



Irish Syringe Analysis Pilot Project

*The identification of current injecting trends
in the Dublin and Midland Region through
the application of syringe analysis methodology*

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Foreword

The European and Irish drug landscape has undergone significant changes since the early 1980's when drug use in Ireland was defined by opioid using communities, mainly intravenous injectors. During this time, use was mainly associated with young populations in areas suffering from social deprivation. More recently, services are experiencing new healthcare challenges among an ageing cohort of opioid users who were impacted by the original heroin crisis.

Overall, heroin use and injecting drug use practices in Europe have been in decline for the past decade. However, there are indications of new forms of stimulant and new psychoactive substance injecting which require monitoring at a local level due to the health risks often associated with these practices. In Ireland, we have witnessed HIV outbreaks associated with new psychoactive substance injecting and new and often hidden user groups continue to emerge through the 'chemsex' scene. We recognise that there are knowledge gaps in Ireland in relation to these emerging trends and hidden user groups and therefore we need to develop innovative approaches to monitor drugs for public health and harm reduction purposes.

The volatile nature of the drug market is a healthcare concern as new and more potent substances, including synthetic opioids continue to emerge on the European drug market. Compared with our European counterparts, there is limited localised data on the contents and purity of drugs available on the Irish market to help inform health-led responses and alert mechanisms.

The Report of the Emerging Drug Trend and Drug Checking Working Group reviewed the area of nightlife substance use and the role of analytical drug monitoring in preventing harm. The group made a series of recommendations including the implementation of a syringe analysis project. I want to thank the staff in both Merchants Quay Ireland and the HSE National Drug Treatment Centre for the successful collaboration on this project. Staff in both agencies ensured the safe collection and the analysis of samples which took time and dedication to apply these new methods.

This syringe analysis project was carried out in 2021 in conjunction with our European colleagues and is very significant as this is the first time we have conducted an analytical project to inform health and harm reduction responses in Ireland.

While this data identifies recent drug trends, it also highlights the need to conduct this work on an on-going, annual basis so we can monitor and map trends and report public health threats as they emerge. I am concerned in relation to some of the trends identified such as stimulant injecting and the emergence of new psychoactive substances. I am pleased to see that this project did not identify the emergence of synthetic opioids; however, we must continue to monitor this situation closely. Substance analysis has a key role to play in informing our public health responses in Ireland to help monitor these emerging trends and ultimately minimise harms.



Professor Eamon Keenan
HSE National Clinical Lead Addiction Services

Executive Summary

This report presents the findings from the first Syringe Analysis Pilot Project conducted in Ireland throughout September 2021 by the HSE National Social Inclusion Office, The HSE National Drug Treatment Centre Laboratory and Merchants Quay Ireland (MQI). As part of a recent review on improving responses in Ireland, health experts made a series of recommendations on the application of analytical techniques, including the use of syringe analysis methodology to identify current drug trends (Keenan, Killeen & The Emerging Drug Trend Working Group, 2021).

Syringe analysis is a scientific approach that involves obtaining information through the analysis of the residual content of used syringes to help identify drug use trends at that particular point in time to inform tailored prevention interventions (EMCDDA, 2021a). Guided by the ESCAPE Generic Protocol (EMCDDA, 2021b), the Irish Syringe Analysis Pilot Project involved obtaining 155 used syringes from three services provided by MQI which represented both urban and rural localities. Of the 155 syringe samples, 100 were accessed from Dublin, 27 from Longford and 28 from Offaly. Due to the relatively small number of syringes provided by the two rural locations, the results from both Longford and Offaly were aggregated for reporting purposes and are referred to as the 'Midlands Region' in this report. The syringe contents were extracted and analysed by the HSE National Drug Treatment Centre Laboratory for 232 drugs and metabolites using LC-MS (Liquid Chromatography-Mass Spectrometry).

Main findings:

- The majority of syringes were found to contain heroin with 93% of syringes collected in Dublin and 98.2% of syringes from the Midlands Region found to contain this substance. This is reflective of heroin being the most commonly used substance among needle exchange service users nationally
- The pilot confirmed the re-emergence of cocaine injecting in Ireland with significant levels detected in both the Dublin (86.5%) and Midlands Regions (89.1%) as part of a poly substance pattern
- New trends were identified that require further monitoring in Ireland such as the presence of synthetic cathinone 3-methylmethcathinone (3-MMC), methamphetamine and the possible injecting of flurazepam in the Midlands Region
- While similar trends were identified across localities, the pilot found regional differences with niche trends presenting in the different locations such as the presence of 3-MMC (23.6%) and pregabalin (34.5%) in higher quantities in the Midlands Region and the detection of oxycodone (7%) ketamine in Dublin (7.8%)

The pilot demonstrates how syringe methodology can be utilised as a monitoring tool by community services to inform harm reduction responses. This type of information captured from used syringes on an on-going basis can provide greater insight on the Irish drug market and help predict possible fluctuations.

155
used
syringes



100
DUBLIN

55
MIDLANDS

32

different
drugs &
metabolites
found



11

different
drug
categories

AMPHETAMINES

BENZODIAZEPINES

CATHINONES

COCAINE

HEROIN

KETAMINE

METHADONE

PIPERIDINES & PYRROLIDINES

OTHER OPIOIDS

OTHER MEDICATIONS

Heroin

93.3% Dublin
98.2% Midlands

Cocaine

86.5% Dublin
89.1% Midlands

Methamphetamine

32.6% Dublin
18.2% Midlands

3-MMC

11.3% Dublin
23.6% Midlands

Polydrug use

85.4% heroin & cocaine
(123 syringes)
23.6% heroin, cocaine
& methamphetamine
(34 syringes)

Injecting drug trends in Ireland

The history of drugs in Ireland is mainly defined by an opioid injecting culture which initially began in the 1980's concentrated within a small number of Dublin communities (O'Gorman, 1998; Butler, 1991), and similar to European trends, injection drug use has mainly been associated with heroin using communities for some time (EMCDDA, 2015, 2022a). As a result, local responses have focused on this population with less attention applied to monitoring, expanding harm reduction services and engaging with emerging user groups, although the drug market diversified through the past two decades.

Stimulant injecting patterns have emerged from time to time in Ireland, mainly associated with cocaine injecting among addiction and homeless service user populations. In the mid-2000s there was an increase in the prevalence of cocaine injecting and the practice of 'speedballing' which meant the use of heroin and cocaine together (National Advisory Committee on Drugs, 2007; Connelly et al., 2008). More recently, cocaine prevalence began increasing again among service user populations from around 2012 onwards, as identified by urine analysis conducted by the HSE National Drug Treatment Centre Laboratory among those attending opioid agonist treatment (Stokes, 2017). These upward trends are also reflected in the annual treatment figures reported by the National Drug Treatment Reporting System (Kelleher, Condron & Lyons, 2022).

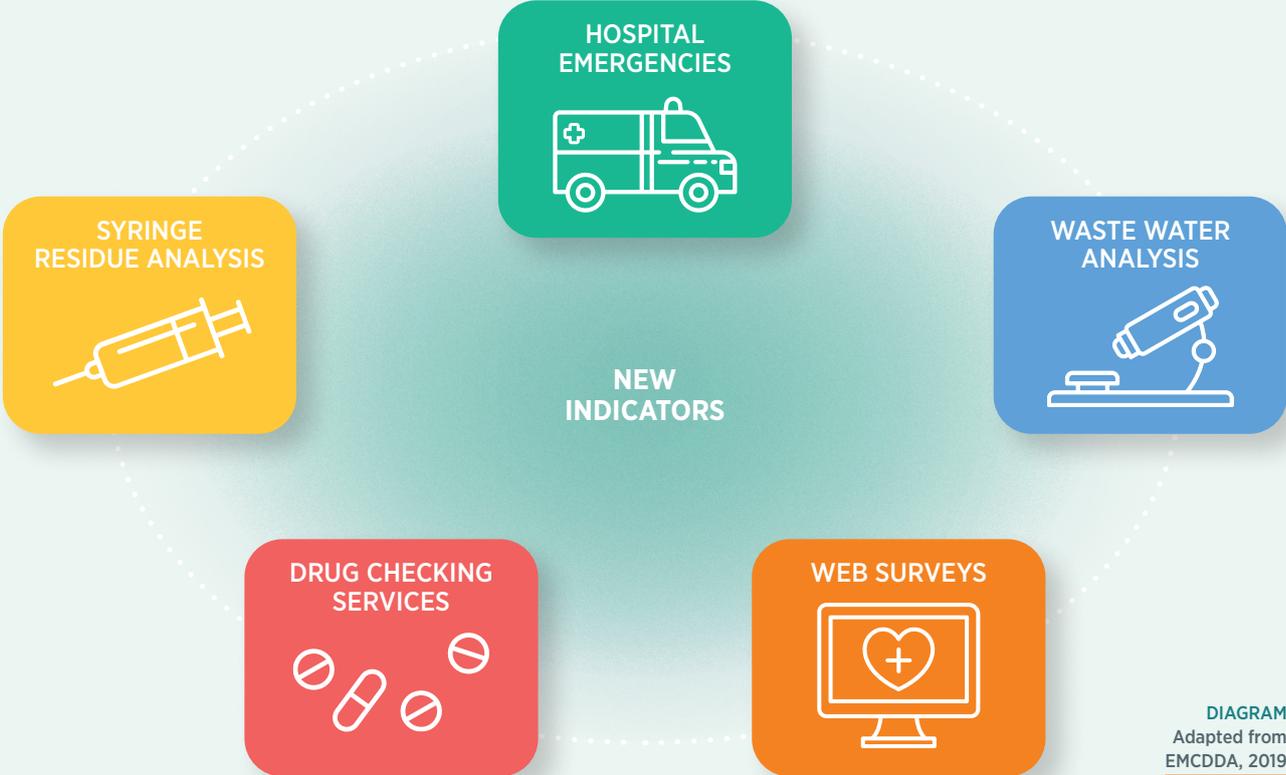
The injecting of New Psychoactive Substances (NPS) and novel injector user groups have led to new health challenges in Ireland in more recent times. In 2015, there was an unexpected increase in cases of acute HIV infection among people who inject drugs in the Dublin region associated with NPS. Analytical confirmation identified that cathinone type substances Alpha-pyrrolidinovalerophenone (α -PVP), pentedrone and MDPBP were the main substances associated with the outbreak and these were being sold under the colloquial name 'Snow Blow' (Giese et al., 2015). The practice of injecting drugs 'slamming' has also emerged among new user profiles as part of the 'chemsex' community in Ireland, which has led to reported increases in the use of methamphetamine among this group (Glynn et al., 2018; Schmidt et al., 2016). At present, there is limited available evidence on the current injection practices among this community and no recent estimate is available on the number of injecting drug users in Ireland.

