Public Health Scotland

Interventions to reduce harms from cocaine

A scoping review

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Abbreviations

CBT	cognitive behavioural therapy
CM	contingency management
CRA	community reinforcement approach
DRNS	Drugs Research Network Scotland
HCV	hepatitis C virus
LPASS	Lead Psychologists in Addictions Services Scotland
MET	motivational enhancement therapy
MI	motivational interviewing
RCT	randomised controlled trials
rTMS	repetitive transcranial magnetic stimulation (a neurostimulation technique)
SEPT	supportive-expressive psychodynamic therapy
TAU	treatment as usual

Contents

1. Executive summary

There is a trend of increasing drug deaths and cocaine harms in Scotland. The most severe consequences of cocaine use include dependence, overdose and death, but harms also include increased risk behaviours, wounds and infections as well as deteriorating mental and physical health and social exclusion.

1.1. What we did

We undertook a scoping review to map published and unpublished review-level evidence to help understand what is known and not known about interventions to reduce harms associated with cocaine use. Specifically, we assessed the size and quality of the review-level evidence base for:

- strategies to reduce or mitigate harm, and
- psychosocial interventions.

We also looked at the effectiveness evidence for harm reduction and psychosocial interventions.

We also undertook a horizon scanning exercise to identify new developments for harm reduction and psychosocial interventions from clinical trial registries.

Systematic methods were used to identify, extract and critically appraise reviews that used systematic methods from published and grey literature since 2014 on harm reduction and psychosocial interventions among adults who met the diagnostic criteria of cocaine use disorder, sought treatment for cocaine dependence or used cocaine (in any form and all methods of consumption) as at least one of their substances. Citations from clinical trial registries were identified from the last 10 years, but only those in the last 5 years were included on emerging research for new interventions. We included all interventions and outcomes of harm and/or benefit (including abstinence, reduction in cocaine use and craving, reduction in health-harming behaviours, retention in treatment, adverse events, mental wellbeing).

1.2. What we found

Review-level evidence for harm reduction and psychosocial interventions

From a comprehensive search of published and grey literature, we included 33 reviews that identified harm reduction (n=6) and psychosocial interventions (n=29), with some of the reviews evaluating both harm reduction and psychosocial interventions. Our scoping review also benefited from appraising the methodological rigour of the review-level evidence, which contributes to an assessment about the reliability of findings. Overall, the quality of the evidence base was mixed, with overall ratings of high for 11 reviews, moderate for six and low for 16.

Horizon scanning for new developments from clinical trial registries

We identified 13 citations from clinical trial registries of recently published and in-progress research, with new developments in harm reduction (n=7) and psychosocial interventions (n=6).

1.3. What are the key messages from the evidence?

Evidence for harm reduction strategies

We found limited evidence for harm reduction strategies from six reviews.

Early intervention identifies risk factors for, and early warning signs of, cocaine use or harms. We found only one high-quality review for an early intervention strategy, which reported that brief interventions within a Screening, Brief Intervention and Referral to Treatment model (a tool that helps to identify and address harmful and risky substance use behaviours) were not effective across a number of harm reduction outcomes.

We identified four reviews on provision of equipment (such as safe inhalation devices and syringes), with three assessing syringe provision programmes, of which two (one low-quality and one high-quality) provided some evidence of benefit (i.e. decreased syringe sharing and Hepatitis C transmission, receiving effective treatment) for people who use cocaine.

There was no cocaine-related evidence on safe environments/settings (such as using safer drug consumption facilities) within the single, low-quality review we identified. Evidence of some benefit from community outreach came from one low-quality review.

Evidence for psychosocial interventions

The largest evidence base included in our review was the evidence on psychosocial interventions, including 29 reviews examining a broad range of interventions, including contingency management, psychotherapy, psychodynamic therapy, cognitive behavioural therapy, motivational interviewing, systematic family therapy, drug counselling, relapse prevention, 12-step programmes, mindfulness-based interventions, holistic/ancillary interventions, and cyber health psychology interventions (i.e. use of technology in delivering psychological interventions such as virtual reality, mobile health, smartphone applications). Where possible we identified cocaine-related evidence from reviews to draw some conclusions about direction of effect for individual psychosocial interventions, but where reviews looked at multiple psychosocial interventions, we grouped studies as mixed psychosocial interventions. The quality of the reviews on psychosocial interventions was mostly low (n=16) studies, but eight studies were rated as high and five as moderate.

