

EQUIPMENT CONSIDERATIONS

DRUG CHECKING PROJECT
BRIEFING PAPER/002
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UNIVERSITY of
STIRLING



SCOTTISH
DRUG DEATHS
TASKFORCE

The Drug Checking Project is a research project to explore how best to establish drug checking in Scotland. This project aims to build an evidence base for, and facilitate the development of, drug checking services across three cities: **Glasgow, Aberdeen and Dundee.**

This paper sets out equipment considerations in **point of care** and **lab based** settings and summarises findings from the equipment subgroup.

Related documents

Drug checking project briefing paper/002: National considerations

Drug checking project document: Summary of initial drug checking equipment considerations

WHAT IS 'POINT OF CARE' TESTING?

Point of care (POC) testing occurs on the site where the sample is handed in. This commonly combines the use of one or more types of mid-range testing equipment with basic techniques such as reagent testing kits, and fentanyl and benzo testing strips.



WHAT IS 'LAB BASED' TESTING?

Lab based (LB) testing occurs in a laboratory (a facility dedicated to performing testing in a controlled environment). Dedicated facilities can provide comprehensive testing, utilising advanced equipment and methods.



CORE ELEMENTS OF DRUG CHECKING

POINT OF CARE

LAB BASED

• A trusted space with pre-existing high level of footfall	✓	✗
• Provide signposting or access to interventions and services	✓	✗
• Staff skilled in providing harm reduction to a range of people	✓	✗
• Outreach dimension*	✗	✗
• Clarity about what results tell you**	?	✓
• Quantitative results as often as possible***	✗	✓
• Point of care testing in at least one location in a city	✓	✗
• Confirmatory lab-based testing****	✗	✓

*Outreach was spoken about positively by research participants but is not being progressed due to anticipated difficulties in obtaining a Home Office licence.

**Not all testing methods will give clear results and this needs to be communicated. Some people do not want an uncertain result and the service provider needs to communicate that uncertainty effectively. The worker needs drug knowledge in order to give the correct advice.

***Quantitative results are possible in some situations, but not always - particularly with benzodiazepines.

****Some places provide a service that allows samples to be collected and transported straight for LB testing without POC methods.

WHY DO WE NEED BOTH?

Both POC and LB testing have advantages and limitations and there is no one method or technique that can meet the core elements of a drug checking service required in a Scottish context.

It is essential that a drug checking service meets the needs of the population. This means that in Scotland, there is a requirement to test for a range of drugs including benzodiazepines. Many of these are extremely potent (active in very small quantities), for example, a dose of etizolam is considered to be 1 milligram (1 gram contains 1,000 doses), meaning the etizolam content of a pill is likely to be less than 0.5% of the overall pill weight. Drugs that are potent or present in small amounts, are more difficult to detect, and to successfully and quantitatively test certain drugs (such as benzodiazepines) there is a requirement for LB testing.

These limitations highlight the need for a balance between providing enough information in a useful time frame to encourage positive behaviour change **and** designing a service that is practical and affordable within a city. They also highlight the requirement for more comprehensive equipment/methods to back up POC testing.

CAN WE HAVE POC AND LB TESTING AT THE SAME PLACE?

Yes. This is possible. However, it is unlikely that a suitable POC service will have the facilities and space required for LB testing, and such testing has significant cost and resource implications.

It is possible that POC and LB testing are available in the same city, however having 3 LB services in 3 different cities has significant cost implications. Research is underway to consider a national component that would provide LB facilities in 1 location that can be accessed by the 3 city sites. See *national considerations briefing paper*.

POINT OF CARE ADVANTAGES

- Provide **results to clients at point of care** setting.
- Provides results within an **acceptable time-frame** (hours).
- **Engages people** in harm reduction conversations and support.
- **Cheaper** than LB testing.
- Equipment is **easier to use** than high-range testing equipment (but still requires significant skills and knowledge).

LAB BASED ADVANTAGES

- Provides **confirmatory testing** to confirm and quality-check the results from POC testing. This will allow us to establish levels of accuracy and error margins, and assess limitations at POC testing.
- Provides **comprehensive testing** which will give more complete results, including quantitative information and data on cutting agents. It will also help to identify compounds not detectable at POC.
- This provides baseline data, a **fuller surveillance picture** and better identification of emerging trends and new drugs, making it a valuable market monitoring tool.

POINT OF CARE LIMITATIONS

- May only provide **presumptive testing** – meaning that there is a level of uncertainty around results.
- **Quantification is not always possible** and depends on the substance, sample, equipment, methods and expertise of person interpreting. May be more of an 'approximation' of strength.
- **Potential for compounds to be missed**, esp. if the compound is unknown or not included in the reference library being used.
- **Potential for other errors** (false positives/negatives). To overcome this, may have to use multiple methods and triangulate results. This reduces uncertainty but increases cost.

LAB BASED LIMITATIONS

- Requirement to **transport** samples.
- **Capacity** of the lab. Resources need to be dedicated to drug checking to ensure work is prioritised and results are timely.
- Lab staff need **expertise** in drug checking.
- **High costs** of equipment, facilities and staff.
- More **difficult to communicate** results.
- **Longer timeframe** to provide results (days/weeks rather than hours).
- Even with high-range equipment there can still be **difficulties detecting some drugs**.

OTHER CONSIDERATIONS

KNOWLEDGE

Drug checking can be complicated but we can learn from experts in the field.

- There is a need to learn from others and tap into existing knowledge and projects. This applies even in the early stages, for example, it can help to make sure the equipment being purchased is able to deliver what it promises.
- There is a need to map existing expertise on testing method in Scotland to ensure that we make best use of the available knowledge.
- The knowledge and experience of the operator can influence how results are interpreted. Staff training is essential (even if the person already has a background in chemistry).