Monitoring drugs in an Irish context

For some time, there has been limited information available in relation to the contents and composition of drugs available on the Irish market to inform health-led and harm reduction responses. In the absence of formal drug monitoring there is no real time data available to inform health professionals or people who use drugs if there are extra risky substances in circulation. Surveys are useful to monitor the epidemiological indicators of health and trends over time; however surveys cannot provide accurate information on what has actually been consumed by people who use drugs. Without widespread analytical drug monitoring people who use drugs may report on use which is not reflective of what they have actually taken (EMCDDA, 2018a). While drug use communities engaged with support services report on the types of drugs they consume and provide anecdotal feedback on market changes, service users and health care providers alike are often unaware of the actual composition of the substances available. This can lead to the misrepresentation of drug trends and reliance on anecdotal reports of 'contaminated' substances circulating without supporting evidence. These limitations make it difficult for health officials to portray an accurate representation of the current Irish drug market.

Although synthetic opioids such as fentanyl derivatives have not presented at the same rate compared to North America (Wallace et al, 2020) this trend has been an on-going worry for the opioid using community due to the potential threat to health. The most up to date drug-related death data indicates that 7 fentanyl related deaths occurred in 2015 (HRB, 2019). Following this in 2016, an alert was issued by the Health Service Executive (HSE) regarding the emergence of non-pharmaceutical fentanyls. In total 21 fentanyl deaths were recorded for the period of 2015 -2017 in Ireland (HRB, 2019). There is a need for improved monitoring for fentanyl class drugs going forward, to inform public health responses and reduce mortality. An estimated 73 new synthetic opioids were detected between 2009 and 2021 in Europe and include 6 first reported in 2021 (EMCDDA, 2022a). Although the prevalence of synthetic opioids is relatively low, other new and concerning drugs continue to emerge onto the European market. At the end of 2021, the EMCDDA was monitoring around 880 NPS, 52 of which were first reported in Europe in 2021 (EMCDDA, 2022a). The most recent drug market shifts indicate an increase in cathinone supply and use. At the end of 2021, the EMCDDA was monitoring 162 cathinones, making them the second largest category of NPS monitored by the EU Early Warning System, after synthetic cannabinoids (EMCDDA, 2022a). This ever-changing situation means that those working in harm reduction and prevention services need to be aware of and be able to respond quickly to changes in injecting drug use practices (Néfau et al., 2015). These market shifts are currently a significant concern for Irish health care providers in the absence of analytical tools to monitor the market.

EMCDDA reports highlight the importance of sourcing indicators of drug use and emerging harms from newer and more targeted data sources to better inform Europe-wide reporting and emerging drug trend responses. There is increased interest by experts on the utilisation of innovative tools such as biomedical samples from urine or hair analysis (EMCDDA, 2018a, 2022b) as well as from drug paraphernalia to verify what has actually been consumed and what is available on the drug market at that particular point in time. Syringe analysis is one such method which is now used to inform European monitoring (EMCDDA, 2021a) and has potential to be part of the development of drug monitoring mechanisms in Ireland.



In 2021, the HSE published the Report of the Emerging Drug Trend Working Group which made a series of recommendations to improve service, research and analytical responses to the changing drug landscape in Ireland. The Report recommended that current responses are reviewed and that new methods are piloted such as drug analysis in festival settings, wastewater epidemiology and syringe analysis (Keenan, Killeen & The Emerging Drug Trends and Drug Checking Working Group 2021). As a result, a pilot syringe analysis project was developed to gain rapid insight on drug trends among injecting populations.

Syringe analysis as a monitoring and harm reduction tool

Syringe analysis is a scientific approach that involves obtaining information through the analysis of residual content of used syringes. This is done using a validated liquid chromatography method with mass spectrometry detection to identify different molecules (Néfau et al., 2015; EMCDDA 2021b). The primary objective is to provide public health professionals with laboratory-confirmed information on substances used by people who inject drugs to detect trends of concern in specific locations over time (EMCDDA, 2021a; Brunt et al., 2021). Knowledge of what substances are being injected in a location at a particular point in time is important to help predict future changes, to guide prevention strategies and to plan the provision of treatment, as well as to inform law enforcement agencies. Furthermore, identifying associated risk factors, such as the use of multiple substances and/or the reuse of injecting material, is useful to assess and improve harm reduction interventions and public health responses (EMCDDA, 2021a).

The ESCAPE Project

The ESCAPE Network (European Syringe Collection and Analysis Project Enterprise) aims to identify the range of substances being used by people who inject drugs in a number of cities as part of a sentinel network in Europe to monitor changes in patterns of use over time. It is intended that this approach will provide timely, city-level data that can complement other information and help identify possible emerging health threats throughout Europe (EMCDDA, 2021a; Brunt et al., 2021).

Syringe analysis methodology was first developed and piloted as a monitoring tool by research teams in low-threshold services in France (Néfau et al., 2015) followed by 6 cities across Europe in 2017 (EMCDDA, 2021a; Brunt et al., 2021). Collection has since been conducted throughout 2018 – 2021 as part of the evolving ESCAPE Network which consists of researchers from participating countries. In 2018, research teams analysed a total of 988 syringes from five cities (Budapest, Cologne, Helsinki, Lausanne and Paris) and traces of 48 different drugs were identified in the syringes analysed in the study. Overall, the drug categories most often found in the syringes were cocaine, heroin, cathinones, buprenorphine and amphetamines, with differences across cities (EMCDDA, 2021a). The most recent available information from the ESCAPE Network showed that of the 1,392 used syringes collected by the ESCAPE network of 8 European cities in 2020-21, in 5 cities, half or more of the syringes contained stimulants. A third of all syringes contained two or more drugs, indicating polydrug use or re-use of injecting material, with a mix of stimulant and opioid drugs the most frequent combination (EMCDDA, 2022a).

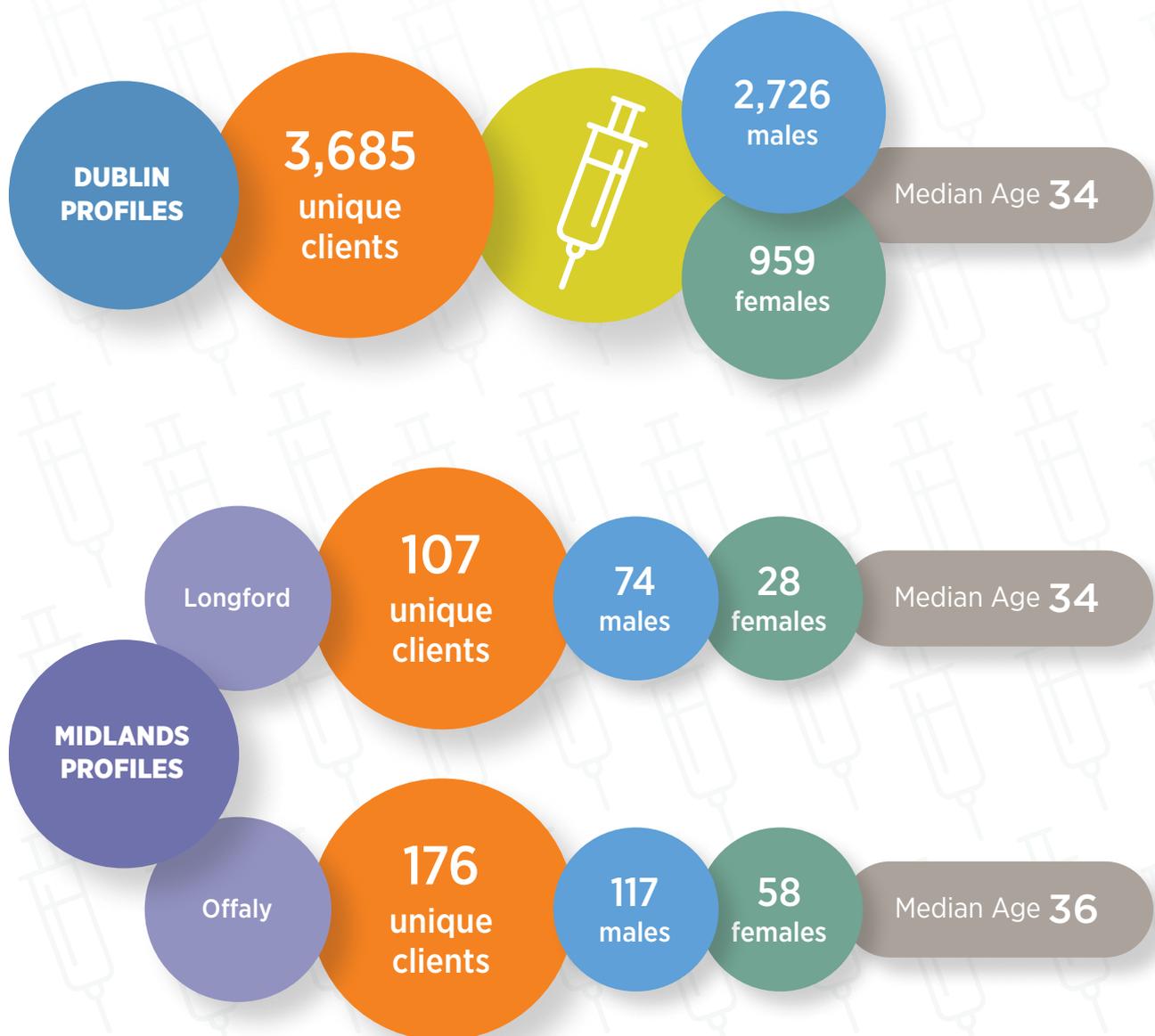
The Irish Syringe Analysis Pilot Project

In 2021, the HSE National Social Inclusion Office, The HSE National Drug Treatment Centre and Merchants Quay Ireland (MQI) collaborated to develop the Syringe Analysis Pilot Project.