Contingency management, alone or in combination with other interventions, was the most evaluated psychosocial intervention in 14 reviews, which were a mixture of low, moderate, and high methodological quality. Cocaine-related evidence for contingency management was broadly consistent and indicated a positive effect in addressing a range of harm-related outcomes (e.g. abstinence, reductions in cocaine use, increased retention in treatment). There is also some evidence that combining contingency management with other interventions provides additional benefit.

Evidence for other types of psychosocial interventions was limited. Inconsistent findings were noted for cognitive behavioural therapy, psychotherapy, psychodynamic therapy, systematic family therapy, motivational interviewing, mindfulness-based intervention, drug counselling and 12-step programmes. One low-quality review indicated relapse prevention interventions may offer some benefit.

Evidence from reviews evaluating a range of psychosocial interventions, alone or in combination, was heterogeneous in terms of quality and effectiveness. Several reviews focused on specific populations (e.g. females with offending history, parents with substance use). However, findings from one high-quality review with a high proportion of cocaine-related studies suggest that psychosocial interventions reduce the number of people with stimulant use disorder that leave treatment prematurely, compared with no treatment and with treatment as usual, and may reduce stimulant use compared with no treatment.

One high-quality and four low-quality reviews on neurostimulation techniques provided some evidence of short-term benefit (i.e. reduction in cocaine use and cravings, improved abstinence). In addition, there was some evidence of improvement to abstinence rates, mental wellbeing and quality of life with yogic breathing/meditation techniques from three low-quality reviews, but limited or no benefit from acupuncture in two reviews (with one of moderate and one of low quality) and exercise from one low-quality review. Within one low-quality review on cyber health psychology interventions, no cocaine-related evidence was identified.

New developments from clinical trial registries

We identified developments in equipment provision to include two studies on inhalation pipes in people who use crack cocaine. One of these is an ongoing UK trial evaluating safe inhalation pipe provision kit to reduce crack-related health harms (associated with pipe sharing) to inform legislative review, which is due to be completed in late 2025.

In addition, interventions that manage risk behaviours (in the form of a toolkit and an interactive visual tool) and community-based drug checking services were areas of recent published research in harm reduction.

We also identified a novel Scottish initiative that combined psychosocial and harm reduction measures, such as contingency management as well as four harm reduction measures (i.e. known as the WAND initiative: Wound care, Assessment of injecting, Naloxone, and Dried blood-spot test).

For psychosocial interventions, published research tended to focus on contingency management (either alone or combined) and there is evidence from ongoing trials of delivering psychosocial interventions using technology such as online platforms, smartphone apps and virtual reality simulation.

Implications of this review

This scoping review is a foundation piece of evidence work to help identify the direction for future in-depth work to inform evidence-based practice in reducing cocaine harms. Until then, our conclusions may assist service managers and third sector agencies prioritise interventions in this area.

2. Introduction

Harm from cocaine use is a concerning public health issue in Scotland. The most severe consequences of cocaine use include dependence, overdose and death but harms also include increased risk behaviours (such as unsafe sexual behaviour, driving under influence, using other substances such as alcohol and other drugs, sharing of syringes, violence), wounds and infections as well as deteriorating mental and physical health.[1,2] Harmful patterns of use and route of administration are associated with increased risk of harm and severe consequences.[2]

In Scotland, there has been an increasing trend in the number of deaths associated with stimulants, in particular cocaine. The proportion of drug-related deaths where cocaine was implicated has increased from 6% in 2008 to 41% in 2023.[3] In addition, the percentage of drug-related hospital stays due to cocaine have increased more than two-fold from 6% in 2014-2015 to 15% in 2022-2023.[4] Consistent with these data, Scotland's early drugs warning system, RADAR[i] (Rapid Action Drug Alerts and Response), also identified cocaine as the most commonly detected substance in post-mortem and emergency department toxicology samples.[5]

Scottish surveillance data indicate high levels of polydrug use in Scotland and an increase in cocaine use among people who use drugs.[7] As a result of increased use, the number of people seeking help has risen; with 30% of people starting specialist drug treatment in Scotland reporting cocaine as their main drug in 2023-2024, compared with 28% for heroin.[6] Nasal consumption has been reported as the most common route of administration (58%), followed by smoking (37%) and injecting (6%). Recent data (2022-2023) from the Needle Exchange Surveillance Initiative

[i] RADAR validates, assesses and shares information to reduce the risk of drug-related harm by identifying new and emerging harms, recommending rapid and targeted interventions, and publishing information on services, harms and emerging drug trends. It involves people and services across the country and is coordinated by Public Health Scotland.

