education, motivational interventions, cognitive behavioural interventions) showed mixed and short term effects on crack cocaine use and associated HIV risk outcomes.⁶⁵

7.2.2 Harm reduction

Harm reduction interventions primarily target high risk cocaine related behaviours such as unsafe injection and crack cocaine smoking practices, and promote safer sexual behaviours. In some European countries crack cocaine 'kits' including pipes and filters are provided to encourage safer smoking practices.^{3, 65} Sodium bicarbonate is provided in some kits to discourage users from using more harmful ammonia. Other agencies have produced harm reduction leaflets which encourage smoking crack over injecting crack, and safer injecting practices. Fischer *et al.* found material interventions such as the distribution of safer crack use kits demonstrated modest efficacy in risk reduction.⁶⁵

Smoking and injecting drug consumption rooms have been established in other parts of Western Europe.³ These provide a setting where cocaine can be used under the supervision of trained staff. However, there is limited empirical evidence on these facilities in the context of cocaine use.

Drug checking services are also used to reduce cocaine related harms in some European countries.³ These can be important in informing people about the quality of cocaine purchased, adulterants present, and provide concurrent harm reduction advice.

8. Conclusions

International and national evidence suggests that cocaine powder and crack cocaine use is on the rise. The availability and affordability of good quality cocaine powder and crack cocaine has created increased demand and cocaine is now the stimulant drug of choice in many countries across Europe and the world. Local evidence is consistent with national data which suggests there is no longer a homogenous group of cocaine users and there are now a range of different health, social and addiction needs.

Data from the general population do not suggest markedly increased use among people who have not used illicit drugs previously but that it is becoming more prevalent amongst more socio-economic marginalised groups such as people with polydrug addictions and prisoners. Clinical data (e.g. urine toxicology screening) also points to increasing cocaine use. However, there is likely to be an under-reporting of cocaine problems in the presented data due to a number of reasons such as non-disclosure, under-detection (due to the short half life of cocaine) and under-ascertainment by medical practitioners.

Compared to some other mainland Health Boards in Scotland, cocaine addiction requiring treatment and injecting cocaine use appears to be less prevalent in Tayside. This may be due to temporal variability reflecting the longer time it has taken for cocaine markets to be established in smaller towns or cities. There may also be selection bias i.e. for whatever reason people who use cocaine in Tayside are more 'hidden' in Tayside than elsewhere.

There are significant health concerns from cocaine/crack cocaine use that are related to the pharmacological properties of the drug itself, the way it is administered, concomitant substance use, and the cutting agents used. Cocaine can cause health problems throughout the body both arising from both acute and chronic use. Polydrug associated deaths which include cocaine are increasing in Tayside, Scotland and across Europe.

It appears that the people who are most vulnerable and at the greatest and most immediate risk of cocaine related harm are people in the more marginalised groups, often with polydrug dependence. These people may use cocaine in a variety of ways, including often crack cocaine, and supporting both their physical and mental health needs is imperative. The recent HIV outbreak in Glasgow was associated (amongst other risk factors) with cocaine use and highlights the continued need for good surveillance, detection mechanisms and treatment for blood borne viruses.

There is a paucity of evidenced and well established treatment programmes for cocaine dependence as well as polydrug dependence. In terms of treatment, psychosocial interventions appear to offer the most evidence of efficacy certainly in the short term. While evidence of what works is limited, action cannot wait until there is stronger empirical evidence. Led by the best available evidence, a need exists to develop and tailor primary and secondary treatment programmes based on the different demographics of cocaine use in Tayside. A quality improvement methodology should be adopted to allow continuous reflection and evaluation as to what is working, what needs refining and what should be stopped.

9. Recommendations

1. Treatment

Treatment pathways that consider the health needs for people with problematic cocaine use should be developed. These should recognise both cocaine-specific harm and also the wider context of polysubstance use and holistic health care provision for both physical and mental health needs. The needs of socially marginalised users who are at the greatest risk of harm are of the utmost priority and the pathways should be developed in collaboration with mental health services.

2. Secondary prevention

Establish secondary prevention measures to mitigate the risk of health harms. This may include drug checking services in order to allow people who are using drugs to know the strength of the substances they are taking and any hidden adulterants. The development and distribution of crack cocaine kits and associated harm reduction messaging is also recommended.

Ensure Blood Borne Virus care plans are in place with substance misuse teams and testing is offered as a minimum annually in all relevant settings. Continue to train and promote BBV dried blood spot testing in settings likely to be in contact with those with the riskiest cocaine use patterns e.g. homelessness services, hostel outreach services, prisons.

3. Data

Ensuring the gathering and assimilation of up-to-date health intelligence concerning cocaine use and associated harms should form part of the wider development of local drug use and related health harms surveillance. There should be continuous surveillance from a range of sources to allow frequent investigation, risk assessment and risk management of substance use related problems. This will enable treatment and supportive measures to be implemented and communicated in a timely fashion in response to emerging drug trends.

4. Education

A need exists to increase the awareness of cocaine related health problems for frontline staff, especially in healthcare, to provide timely support to those with cocaine addictions and associated health harms, and to allow more accurate surveillance through better reporting.

Raising awareness of cocaine related harms with the public is also recommended. This should include information on how and where to access help.

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