While analytical tools are routinely implemented across other European countries, the Syringe Analysis Pilot Project was the first of its kind in Ireland, whereby analysis would be conducted to inform health and harm reduction responses within a community setting.

An agreement was developed with MQI to source used syringes through their needle exchange services which would then be analysed for a series of substances by the HSE National Drug Treatment Centre Laboratory. The results of this pilot will be used to inform the ESCAPE project coordinated by the EMCDDA as well as to inform Irish responses to emerging drug trends.

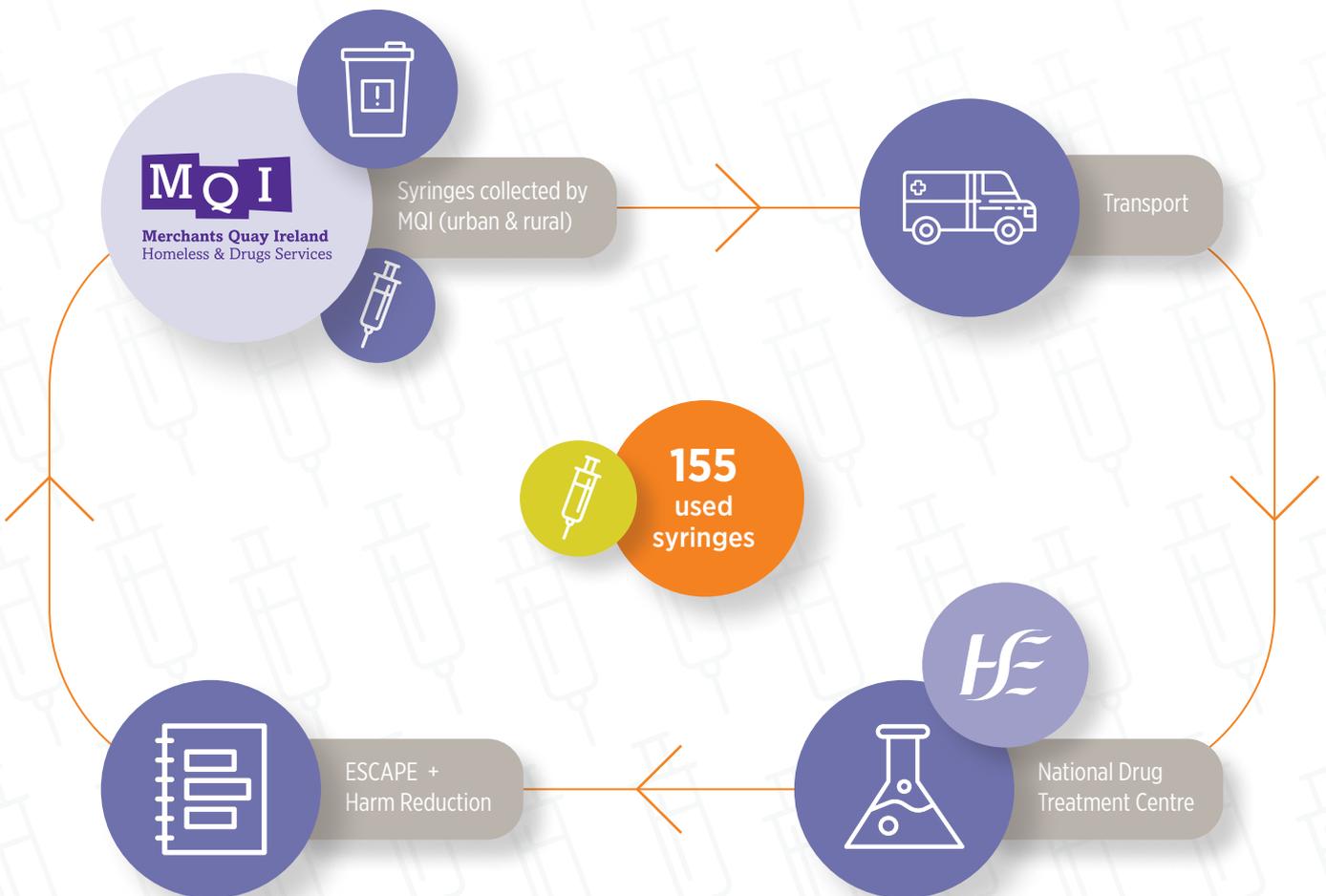
The results of this pilot project represent the trends among Merchants Quay service user communities in the Dublin and Midland Regions.



Syringe Analysis Methodology

Syringe Collection

Following the ESCAPE Generic Protocol (EMCDDA, 2021b), the Irish Syringe Analysis Pilot Project involved obtaining 155 used syringes from three services provided by Merchants Quay Ireland which represented both urban and rural localities. Of the 155 syringe samples, 100 were accessed from Dublin, 27 from Longford and 28 from Offaly. Due to the relatively small number of syringes provided by the two rural locations, the results from both Longford and Offaly were aggregated for reporting purposes and are referred to as the 'Midlands Region' in this report. The syringe contents were extracted and analysed by the HSE National Drug Treatment Centre Laboratory for 232 drugs and metabolites using LC-MS (Liquid Chromatography-Mass Spectrometry).



Laboratory Analysis

As part of their needle exchange services, a variety of different syringes are provided by MQI Dublin and Midlands Services ranging from Diabetic 1ml, 1ml barrels, 2ml barrels and 5ml barrels. A variety of needles are also available ranging in different lengths.

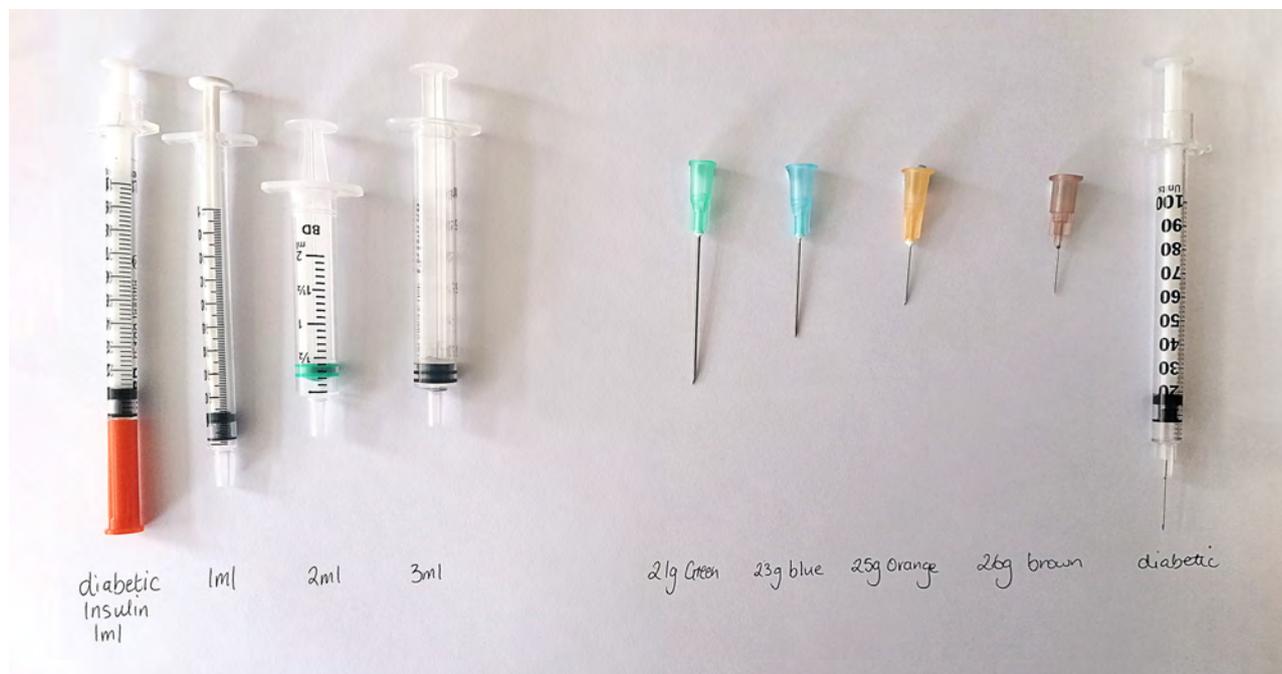


Figure 1: Example of syringes distributed by Merchants Quay Ireland Dublin Service*

Following sample collection by MQI staff, extraction and analysis of the syringes and their contents was carried out in the Laboratory of the HSE National Drug Treatment Centre. Following an on-site risk assessment exercise and development of a site specific sample preparation protocol, extracts from the syringes were prepared for analysis using the criteria as set out in the ESCAPE Generic Protocol (EMCDDA, 2021b). To reduce the risks associated with handling used injection material, a number of safety precautions were taken, such as wearing personal protective equipment (including safety goggles, gowns and anti-scratch gloves), having access to a bleach basin and using sharps containers to recover syringes (EMCDDA, 2021b).

In brief, taking great care to avoid needle stick injury, syringes were flushed with 1ml of methanol which was pumped 5 times to extract the drugs in the syringe before filtration and transfer of the extract to clean sealed vials. See Sample Preparation Diagram in Appendix 1. Sample extracts were frozen until analysis could be carried out. Macroscopic and microscopic observations including the syringe type and condition were recorded (blood, wear marks, broken/no needle, difficulty rinsing etc.).

Analysis of a total of 232 drugs and metabolites was performed using an analytical technique known as Liquid Chromatography-Mass Spectrometry. These analyses spanned a wide range of substances including opioids (including new synthetic opioids), benzodiazepines, amphetamines, cocaine, New Psychoactive Substances (NPS), Z-Drugs (Zopiclone etc), Gabapentanoids and various cutting agents. Synthetic cannabinoid receptor agonists are not included in the suite of testing currently.

* image does not include 5ml barrels used in the Syringe Analysis Pilot Project

Syringe and needle characteristics

Different characteristics of the syringe samples were observed as part of the analytical process. The following Macroscopic Observations were recorded:

- 1) Syringe/Needle type
- 2) Visible traces of blood in syringe (necessary to record as if there is blood present the contents of the syringe as well as the contents of the blood are both analysed)
- 3) Wear marks (this may indicate if the syringes have been used previously)
- 4) Distinctive signs such as type of syringes and needles used

A review was then conducted on the common types of syringes and needles obtained. A breakdown of syringe and needle types found in each location are shown in figures 2.1, 2.2, 3.1 and 3.2.