(NESI) reported that the increasing trend of injecting powder cocaine continues, as well as a smaller but consistent rise in injecting crack cocaine.[7]

A recent report commissioned by Drug Research Network Scotland (DRNS) highlighted the need for a better understanding of treatment options for stimulant use disorder.[8] They conducted a rapid review of review-level evidence on the safety and efficacy of both psychosocial and pharmacological treatments and found there was limited evidence for pharmacological treatment but that psychosocial treatments are a cornerstone of a therapeutic approach.

3. Objective

A scoping review is the most appropriate way to provide an overview of the breadth of the evidence on ways to respond to reduce harms associated with cocaine use.

3.1. Rationale for scope of the report

Our scoping review builds on the DRNS rapid review[8] but differs in several ways.

We focused on cocaine use rather stimulant use, based on discussion with experts in the field and drawing on cocaine trends from RADAR surveillance data. In addition, we extended the scope of care beyond treatment (i.e. tertiary prevention) to include secondary preventative measures such as early intervention and harm reduction as outlined in the continuum of care conceptual framework in Table 1.[9]

Table 1. Continuum of care framework

← Focus of the review →

Primary prevention	Secondary prevention: Early intervention	Secondary prevention: Harm reduction	Tertiary prevention: Treatment	Relapse prevention/ recovery support
Preventing cocaine use by focusing on social determinants/the causes at a population level.	Strategies or interventions to identify risk factors and early warning signs of cocaine use or harms.	Strategies or interventions to reduce or mitigate harms due to cocaine use.	Intervening with pharmacological and psychosocial treatments aimed at managing cocaine use, reducing symptoms, and supporting functional ability.	Removing barriers and providing support to aid long-term recovery process.

Given the DRNS report concluded that there was insufficient evidence to support the use of pharmacological treatment in stimulant use disorder, we did not include pharmacological treatment in the scope of this review. Therefore, we decided to focus on secondary prevention measures to include early intervention and harm reduction interventions, as well as psychosocial interventions for people who use cocaine.

To build on the findings of DRNS review, we decided to undertake quality appraisal of the reviews we identified. Whilst this step is not usually included in a scoping review, quality appraisal contributes to an assessment about the reliability of findings about harm reduction and psychosocial interventions.

Finally, experts in the field highlighted that new developments were being carried out in harm reduction research and this scoping review was an opportunity to collate evidence from a horizon scanning exercise. As such, it outlines new developments in ongoing research from trial registries of any study design on harm reduction interventions (including early intervention) as well as psychosocial interventions for people who use cocaine.

3.2. Aim

This scoping report maps published and unpublished review-level evidence to help understand what is known and not known about harm reduction and psychosocial interventions associated with cocaine use and to identify knowledge gaps that will inform areas for further evidence work.

A horizon scanning exercise was also undertaken to identify new developments to reduce cocaine harms from in-progress research.

3.3. Research questions

To achieve these aims, we answered the following research questions:

1. What is the size and quality of the review-level evidence base for harm reduction interventions for cocaine use i.e. measures to prevent or mitigate harms related to cocaine use, such as the environment and/or equipment?
    - What does the review-level evidence tell us about the effectiveness of harm reduction interventions?
2. What is the size and quality of the review-level evidence base for psychosocial interventions to treat/manage cocaine use?
    - What does the review-level evidence tell us about the effectiveness of psychosocial interventions?
3. What is the evidence from in-progress research from trial registries on new developments in harm reduction and psychosocial interventions?

Evidence for research questions 1 and 2 is presented in Sections 5 and 6 respectively and new developments from in-progress research are presented in Section 7.

4. Methodology

For research questions 1 and 2, three electronic bibliographic databases (CINAHL, Embase, PsycINFO) were searched between December 2024 and February 2025 to identify review-level evidence using systematic methods (to include systematic reviews and/or meta-analyses[ii], health technology assessments and scoping reviews) that were published since 2014 for psychosocial interventions and measures to reduce cocaine harms. An advanced Google search covering the same time period was undertaken as well as a search of grey literature evidence sources identified through initial scoping and in consultation with the short-life research advisory group. Finally, a bespoke search was undertaken with more targeted search terms to identify reviews on equipment provision (e.g. syringe provision, safer inhalation devices, safe settings and wound care) in April 2025. Author-identified references from other studies were also included.