METHODS

Due to our novel drugs market in Scotland, a range of methods and multiple pieces of equipment are likely to be needed.

- The techniques used are just as important as the type of equipment. Techniques are being developed and will continue to be optimised but there is a need for formal communication channels to be set up to share this learning (between 3 cities and wider networks).
- Multi-element testing methods should be considered, for example, if testing a suspected benzodiazepine, the first question would be: 'is this a benzo?' If yes, then: 'what is the likelihood of having got the wrong result? what is the error rate?'. Then move onto the next technique to try and determine the type and concentration. This is important to get as much information as possible.
- Development should also consider methods to prepare and introduce the sample into the instrument. It can be complex because you need to have an idea of the magnitude of the sample to ensure you are not overloading the system, or diluting the sample too much and missing low concentrations.

FOCUS

Drug checking is quicker, cheaper and more efficient if we know what to look for.

- Testing can be focussed by considering:
 - **What is it likely to contain?** Link drug checking services to wider surveillance networks (Police Scotland Expert Witness Unit, Public Health Scotland, toxicology etc.) so we are pragmatic and searching for the right things, i.e. the drugs most likely to be in Scotland.
 - **What do people think is in the sample?** People's narrative around the drug is important in knowing how to test it and what to test for. What was it sold as? Have they already taken it? What were the effects?

COMMS

The way we communicate the limitations of drug checking is just as important as the results.

This section links to research gathered from the messaging group. See meeting notes for more info.

- Contributing to surveillance is a key part of drug checking.
 - Who do we communicate with if a new drug is found?
 - How do we communicate results to services and the wider public?
 - There is a need to share reports within networks. For example, Trip App (<https://tripapp.org/>) collates testing results.
 - The information from general drug surveillance can be used to inform messaging and highlight key trends and considerations.
- How do we ensure the information we share is useful and meaningful?
 - Even if it is not the best analytical result it can still be helpful.
 - However, providing too limited results may not be helpful. Need to establish what is 'useful enough'. If full quantification is not possible, can we provide a range or estimate? For example: 'this tablet does not contain any more than x.' Providing information on both the type of drug **and** amount is more effective. Providing good quality harm reduction information is essential and communicating risk accurately and successfully is a challenge.
- All testing has limitations:
 - We need to know the error rate of POC.
 - Even comprehensive quantitative testing doesn't inform someone what is in the rest of the drugs, i.e. only tests 1 benzo in a bag of 10.

HOW MUCH WILL POC TESTING COST?

The overall cost will depend on several factors including:

- the type of equipment used
- whether equipment is purchased or rented
- whether equipment is new or second hand
- how much equipment is purchased at a time
- connection to industry partners
- the number of samples to be processed
- the number of samples to be sent for lab based testing

When budgeting the following costs should be considered:

• Facilities	Rent, utilities, security, storage, cleaning, set up costs
• Primary equipment	Testing machine (and required add ons i.e. gas, consumables), computer (hard/software)
• Secondary equipment	Reagent testing equipment, test strips Pipette, vortex, shaking platform, racks, PPE, fridge/freezer, furniture, air conditioning
• Maintenance	Contracts
• Consumables	Tubes, tips, reagents, buffers, stationery, postage
• Staffing	Salary, pension, tax, NI, CPD Number, level, qualifications, experience Cost for support staff i.e. admin, HR, management, reporting
• Training	Drugs, harm reduction, risk communication, drug checking, H&S, conferences
• Home Office licensing	Home Office licence to possess AND supply
• References	Yearly licences, supplementary libraries, standards

TESTING EQUIPMENT*

MID-RANGE	MID TO HIGH-RANGE	HIGH-RANGE
<p>Infrared Spectroscopy</p> <p>Raman Spectroscopy</p> <p>Ion Mobility Spectrometry</p> <p>Location: POC</p> <p>Price range: £15-50,000</p> <p>Notes: Handheld Raman has been used successfully, however experts have reported that it can be challenging to use effectively, it often provides inconclusive results, and may fail to detect all drugs in a mixed sample.</p> <p>Key considerations: 'Mid-range' equipment may struggle to detect some substances and some equipment has a detection limit, for example, drugs needs to be at least 5% of overall sample. A combination of 'mid-range' equipment may be required, alongside 'low-range' such as testing kits/strips.</p>	<p>Portable Mass Spectrometry</p> <p>Location: POC</p> <p>Price range: £80-100,000</p> <p>Notes: This option can give a greater degree of quantitative results at POC quickly, however experts have reported difficulties using this technology including issues with calibrating the equipment and high maintenance costs/levels, which can cause delays.</p> <p>Key considerations: Requires a higher level of expertise to operate than 'mid-range', and there is a need for further method development. Requires discussion with those with expertise.</p>	<p>High Performance Liquid Chromatography (HPLC)</p> <p>Gas Chromatography-Mass Spectrometry (GC-MS)</p> <p>Price range: £50-150,000</p> <p>Liquid Chromatography-Mass Spectrometry (LC-MS)</p> <p>Price range: £150-500,000</p> <p>Location: LB</p> <p>Notes: Work is ongoing to scope out national lab-based testing options that can be used by all 3 cities. <i>See national considerations briefing paper.</i> Not all 'high-range' equipment is well suited to testing all drugs. Experts at DIMS noted some difficulties around testing benzos with GC-MS.</p> <p>Key considerations: Turnaround time, cost, capacity and transport.</p>

*This is a simplification to highlight key considerations, for more comprehensive information please see: *Drug checking project document: Summary of initial drug checking equipment considerations*. It is likely that all equipment and methods will require research and development to optimise technology to meet our needs. We recommend experts on the Equipment Group are consulted before purchasing decisions are made.