Figure 2.1

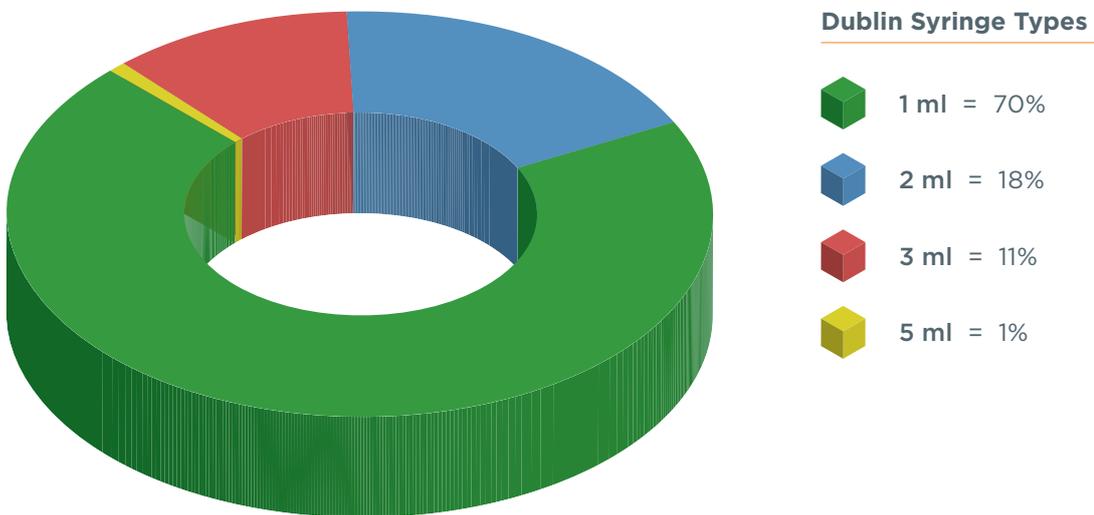


Figure 2.2

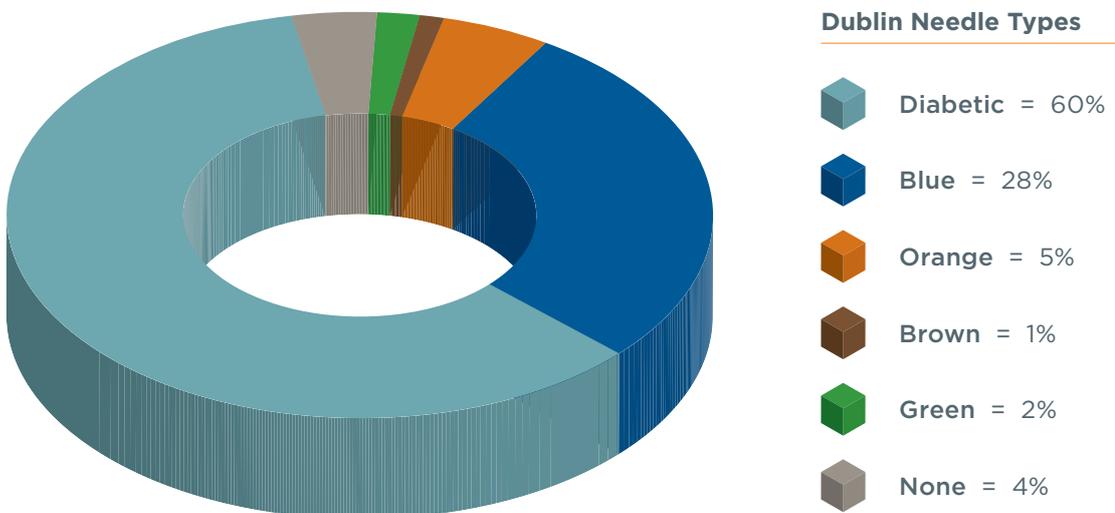


Figure 3.1

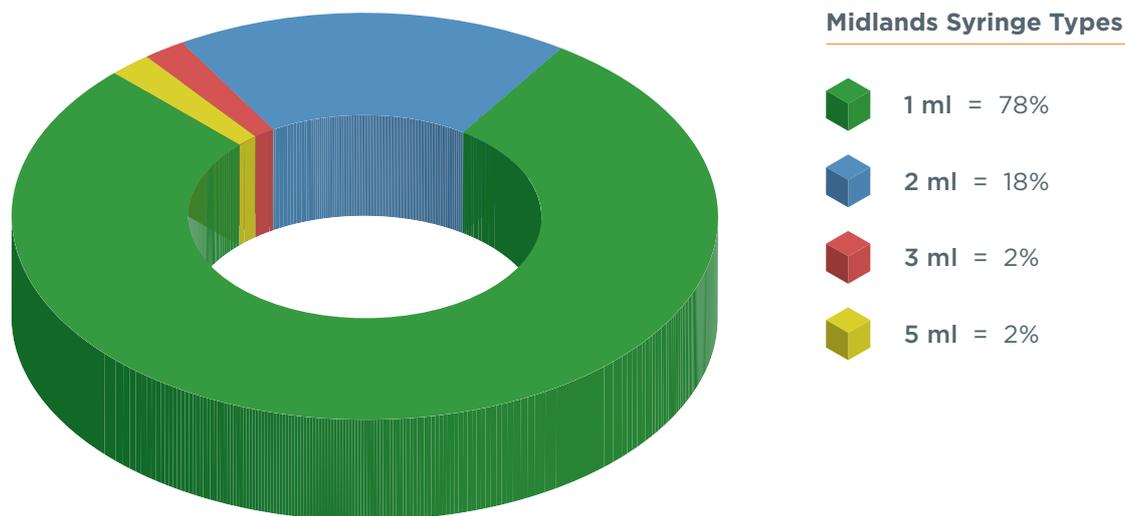
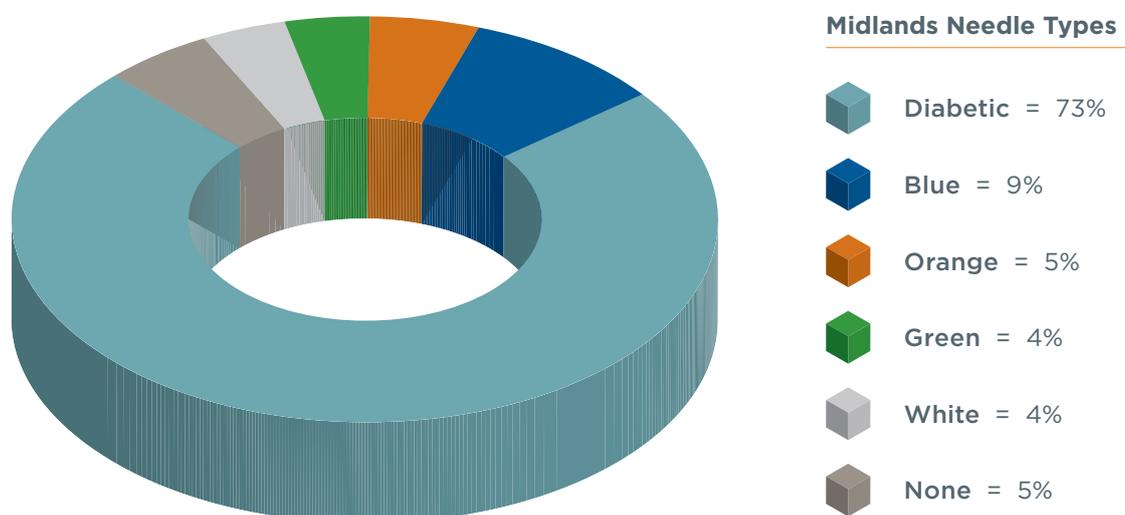


Figure 3.2



Green, blue, orange, brown and diabetic white needles were recorded in this study along with a variety of syringe sizes. From a harm minimisation perspective, the diabetic needles have an advantage in causing less damage to veins as they are very narrow bore. The majority of syringes in both Dublin and Midlands samples collected were diabetic syringes probably reflecting the needle distribution and harm reduction interventions delivered. Blue and green are slightly longer needles and can be associated with poor injecting practices and increased risk of injecting related damage if used in veins and on certain parts of the body (Haran et al., 2007; Senbanjo & Strang, 2011). A higher proportion of blue needles (28%) were accessed in Dublin compared to the Midlands Region (9%). Also of note, 60% of syringes were observed to have blood residue present which could give rise to drugs or metabolites being extracted from the blood.

Drug analysis results

Traces of 32 different drugs and metabolites were identified in the syringes analysed in this study from both the Dublin and Midlands Region.

Substances were identified as being within the syringes by the presence of the parent drug or a metabolite including: heroin, cocaine, methamphetamine, 3- Methylmethcathinone (3-MMC), ketamine, pregabalin, flurazepam, methadone, paracetamol, oxycodone, zopiclone, alprazolam, diazepam, phenacetin, MDMA, dextromethorphan and methylphenidate.

7 syringes from Dublin did not contain any detectable substances. 4 syringes only contained a metabolite and were eliminated from the statistics by the ESCAPE Protocol criteria. This gave a residual total number of 89 syringes in Dublin to be included in the data.

Confirming the user profile of this study, 61.8% of the Dublin samples and 50.9% of the Midlands samples were positive for methadone indicating that the study sample mainly represents the opioid using community that are engaged in treatment services or those who are possibly accessing diverted methadone.