For research question 3, clinical trial registries were searched for the period 2014 to 2024 for ongoing research on harm reduction and psychosocial interventions. Citations from the last 5 years were included as much of the research from the 2014-2019 period had been published or included in the reviews we had identified.

Full search strategies are available in the Technical Report (Section 2).

English-language studies were selected if they included adults who met the diagnostic criteria of cocaine use disorder, sought treatment for cocaine dependence or used cocaine as at least one of their substances; assessed psychosocial interventions and/or measures to reduce or mitigate harms (to include early intervention, risk management, equipment provision, environments/settings) and

[ii] A systematic review is a synthesis of primary research on a particular research question and a meta-analysis is a statistical technique to combine results to provide greater reliability of the estimates of any treatment effect. These are complementary processes and are considered one of the most robust types of evidence.

included comparative evidence. All outcomes relating to benefit and harm were included. The eligibility criteria were applied to all research questions.

Only review-level evidence was critically appraised using a modified Joanna Briggs Institute checklist[10] with 12 domains of study quality, and were then rated overall as low, moderate or high quality.

Key characteristics of each study/citation (population, intervention type, outcomes, results) were extracted.

For synthesis, high-level findings are summarised narratively by intervention category. We planned to use the Lead Psychologists in Addictions Services Scotland (LPASS) 2018 report for categorising evidence on psychosocial interventions. The LPASS categorises psychosocial interventions into 'harm reduction' (Tiers 1 and 2: psychologically informed care and low-intensity psychological interventions) and 'treatment' (Tiers 3/4: high-intensity psychological interventions for complex and enduring substance use).[11] We were unable to categorise psychosocial interventions into 'harm reduction' and 'treatment' using these criteria consistently due to the nature of the systematic review-level evidence. Therefore, we combined all of these into one 'psychosocial interventions' category, some of which are treatments and some of which are low intensity interventions that do not meet the level of treatment.

See the Technical Report for the full methodology (Section 1).

5. Overview of evidence

To answer research questions 1 and 2, our scoping review included 33 reviews which used systematic methods: 26 from the search for psychosocial interventions; 4 from the bespoke search of published literature on harm reduction and 3 from the grey literature searches on both psychosocial and harm reduction interventions.

For research question 3, we included 13 citations for interventions from horizon scanning of trial registries.

See PRISMA diagrams in the Technical Report (Figures 3.1 to 3.4).

Intervention types

A wide range of harm reduction and psychosocial interventions were identified from the published and grey literature evidence base as well as trial registries. The range of interventions by category (as outlined in Table 1) and frequency are summarised in Table 2. Some interventions did not fit neatly into these categories. As some reviews included interventions mapping to more than one category, the number of studies per category presented in Table 2 sums to more than the total number of reviews included.

Table 2. Types of interventions from the included studies

	Review-level evidence (n=33)	Ongoing/primary research (n=13)
Harm reduction interventions (including early intervention)	Screening, brief intervention and referral to treatment (n=1) Equipment provision (n=4) Environment/setting (n=1) Community outreach (n=1)	Drug checking service (n=2) Risk management (n=2) Equipment (n=2) CM, health monitoring, wound care, overdose prevention (n=1)*
Psychosocial interventions	Contingency management (CM) (n=14) Cognitive behavioural therapy (CBT) (n=4) Psychodynamic therapy (n=2) Drug counselling (n=2) Psychotherapy (n=3) Mindfulness-based interventions (n=1) Motivational interviewing (n=2) Systematic family therapy (n=2) Relapse prevention (n=1) Mixed psychosocial strategies (n=7) Neurostimulation (n=5) Holistic/adjunct strategies (n=5) Cyber health tools (n=1)	Virtual reality exposure therapy (n=1) Computerised CBT (n=2) Mobile guided self-help (n=1) CM interventions (n=2)

* Includes components of both harm reduction and psychosocial interventions.

For review-level evidence, most evidence identified was psychosocial interventions (n=29 reviews), while for in-progress research, evidence identified was for harm reduction (n=7 citations) and psychosocial interventions only (n=6 citations).

Review-level evidence on harm reduction and psychosocial interventions is summarised in Section 6.

A detailed summary of the ongoing research from trials and new developments in primary literature on harm reduction and psychosocial interventions is presented in Section 7.

6. Findings from review-level evidence

This section outlines the breadth of review-level evidence identified to answer research questions 1 and 2.