Table 1: Drugs detected in the syringes

Drug	Dublin	Midlands
CATHINONES		
3-MMC	11.3%	23.6%
AMPHETAMINES		
Methamphetamine	32.6%	18.2%
Amphetamine	9.0%	1.8%
MDMA	1.1%	0.0%
BENZODIAZEPINES		
Flurazepam	0.0%	12.7%
Diazepam	2.2%	3.6%
Alprazolam	1.1%	0.0%
COCAINE		
Cocaine	86.5%	89.1%
OPIOIDS		
Heroin	93.3%	98.2%
Oxycodone	7.8%	0.0%
Methadone	61.8%	50.9%
OTHER MEDICINES		
Zopiclone	4.5%	9.0%
Dextromethorphan	0.0%	3.6%
Pregabalin	24.7%	34.5%
PIPERIDINES AND PYRROLIDINES		
Methylphenidate	1.1%	0.0%
KETAMINE		
Ketamine	7.0%	0.0%

On interpreting these results, it is important to note that substances detected in these syringe samples may be present from

- a) the drug being present in the syringe for the purpose of injection of the drug
- or
- b) from traces extracted from blood in the syringe indicating that the user had consumed the substance being detected through other administration routes (oral, snorting, smoking, etc)

In some cases it is possible to infer one or the other depending on the amount present or on the presence or absence of a metabolite. For heroin to be confirmed we have used the criteria that the syringe must contain 6-acetylmorphine it being the unique breakdown product of heroin. Most heroin syringes also contain morphine a metabolite of heroin and codeine which commonly present in heroin as a contaminant. For cocaine, if benzoylecgonine was detected this is classified as cocaine as again this is a unique breakdown product of cocaine.

Figure 4: Dublin distribution of syringes/needles

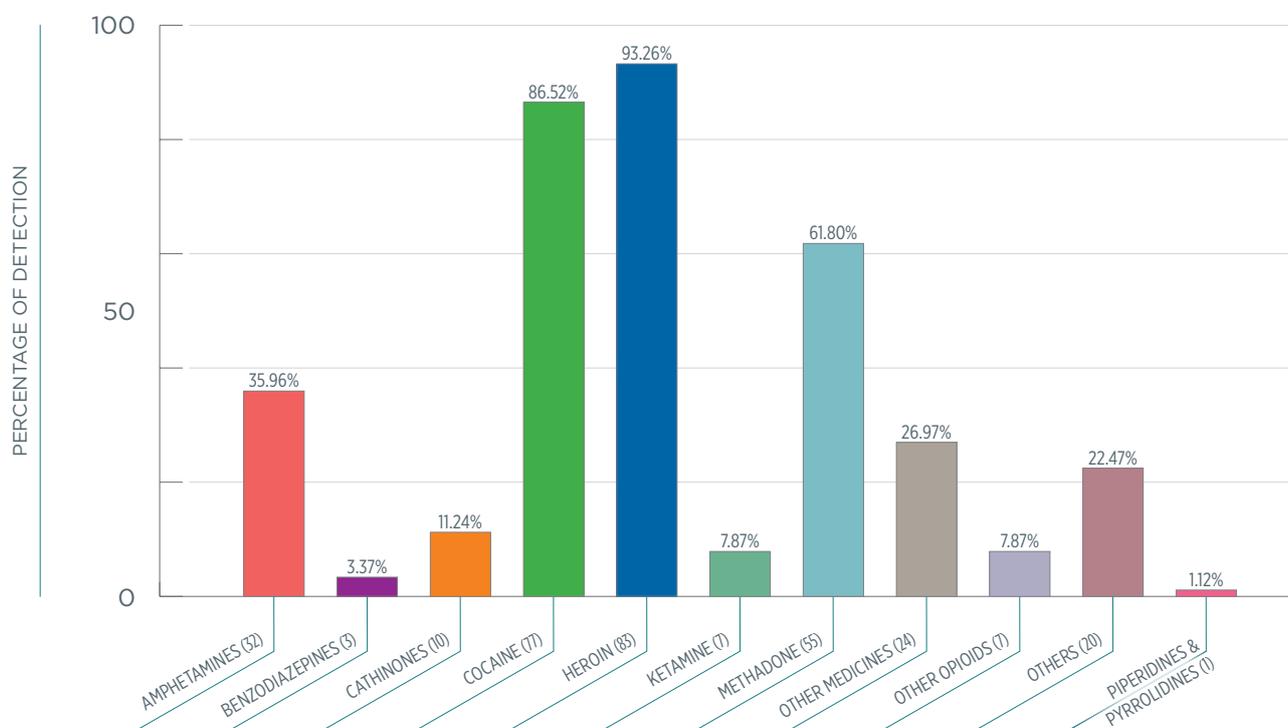


Figure 4 shows the Distribution (%) of syringes/needles (N=89) by detected drug category and psychoactive substance (excluding metabolites and adulterants) in Dublin in September 2021

Figure 5: Midlands distribution of syringes/needles

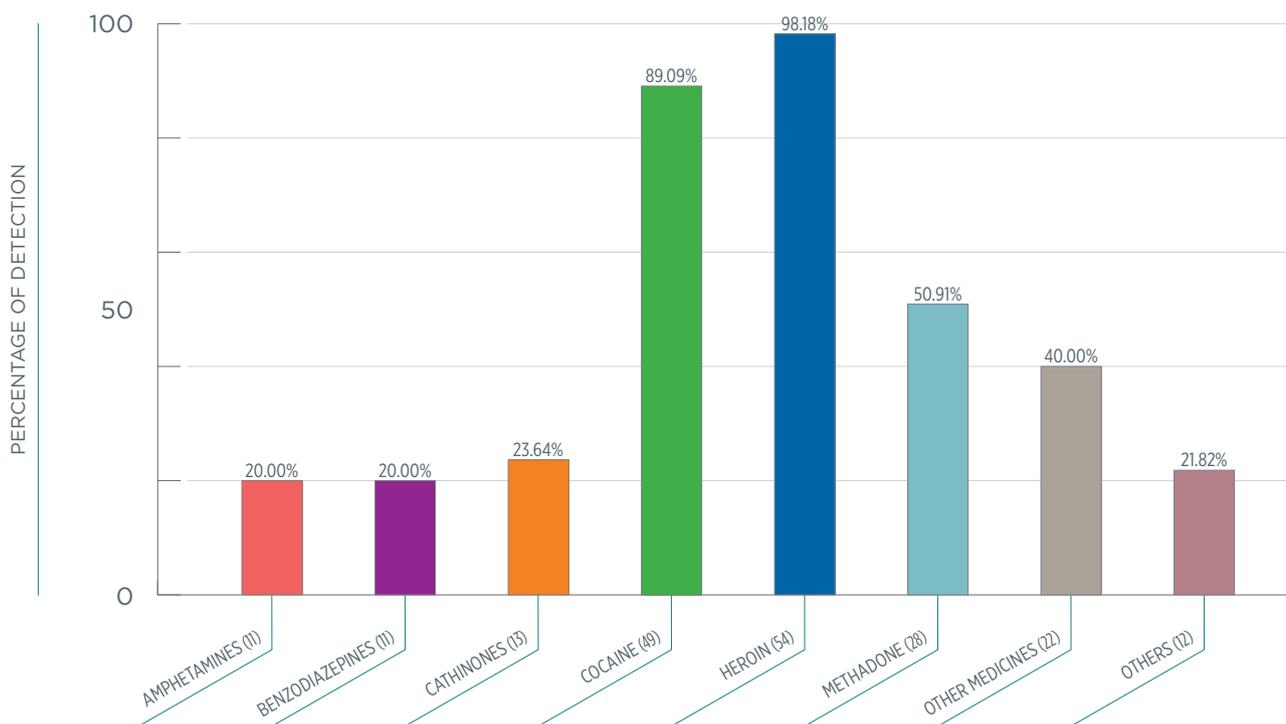


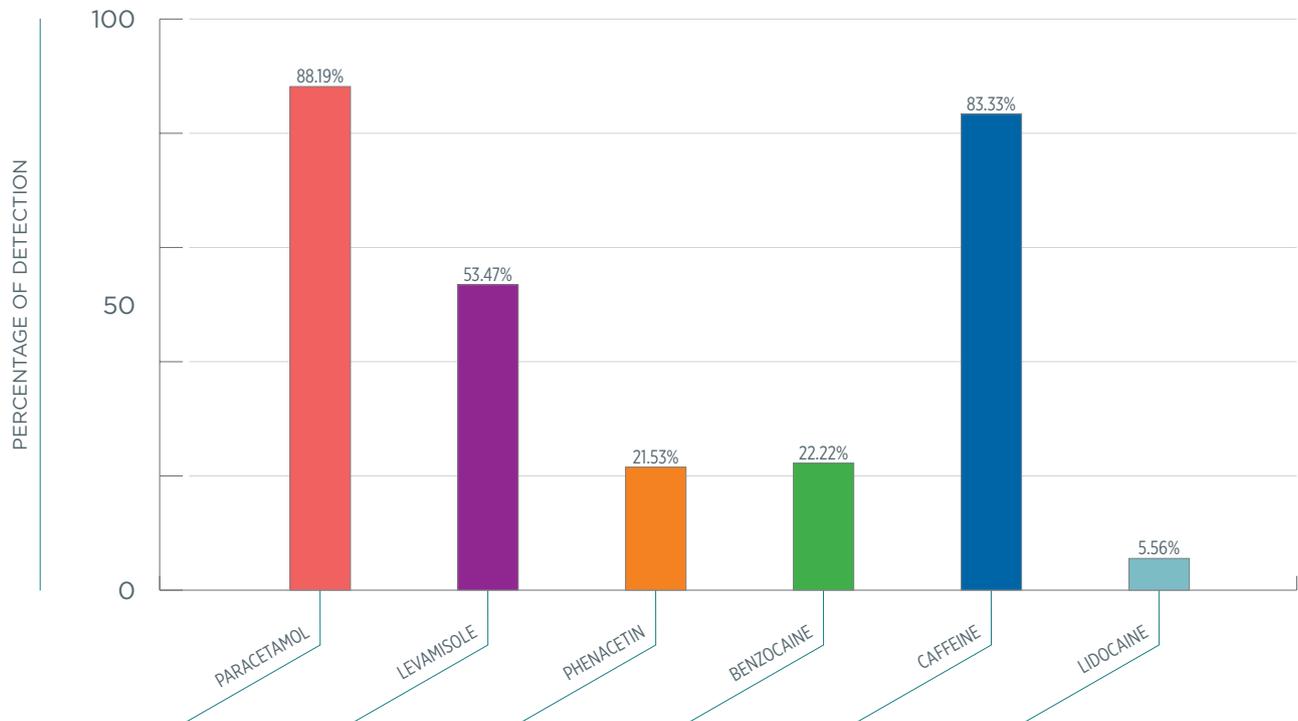
Figure 5 shows the Distribution (%) of syringes/needles (N=55) by detected drug category and psychoactive substance (excluding metabolites and adulterants) in the Midland locations in September 2021

Overall eleven drug classes/categories were detected in total in the syringes including amphetamines, benzodiazepines, cathinones, cocaine, heroin, ketamine, methadone, piperidines and pyrollidines, other opioids and other medicines.