Of the review-level evidence identified, two were reviews of systematic reviews[1213], one was a review of meta-analyses[14], 28 were systematic reviews (of which nine included meta-analysis and one a network meta-analysis), one was a health technology assessment[15] and one was a scoping review[16].

We assessed the methodological quality of the reviews and found that the quality of the evidence base was mixed, with quality ratings of high for 11 reviews, moderate for six and low for 16.

The judgements made within each domain of study quality for the included studies can be found in Table 4.1 of the Technical Report. The domain that was most judged as weak was the assessment of publication bias. Other domains that commonly demonstrated weaknesses were a lack of quality appraisal and not reporting robust study selection, critical appraisal or extraction in duplicate. The search strategy was an area of concern in a fifth of the studies.

Section 6.1 summarises findings from reviews on harm reduction interventions (include early interventions) and Section 6.2 outlines key messages from review-level evidence for psychosocial interventions.

6.1. Harm reduction interventions

Key findings

- We found one high-quality review on early intervention strategies, suggesting that brief interventions (within a Screening, Brief Intervention and Referral to Treatment model) were not effective across a number of harm reduction outcomes.
- We identified five reviews that examined harm reduction interventions, which included equipment provision, environments/settings and community outreach.
- Two high-quality and two low-quality reviews were identified on needle and syringe programmes and crack use paraphernalia, with some limited evidence of benefit.
- We found one low-quality review that found no rigorous evaluations on safe drug consumption facilities among people who use crack cocaine.
- One low-quality review provided some evidence of benefit of community outreach among people who use crack cocaine.

Only one review was identified that examined early intervention strategies to reduce cocaine harm and five studies assessed harm reduction interventions, which were broadly classified as equipment provision, environments/settings and community outreach. Study characteristics and outcome measures reported for each review are summarised in Tables 5.1 and 5.2 in the Technical Report.

6.1.1 Early intervention strategies

Young and colleagues[17] reviewed two studies that assessed the effectiveness of brief interventions (within a Screening, Brief Intervention and Referral to Treatment model), in comparison to provision of written information. These studies found no

statistically significant evidence that brief interventions are effective in increasing abstinence, reducing use, improving treatment attendance or lowering ASSIST (Alcohol, Smoking and Substance Involvement Screening tool) scores. We rated this systematic review as high quality, but the authors rated the relevant randomised controlled trials (RCTs) as low to very low quality.

6.1.2 Equipment provision

Four reviews synthesised evidence related to the outcomes of equipment provision interventions.[16, 18-20] Three of these focus on syringe provision programmes,[16, 18, 20] two of which[16, 20] provide some evidence of benefit among people who use cocaine:

- a high-quality review of people who inject drugs, of which some studies (n=6) included people who use cocaine, reported that pharmacy-based programmes are potentially more effective at reducing syringe sharing and hepatitis C virus (HCV) transmission than either non-pharmacy-based syringe provision programmes or the absence of syringe provision programme, but many studies had a high risk of bias and effects were not statistically significant.[20]

- a low-quality scoping review suggested using syringe provision programmes is associated with receiving effective treatment. This evidence came from populations including people who use cocaine, but the effectiveness was not itemised by the specific drug(s) used.[16]

Conversely, one high-quality review included only one retrospective cohort study of people who used cocaine, which indicated that use of a syringe provision programme correlated with an increased risk of HCV transmission. However, the reviewers had concerns about sample representativeness, the potential influence of confounders, potential bias from participant non-response, and the accuracy of the measure used to determine HCV infection.[18]

The fourth, low-quality systematic review examined the provision of equipment (safe inhalation devices as well as syringes) among people who use crack cocaine, and provided unclear evidence of benefit for reduced risk behaviours (e.g. some

decreased syringe use and uptake of safe inhalation devices, but continued sharing of equipment) in people who use crack cocaine.[19]

6.1.3 Environment/safe settings

We identified limited evidence for safer drug consumption facilities within one broad-ranging, low-quality systematic review that included studies of people who used crack cocaine.[19] The authors conclude that "no rigorous evaluations" of safer drug consumption facilities for people who use crack cocaine exist. No other evidence was identified from reviews that used robust systematic methods on these facilities.

6.1.4 Community outreach

We identified one systematic review that included studies evaluating community outreach which found it to be beneficial in reducing risky equipment use, cocaine use, and other drug use among people who use crack cocaine, but there was limited evidence for increased abstinence.[19] This review was judged to be low quality.