Adulterants

Adulterants are commonly used to cut the primary drug controlled drug (EMCDDA, 2021a) or are used to augment the effects. Adulterants were present in many of the syringes from both the Dublin and Midlands Region and included caffeine, levamisole, paracetamol, phenacetin, lidocaine and benzocaine.

Figure 6: Percentage of adulterants found in all syringes (N=144)



Discussion

This report highlights the findings from the first Pilot Syringe Analysis Project conducted in Ireland and has provided significant insight on drug trends and the Irish drug market from samples obtained in Dublin and the Midlands during the period of September 2021. The successful collaboration between MQI and the HSE National Drug Treatment Laboratory demonstrates how drug paraphernalia can be easily obtained and used to inform public health responses. Therefore it can be concluded that syringe analysis is a beneficial tool to help overcome current knowledge gaps in Ireland.

A number of key themes have been identified in this study.

New trends require further monitoring in Ireland

A number of specific trends were identified in this study that have not yet been reported as issues of concern by addiction service providers in Ireland.

Significant new trends were identified in the project including:

- The presence of synthetic cathinone, 3-methylmethcathione (3-MMC) for the first time in this population
- Higher levels of methamphetamine use in this population than normally recorded
- The likely injection of flurazepam in the Midlands Region

CATHINONES

By 31 December 2021, the EMCDDA was monitoring 884 NPS that had appeared on Europe's drug market since monitoring began in 1997. Synthetic cathinones accounted for 162 of these substances, making them the second-largest category of NPS monitored after synthetic cannabinoids (EMCDDA, 2022a). There has been increased attention on the re-emergence of cathinones on the European drug market with them dominating drug seizures made in 2020 (EMCDDA, 2022a). During the same period, the analysis of 1,166 used syringes collected by the ESCAPE network of seven European cities in 2020 found synthetic cathinones in over half of all syringes analysed in Budapest and Paris (EMCDDA, 2022a). Other indicators have also detected the presence of cathinones throughout Europe, such as wastewater analysis applied in the Netherlands, Estonia and Italy, which detected 3-MMC in samples over the period of 2019–2020 (Bade et al., 2021). In 2021, significant shifts were observed by the UK Drug Checking Service, the Loop, regarding cathinone adulteration in MDMA. Cathinones were identified as the primary component in 19.4% of samples submitted to their service, with 4-Chloromethcathinone (4-CMC) representing more than half of all cathinones detected. Secondary to 4-CMC, 3-MMC was identified in 21.4% of cathinone samples (Pascoe et al., 2022).

In November 2021, the EMCDDA conducted risk assessments on 3-MMC (EMCDDA, 2022c) and 3-CMC (EMCDDA, 2022d) — substances that were first reported in Europe in 2012 and 2014, respectively, but re-emerged in around 2020. Based on the risk assessments, on 18 March 2022 the European Commission adopted a proposal to control the substances across Europe (EMCDDA, 2022e).

The HSE National Drug Treatment Centre laboratory has been monitoring the use of NPS since 2007 through urine analysis conducted among opioid treatment populations and have not yet identified the substance 3-MMC in samples. Notably, through the application of syringe analysis methods as part of this pilot in Ireland, we have been able to identify the presence of 3-methylmethcathinone (3-MMC) in

the population of people who inject drugs which had not yet come to the attention of addiction and homeless service providers. Due to nature of this syringe analysis study, we cannot confirm if the user group represented in this study are actively purchasing 3-MMC or if it is being mis-sold as another stimulant type drug.

METHAMPHETAMINE

The high number of syringe samples which contained methamphetamine in this study was surprising as there has been limited evidence of the use of this substance outside of the chemsex scene, however, MQI has confirmed that a small cohort of methamphetamine users have come to their attention in their Dublin service. Amphetamines are currently detected in less than 1% of urine samples routinely tested in the HSE laboratory among opioid treatment populations, so the high number of syringes where methamphetamine was detected is of particular concern and this area requires further monitoring moving forward. However, it is possible that low detection rates in the HSE laboratory is because methamphetamine metabolises quickly and therefore may be under-detected in urine samples using normal screening methods. Another contributing factor to this may be the fact that the screening test cut off used in our laboratory for testing urine samples is set quite high at 1000ng/ml. Due to the nature of this syringe analysis study, we cannot confirm which user community that this trend represents and if it is possibly linked with the chemsex scene.

This was the first time this project was carried out and every effort was made during the sampling process to ensure that syringes collected were well mixed and as many different syringe types were selected. Nevertheless the possibility still exists that, if a small number of users returned multiple syringes the contribution from them to the overall number of syringes selected could give rise to an over estimate of the use. The ESCAPE project recognises that the high proportion of syringes containing residues of stimulants in studies could reflect a higher frequency of injecting among stimulant users than among non-stimulant users, rather than a higher prevalence of stimulant use than other drug use among people who inject drugs (EMCDDA, 2021a).

Overall, it is acknowledged that methamphetamine plays a relatively small role in the Irish stimulant market at present, however a small number of production facilities 'box labs' were identified by law enforcement in 2018 (HRB, 2022). Close to the timeframe of the project, in October 2021, 2.6 kilograms of methamphetamine powder was found embedded within plastic sheeting panels being transported in Ireland. (FSI, 2022). It has been recognised that there is potential for this market to expand in Europe. At the end of 2019, an EMCDDA-Europol joint threat assessment concluded that after a period of relative stability, the threat posed by methamphetamine appeared to be increasing as the drug begins to spread to new markets in Europe which is an area that requires monitoring across countries (EMCDDA, 2022f).

FLURAZEPAM

Benzodiazepines are commonly prescribed to people in opioid treatment; however, there has been increased availability of illicit and counterfeit products as part of an evolving benzodiazepine market in Ireland (McNamara, Stokes & Nolan, 2019; Drugs.ie, 2020). Benzodiazepines and 'street tablets' are commonly used among addiction and homeless service user populations in Ireland as part of a polydrug pattern. In this study, benzodiazepines were identified in 20% of syringes from Midlands and 3.4% of syringes from Dublin. We surmise that most of these findings could be attributed to traces of the substances being extracted and detected from blood residues in the syringes, meaning that the benzodiazepines were consumed orally. However, of particular interest in the study samples was the detection of flurazepam in 7 of the 55 syringes collected from both sites in the Midlands. In

these syringes, the metabolite of flurazepam, 2-hydroxyethylflurazepam was not detected and the drug was present at levels which were consistent with presence of the drug in the syringe itself. This suggests the injection of flurazepam, probably in the form of crushed tablets as opposed to this being consumed orally. This finding was confined to the Midlands collection sites, not being seen in the Dublin site indicating that this may be a localised trend. Injection of crushed tablets carries additional health risks than other injected drugs as the drug excipients may not dissolve well. Severe health complications can occur after long-term, repeated injection of crushed tablets intravenously (Jonsson et al., 2014). Health experts should now monitor these trends to identify if they are sustained and if there may be related health implications.

Cocaine injecting recognised as a re-emerging trend

In Ireland in 2017, based on drug testing positivity rates, the HSE National Drug Treatment Centre Laboratory reported increasing cocaine use among patients in opioid treatment year on year since 2012 (Stokes, 2017). This is representative of the same populations from which the syringe samples were accessed. Overall, across all data sources in Ireland (Prevalence surveys, treatment and death data) there has been a significant upward trend in cocaine use and associated harms to health (HRB, 2019; Mongan, Miller & Galvin, 2021; HRB 2022). These patterns are possibly reflective of the increased production and supply of cocaine to Europe (EMCDDA, 2022a).

Results from the Syringe Analysis Pilot support other data sources and confirm that there is significant levels of cocaine use among service user populations and injectors in Ireland, with 86.5% of Dublin syringes and 89.1% of Midlands syringes containing cocaine. The high levels of cocaine identified in this study corroborate urine analysis findings within the HSE laboratory. The percentage of urine samples testing positive for cocaine has continued to increase from 2012 when just 4.9% of samples tested positive, to more recently in 2021 when 21.5% of samples tested positive for cocaine. This figure contains drug free units so the positivity in people in opioid treatment may well be higher. In relation to the 2021 urine findings, 35.1% of patients attending the HSE National Drug Treatment Centre tested positive for cocaine while 53.1% of samples tested positive for cocaine in one clinic outside of Dublin region. Both urine and syringe analysis methods do not discriminate between cocaine powder and crack cocaine use, however from anecdotal reports of its use in this treatment populations, it is likely that crack cocaine may be the form in question.

Stimulant injecting has implications for public health due to associated risky practices. Stimulant injecting can be associated with more frequent use, the re-use of needles, the sharing of paraphernalia and lowered inhibitions and sexual behaviour (Brunt et al., 2021; Giese et al., 2015, EMCDDA, 2021b). The injection of stimulants — including amphetamines, cocaine and synthetic cathinones — has been linked to increased risk of HIV and hepatitis C virus (HCV) transmission, through increased frequency of use and sharing of injecting paraphernalia as documented in Ireland by health experts in 2015 (Giese et al., 2015; EMCDDA, 2015; Arendt et al., 2019).

People who inject stimulants are likely to need greater access to needle and syringe provision because they may inject more frequently compared with people who use opioids and stimulant user groups are more likely to practice 'binge' type patterns. Responses for this group often include some form of outreach and the provision of sterile injection equipment, condoms, information on safer injecting and basic hygiene, vein and wound care, and antibacterial creams and ointments. (EMCDDA, 2021b).