6.2. Psychosocial interventions

Key findings

- We identified 29 reviews that looked at psychosocial interventions to treat/reduce cocaine harm, of which 14 evaluated CM, alone or in combination with other interventions. There is evidence that CM is effective in addressing a range of cocaine use outcomes. There is also evidence of additional benefit of adding CM to other treatments.
- Evidence for other types of psychosocial interventions was limited. Inconsistent findings were noted for CBT, psychotherapy, psychodynamic therapy, systematic family therapy, mindfulness interventions, drug counselling and 12-step programmes. There was some limited evidence that MI (alone or with MET) was not effective, but relapse prevention interventions may offer some benefit.
- Evidence evaluating mixed psychosocial interventions varied in terms of quality and effectiveness, but one high-quality review suggested that psychosocial interventions reduce the number of people who leave treatment prematurely compared with no treatment and TAU, and may reduce stimulant use compared with no treatment.
- Evidence from three low-quality reviews suggests psychosocial group therapies are beneficial for a range of outcomes.
- Evidence for holistic/ancillary interventions indicated limited or no benefit from acupuncture and exercise, but some improvements with yoga breathing/meditation techniques.
- There was limited evidence from one high-quality and four low-quality reviews that neurostimulation techniques offer some short-term benefit.
- No cocaine-related evidence on cyber health psychology interventions was identified in one low-quality review.

We identified 29 reviews that looked at psychosocial interventions and summarised the findings by type of psychosocial intervention where possible. We classified reviews that covered a wide range of psychosocial interventions as 'mixed psychosocial interventions'.

6.2.1 Contingency management

Contingency management (CM)[iii] was the most studied psychosocial intervention in the review-level evidence, however there was variation in the specific implementations of CM studied, as well as variation in the detail with which those specifics were reported. Where possible, these details are included in Tables 5.1 of the Technical Report.

We identified 14 reviews that investigated the effects of CM, alone or in combination with other interventions, on a range of parameters for cocaine harm. Two of the identified reviews[22, 24] were included in the review of reviews. In addition, some of these reviews were included as mixed psychosocial interventions, summarised in Section 6.3.10. Abstinence was the most common outcome measured, followed by cocaine use. Other outcomes included reductions in craving, treatment attendance, retention in treatment and psychosocial improvements.

Evidence for CM was positive and broadly consistent across the reviews. A number of reviews noted the additional benefit of adding CM to other treatments.[12, 21-23]

We identified two reviews of systematic reviews.[12, 14] The first of these is a high-quality meta-review which included two meta-analyses with cocaine-related evidence in people with substance dependence[14] and reported that CM programmes were significantly associated with increased likelihood of abstinence and reduced drug use

[iii] Contingency management is a behavioural intervention that uses rewards to reinforce abstinence and other positive behaviours related to substance use across various settings and substances. It can be delivered either on its own or as part of a package of interventions.

compared with controls. This meta-review included the systematic review we had identified by Bentzley et al.[24]

A second review of reviews of moderate quality evaluating treatment modalities for stimulant use was identified. Ronsley and colleagues[12] found evidence relating to cocaine and crack cocaine use from one core review (i.e. it was considered high quality by the authors and is the DeCrescenzo et al. network meta-analysis[22]) and four supplementary reviews to support the effectiveness of CM.[12] The reviewers found that CM, both alone and in combination with psychotherapy and pharmacotherapy, had a significant benefit in the treatment of stimulant use (i.e. increase in abstinence, retention in treatment).

In a high-quality Cochrane review in which 47 of 64 studies contained evidence on cocaine or crack cocaine use, Minozzi and colleagues[25] found some evidence that CM was superior when compared to no intervention and non-CM in achieving abstinence at the end of the intervention and/or at longest follow up.

Two systematic reviews with meta-analysis of high[26] and moderate[27] quality provided evidence that CM interventions were associated with increased abstinence from a range of drugs (to include cocaine) in patients with opioid dependence. Effects varied in size and statistical significance, but after meta-analysis each review found a statistically significant positive pooled effect.

Another moderate-quality systematic review of 19 cocaine RCTs (including two on crack cocaine) provided support for CM in favouring cocaine abstinence in the treatment of monosubstance disorders, especially stimulant use disorders.[28]

Five reviews, that were rated low quality, provided limited evidence that CM might improve abstinence when delivered alone[19 21, 29] or in conjunction with pharmacological treatments,[29] and in conjunction with CRA[23]. Evidence of effectiveness was identified for various forms of reward, including cash, vouchers and prizes.[29]

Finally, one high-quality review did not report any benefit of CM on reducing risk behaviours among people who inject drugs.[30] One cocaine study found "no

significant difference in injecting or sexual risk behaviours between the intervention (CBT and contingent vouchers and standard care) and control groups".