Syringe analysis can provide accurate information on regional specific trends

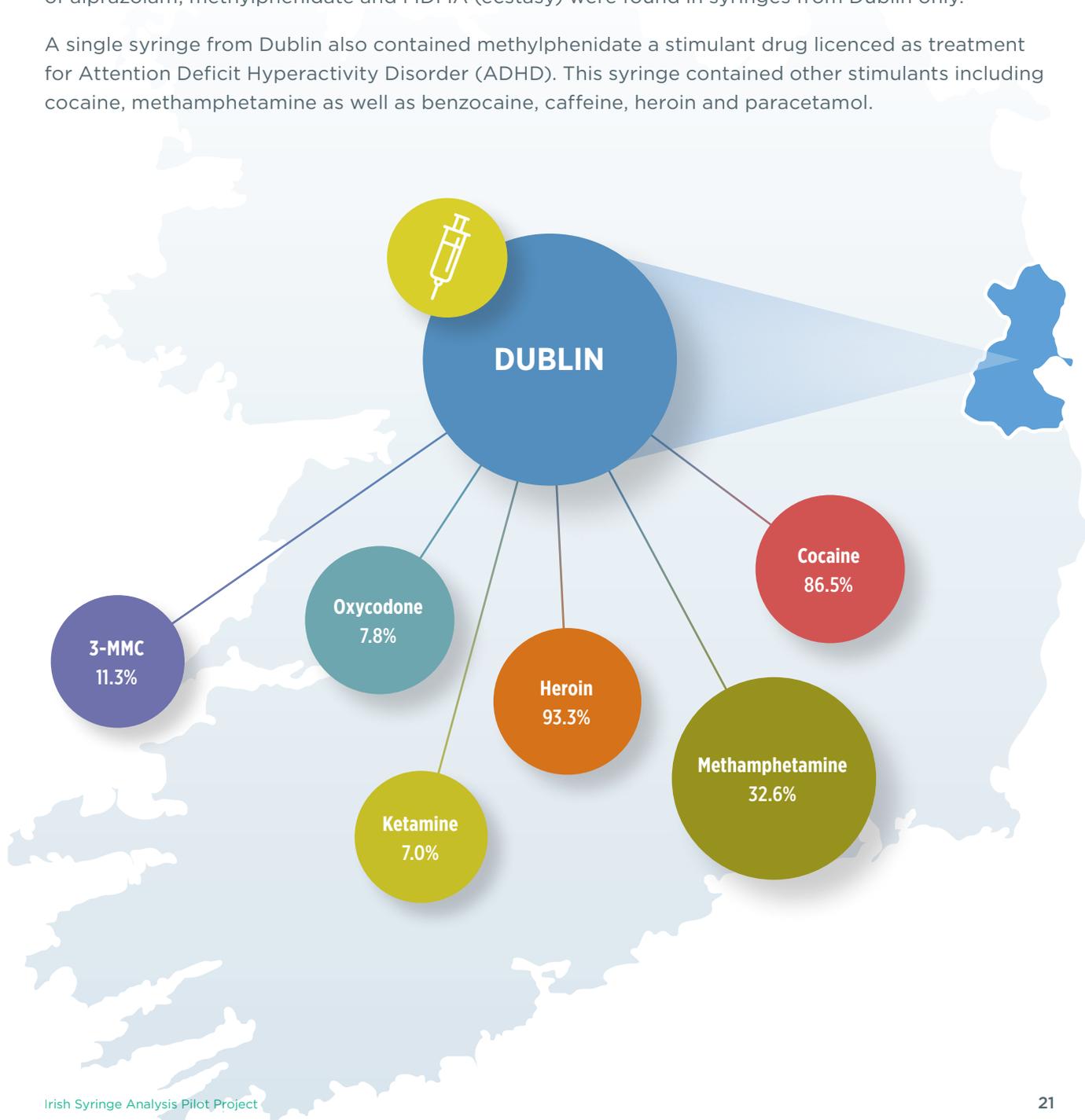
These findings compliment existing studies and confirm that syringe analysis methodology can provide more accurate and geographically sensitive information on drug patterns (Néfau et al., 2015; Brunt et al., 2021). Overall the ESCAPE data from a number of European cities in 2018-2019 show that injected substances vary between each location within each country (EMCDDA, 2021a).

Variations were observed in the profile of drugs detected in syringes sourced in the different locations. Similarly, both Dublin and the Midlands sites had a very high prevalence of both heroin (93.3% & 98.2%) and cocaine (86.5% & 89.1%) use.

DUBLIN TRENDS

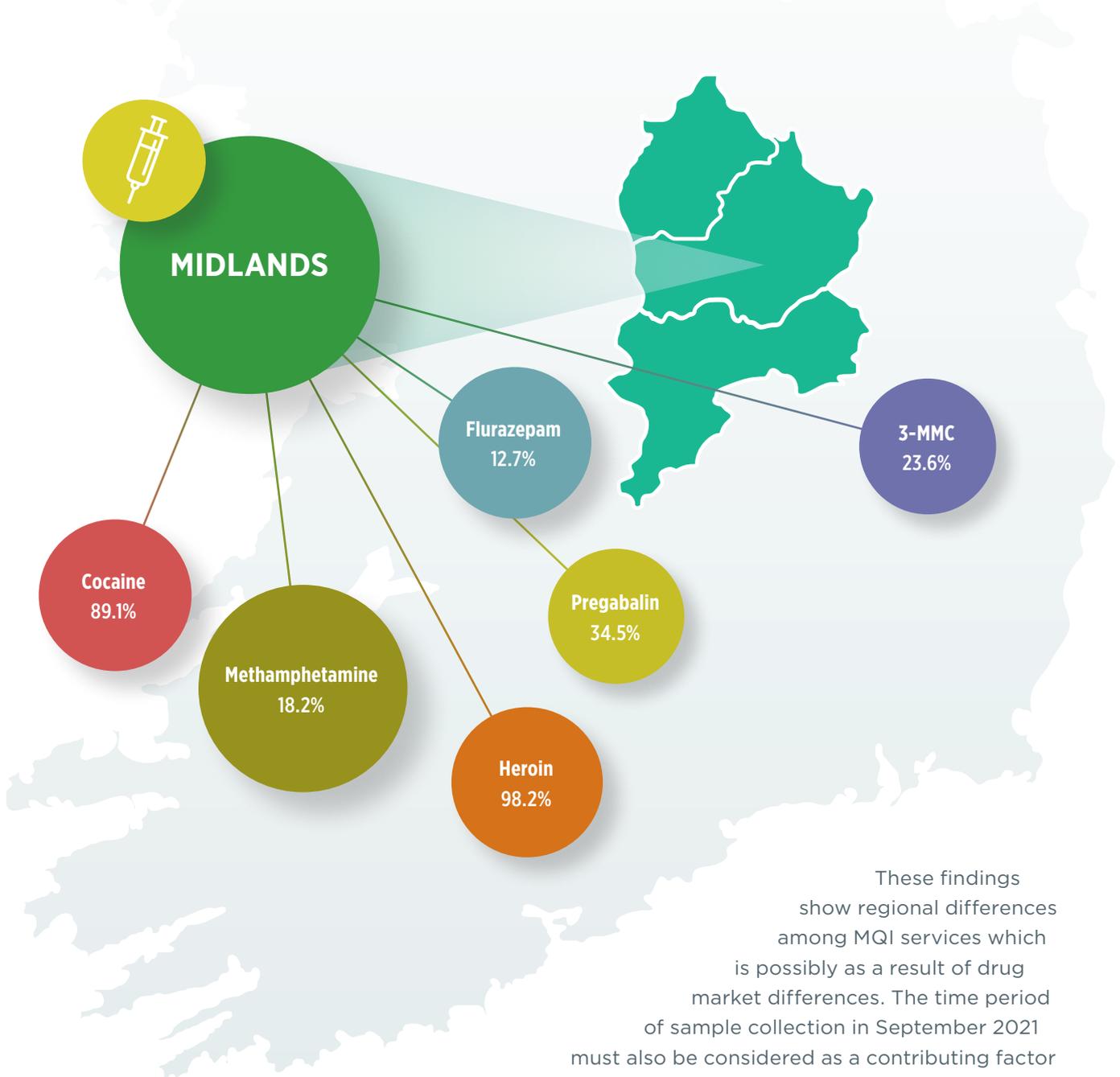
Unique trends relative to Dublin user groups were identified in this study. The substances Oxycodone (7.8%) and Ketamine (7.0%) were only found in samples from Dublin while Methamphetamine use was also much higher in Dublin compared with the Midlands (32.6% v 18.2%). Furthermore, single instances of alprazolam, methylphenidate and MDMA (ecstasy) were found in syringes from Dublin only.

A single syringe from Dublin also contained methylphenidate a stimulant drug licenced as treatment for Attention Deficit Hyperactivity Disorder (ADHD). This syringe contained other stimulants including cocaine, methamphetamine as well as benzocaine, caffeine, heroin and paracetamol.



MIDLAND TRENDS

The likely injection of flurazepam was only recorded in the Midlands location suggesting a localised trend of injecting this substance. The incidence of 3-methylmethcathinone (3-MMC) use was higher in the Midlands (23.6% compared with 11.3%). Similarly, zopiclone, pregabalin and diazepam were recorded in higher rates in the Midlands. Dextromethorphan, an over-the counter cough suppressant commonly found in cold medications, was identified in 3.6% of Midlands samples.



These findings show regional differences among MQI services which is possibly as a result of drug market differences. The time period of sample collection in September 2021 must also be considered as a contributing factor on detected drug trends, as COVID-19 and disruptions to the chain of supply may have had an impact on drug markets throughout 2021. Further studies are required to identify if these are sustained trends in these local areas and to also identify if these substances are appearing in other localities in Ireland.

Polysubstance use is common among Irish injecting drug users

Polydrug use can refer to the consumption of more than one drug by an individual over a certain period of time and can be associated with greater risk (Connor et al., 2014). It includes simultaneous use (or co-use) of different drugs, such as the simultaneous injection of heroin and cocaine, known as 'speedballing' (EMCDDA, 2021a).

Polydrug use has become the norm across all substance user groups in Ireland including the general population (Mongan, Millar & Galvin, 2021; Ivers, Killeen & Keenan). It is known that addiction treatment populations use a variety of drugs in combination including methadone, heroin, alcohol, benzodiazepines, pregabalin and crack cocaine (Connolly et al., 2008; McNamara et al., 2019; McNamara, Stokes & Nolan, 2019; Duffin, Keane and Miller, 2020). Similar to other syringe analysis studies conducted in Europe, the Irish findings indicate that polydrug consumption is common among injecting drug users (Brunt et al., 2021). The presence of multiple drugs in a syringe can be an indication of co-use and may help to identify commonly used combinations (EMCDDA, 2021a). The most recent available results from the 2020-2021 ESCAPE syringe collection of 1,392 used syringes collected by 8 European cities showed that in 5 cities, half or more of the syringes contained stimulants. A third of all syringes contained two or more drugs, indicating polydrug use or re-use of injecting material, with a mix of stimulant and opioid drugs the most frequent combination (EMCDDA, 2022a).