6.2.2 Psychotherapy

Three reviews synthesised evidence of effectiveness of various forms of psychotherapy in treating cocaine use and found mixed results.[15, 24, 29]

Bentzley and colleagues[24] conducted a meta-analysis of 131 studies relevant to cocaine (including 33 for which data were imputed) and found no statistically significant evidence that psychotherapy is effective in reducing cocaine use. This review was rated as being of moderate quality.

The effectiveness of psychotherapy in combination with psychedelic drugs (which work by altering a person's consciousness) was assessed in two cocaine-related studies in a low-quality health technology assessment[15], and showed ketamine-assisted motivational enhancement therapy was significantly associated with higher rates of cocaine abstinence, delayed relapse and a reduction in heavy drinking days (i.e. more than four drinks per day for men and three drinks per day for women), as well as being well tolerated and no attrition due to adverse events. Ayahuasca[iv]-assisted group talk therapy was associated with a significant reduction in cocaine use for treating people with substance use (including cannabis and cocaine) over a six-month follow-up period.

A low-quality systematic review[29] identified two older RCTs on interpersonal psychotherapy in people with cocaine dependence and reported significantly improved abstinence compared to CBT in people with the most severe use (not defined), but this finding was not confirmed in a follow-up trial by the same authors.

[iv] Ayahuasca is a psychedelic infused tea made from native South American plants.

6.2.3 Psychodynamic therapy

Evidence related to psychodynamic therapy for cocaine use came from two reviews, which we rated as low quality. The first review[31] found different psychodynamic interventions and therapies had no significant effect on both cocaine abstinence and therapy participation in two RCTs.

The second review by de Giorgi et al[29] identified two RCTs evaluating supportive-expressive psychodynamic therapy (SEPT) to address cocaine use, with mixed findings about effectiveness; one study reported significant improvements in drug use and psychological functioning, while the other reported worse outcomes (i.e. Addiction Severity Index–Drug Use Composite score and days of cocaine use in the past month) for the intervention arm compared to counselling[32]. However, a further analysis suggested that SEPT may be effective for patients who can achieve initial abstinence.

6.2.4 Cognitive behavioural therapy

Four reviews included evidence relevant to the effectiveness of CBT for managing cocaine use and reported mixed findings.[12, 25, 29, 33]

A high-quality Cochrane review[25] found that, when comparing CBT to any other intervention or to acceptance and commitment therapy, there was largely no difference in cocaine-related outcomes, but there was limited evidence that CBT decreased severity of dependence compared to no intervention.

Two of the reviews relevant to CBT were rated as being of moderate quality.[12, 33] Ray and colleagues[33] identified seven RCTs relevant to cocaine use, and pooled effect sizes found CBT, added to usual care plus pharmacotherapy, exhibited no significant positive effects on either quantity or frequency of use post-treatment, though they did identify a positive effect on frequency of use at follow-up. Similarly, Ronsley and colleagues'[12] review of reviews identified only one systematic review on the effectiveness on CBT in managing cocaine use, and reported that there was insufficient evidence to either support or discount CBT for this purpose.

A fourth review, rated as low-quality, predominantly supported the use of CBT (in combination with pharmacological agents) in cocaine treatment, but the RCTs were heterogenous.

6.2.5 Motivational interviewing

Two reviews presented evidence on the effectiveness of motivational interviewing (MI) in cocaine treatment. A moderate-quality review reported inconsistent evidence for MI/motivational enhancement therapy (MET) on abstinence, cocaine use, cocaine dependence and treatment adherence.[13] Similarly, De Giorgi and colleagues'[29] low-quality systematic review generally found no evidence that MI is effective in cocaine treatment, but did find one study that concluded that the former was better at reducing days of cocaine use amongst the people with the heaviest use (not defined).

6.2.6 Systematic family therapy

We identified two systematic reviews, each rated low-quality, examining the use of systematic family therapy to treat people with substance use[21, 29]. Both reviews included one RCT testing home- and office-based systematic family therapy in reducing cocaine use among mothers. Compared with CRA-based women's health education, systematic family therapy demonstrated a more rapid decline in cocaine use that reached statistical significance. One additional RCT was identified by De Giorgi[29] but found no beneficial effect.