This combination is reflected in the recent Irish findings with 85.4% (123 syringes) containing both heroin and cocaine. This could suggest the pattern of 'speedballing' or co-ingestion at separate times for desired effects. The co-injection of cocaine and heroin increases the risks to health. Cocaine can mask the sedative effects of opioids, thereby increasing the risk of delayed overdose (EMCDDA, 2018b). These findings identify a need for service providers to provide specific information about risks of combining these substances.

Of the Irish samples, 23.6% (34 syringes) contained a combination of heroin, cocaine and methamphetamine. Methadone was found in 83 syringes indicating that many of the syringes were used by people who may be attending for Opioid Agonist Treatment. A low number (N=3 syringes) contained heroin, oxycodone, methamphetamine, ketamine, cocaine and pregabalin. Up to 16 different substances and metabolites were found in the syringes demonstrating the wide range and variety of problem drug use in Ireland. These findings could be as a result of polydrug use or adulteration without the users knowledge.

As part of a polydrug pattern, the injection of medication is recognised in some cities involved in the ESCAPE data collection. The injection of opioid substitution medications, namely buprenorphine and methadone, as well as benzodiazepines, is common in the locations Helsinki, Vilnius and Lausanne (EMCDDA, 2021a). In Ireland, pregabalin, was identified in 24.7% of Dublin and 34.5% of Midlands samples. When in interpreting these findings, it is important to note that pregabalin may be present as an extract from blood in syringes. The medication zopiclone, was identified in 4.5% of Dublin and 9% of Midlands samples and is also probably present as an extract from blood in syringes. As a result, we cannot confirm the injection of these medications among this sample.

Greater insight needed on adulteration across the drug market

The reasons for inclusion of additional elements in drugs are often varied and not always intentional by the manufacturer. Additional substances may be added to bulk, dilute, complement or enhance the effects of the drugs. Other additional elements are the result of manufacturing, production or storage techniques (Cole et al., 2010). The impact of common adulterants may vary but can often lead to additional and unknown risks to the health of people who use illicit drugs (Cole et al., 2010; Radley et al, 2022).

There is now a greater variety of substances available on the European drug market over the last decade and we have witnessed the adulteration and mis-selling of both established controlled drugs and NPS products. This can mean that consumers may be unknowingly exposed to highly potent and toxic substances (EMCDDA, 2022e). The cannabis market is the most recent area to experience adulteration with synthetic cannabinoids being identified across a variety of products including herbal, low purity THC products, vape liquids and edibles (EMCDDA, 2022e; Drugs.ie, 2022)

Common adulterants found in this syringe study included caffeine, levamisole, paracetamol, phenacetin, lidocaine and benzocaine which is reflective of other European syringe analysis results (Brunt et al., 2021). These findings also reflect the usual profile of adulterants commonly found in drug seizures in Ireland. In 2020 Forensic Science Ireland (FSI) reported that benzocaine is the most commonly detected adulterant in cocaine, closely followed by levamisole. Caffeine and paracetamol were the most commonly detected adulterants in diamorphine (heroin) seizures. Other adulterants documented in heroin by FSI also included MDMA (FSI, 2021).

While these adulterants are commonly used, they can have known health implications. Cocaine contaminated with levamisole can impact on white blood cells and cause inflammation of blood cells (agranulocytosis, vasculitis), joint stiffness (arthralgias), retiform purpura (blood vessel wall damage visible on skin), and skin necrosis (dead cells and skin discolouring) (Lee et al., 2012). Exposure to phenacetin has been linked with cardiac effects, with more frequent exposure associated with nephrotoxicity (rapid deterioration of kidney function) leading to incontinence and back pain and (Brunt, 2012).

Although the adulteration of stimulants with synthetic cathinones such as 3-MMC has been observed in other countries (Pascoe et al., 2022), at this point, we cannot confirm if the presence of 3-MMC in this study is as a result of adulteration of other substances or if it is an actively sought after substance and unidentified trend in Ireland. Within our study, we also identified a single syringe containing MDMA which was also found to contain heroin, methadone, paracetamol, levamisole, cocaine, benzocaine and caffeine. We cannot confirm if this is as a result of substance contamination or polydrug use.

It is recognised that the levels of adulteration per location may vary depending on the drug supply chain in different areas. In some cases, extensive adulteration with pharmacological active and inactive compounds takes place at local levels which may not be captured in seizure data (Bourmaud et al., 2021). To gain greater insight on the contents of drugs at the point of sale, further studies should be conducted to understand the threat posed by adulteration across the drug market.

Conclusion

This pilot demonstrates the successful collaboration between a harm reduction service and laboratory to identify drug trends to inform health-led responses. While this study presents very recent drug trends, it also highlights the need to conduct this work on an on-going, annual basis so we can monitor and map trends to inform local work. Some of the results identified in this report require further monitoring to identify if these are sustained drug trends over time.

The findings from this study can now be used to inform interventions provided by MQI and other similar services. Identifying the practice of stimulant injecting is significant and should inform tailored responses to help minimise the harms associated with stimulant injecting practices such as blood-borne virus transmission. Further, service providers should now query the variety of stimulant type drugs being injected in their areas to determine if synthetic cathinone or methamphetamine use is emerging.

Overall, our results support the proposal for converting the Syringe Analysis Pilot Project to an annual exercise to monitor drugs in Ireland for harm reduction purposes.

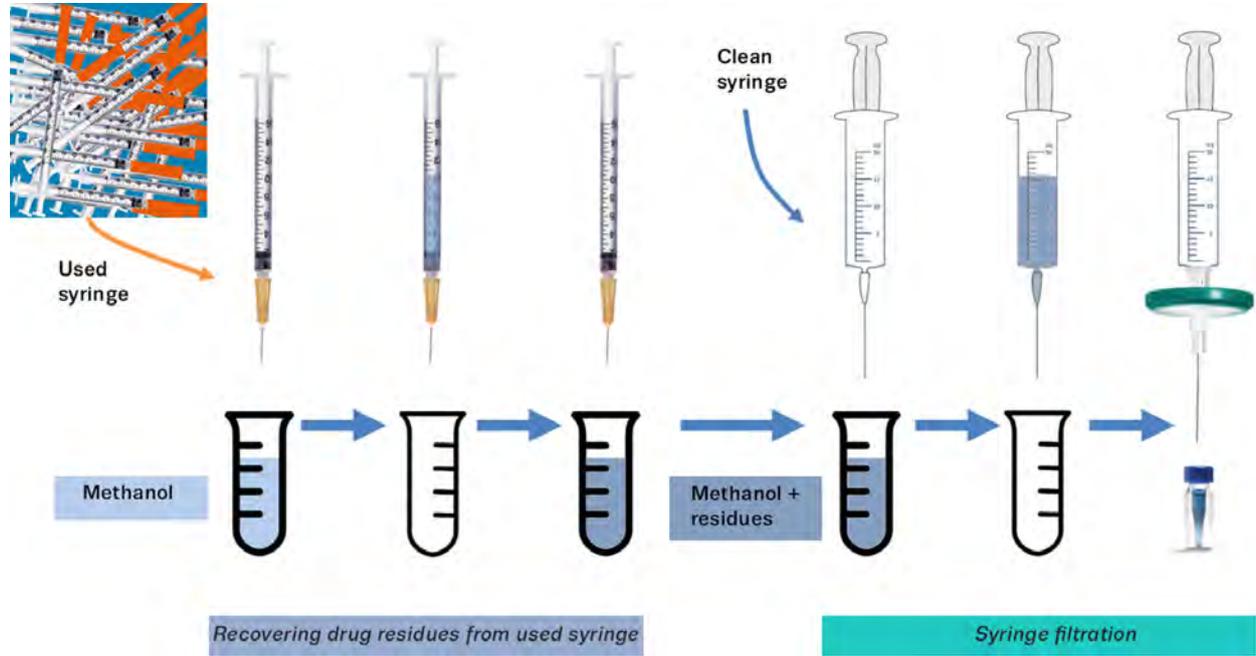
Research and Policy Recommendations

Based on the Syringe Analysis Pilot Project, the following is recommended:

1. The expansion of syringe analysis methodology for market monitoring purposes: As identified in this study, syringe analysis can detect trends otherwise not reported. Implementing this methodology on a more frequent basis and across different regions can provide unique insights on localised trends and potential health threats as they begin to emerge.
2. Monitor signals on the emergence of stimulant injecting trends in Ireland. Given the increased health risks associated with stimulant injecting such as blood borne versus outbreaks, this area requires immediate investigation to inform harm reduction and public health responses.
3. Combine syringe methodology with service user research: There would be greater benefits if syringe analysis methodologies were coupled with quantitative or qualitative research among populations of injectors. This can help to gain greater insight on the current drug market landscape and injecting behaviours for comparison. At present it is assumed that the emergence of new synthetic cathinones is through accidental exposure but this cannot be confirmed without further research among people who use drugs.
4. Pilot analysis methods among other injecting user groups: This pilot focused on service users within Merchants Quay Ireland services in Dublin and the Midlands Region. Expansion to other user groups such as attendees of the Club Drug Clinic Ireland can provide greater market monitoring opportunities to inform harm reduction responses.
5. Continue to enhance harm reduction services for people who use drugs in Ireland. Services should be adapted to meet the changing nature of the current Irish drug landscape. Rapid and innovative responses to new substances can be informed by drug market monitoring.
6. Further develop monitoring for health purposes: Given the experience of the HSE National Drug Treatment Centre laboratory and their role within this pilot project, additional resources should be considered to expand emerging drug trend monitoring within this service.
7. The implementation of the Medically Supervised Injecting Centre. The Syringe Analysis Pilot reinforces the need for the Medically Supervised Injection Centre (MSIF) in the City Centre location in Dublin. The new substances identified and polydrug use confirmed highlights the risk posed for those people who inject drugs. A MSIF will reduce that risk.

Appendices

Appendix 1: Sample Preparation Diagram



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