6.2.7 Drug counselling

One low-quality systematic review[29] identified inconsistent evidence related to the effectiveness of drug-specific counselling interventions. This included evidence that telephone monitoring (for continued care/support) and adaptive counselling for people who use cocaine could increase engagement in therapy and increase abstinence when used in combination with reward vouchers (CM), and evidence that a combination of individual and group drug counselling can be superior to psychodynamic therapies and CBT in reducing drug-related problems and

encouraging 12-step programme uptake. Another low-quality systematic[34] review identified three studies that suggested group drug counselling in combination with individual drug counselling had beneficial outcomes over 9- and 12-month follow-up in comparison to group drug counselling alone, group drug counselling in combination with CBT, or group drug counselling in combination with an individual 12-step programme.

6.2.8 12-step programmes

Two low-quality systematic reviews[29,34] identified limited evidence that 12-step programmes may be effective in reducing cocaine use and abstinence among patients with cocaine dependence, but the evidence base was not consistent.

6.2.9 Relapse prevention intervention

One low-quality systematic review[29] identified six RCTs evaluating relapse prevention interventions. Relapse prevention interventions use cognitive restructuring to recognise cues that trigger dependence and to view lapses as opportunities to learn.

Five RCTs on relapse prevention showed reduced cocaine and other drug use post-treatment, with three showing that it was more effective in people with more severe cocaine use. Group and individual approaches also showed comparable results, but another RCT suggested that relapse prevention was useful only after abstinence was fully achieved.

One RCT evaluated mindfulness-based relapse prevention along with CM which was effective in increasing abstinence, reducing cravings and anxiety compared to TAU for people with cocaine dependence.

6.2.10 Mindfulness-based interventions

A low-quality review included three studies with cocaine-related evidence on mindfulness-based interventions to include group and individual spiritual self-schema therapy, Vipissana meditation and motivational therapy based on mindfulness-based

relapse prevention in substance use disorders. Mixed results were found for reducing cocaine and polydrug use compared with controls.[35]

6.2.11 Mixed psychosocial interventions

A high-quality Cochrane review[25] evaluated the efficacy of psychosocial interventions (CBT, CM, MI, interpersonal therapy, psychodynamic therapy, and 12-step programmes) for stimulant use disorder. Of 64 included studies (the majority included people who use cocaine), 18 included populations on methadone maintenance. The review made comparisons between any psychosocial intervention (i.e. multiple psychosocial interventions combined for analysis) and either no treatment or TAU. The review authors reported that there was high certainty that psychosocial treatments are effective at reducing treatment disengagement compared to no interventions or compared to TAU. There was evidence that psychosocial interventions reduce stimulant use compared to no treatment but this was not found when comparing to TAU. Compared to either no intervention or TAU, there was limited evidence that there was no benefit of psychosocial interventions for continuous abstinence, cravings, severity of dependence, adverse events, or mental wellbeing.

A high-quality network meta-analysis of 50 RCTs[22] assessed the comparative effectiveness of psychosocial interventions alone or in combinations (including CBT, CM, CRA, meditation-based therapies, non-contingent rewards, SEPT and 12-step programme) for the treatment of people with cocaine and/or amphetamine addiction. The review authors concluded that the combination of CM and CRA was the most effective treatment in both short and long term for abstinence, and the most acceptable treatment.

Four RCTs from a high-quality Cochrane review[36] of interventions for women with a history of offending evaluated several psychosocial interventions (to include interpersonal psychotherapy, intensive discharge planning and community-based case management services, dialectic behavioural therapy with case management). There was little evidence to support the use of any of the described interventions in this subpopulation.

A high-quality systematic review[37] on parental substance use found limited effectiveness for complex psychosocial interventions (i.e. those targeting parenting only, drug use only, and parenting and drug use) in positively influencing outcomes. There was some limited evidence of reduced cocaine use at long-term (but not short-term) follow up but no benefit for child welfare outcomes. A parenting intervention found benefit for reduced rates of relapse at 6 months follow-up in one RCT.

Finally three low-quality reviews presented evidence that:

- group therapies are more effective than TAU in reducing cocaine use[34];
- psychosocial interventions in general can reduce use of, and harms from, crack cocaine[19]; and
- a broad range of psychosocial interventions may improve cocaine-related outcomes, particularly when used in combination with harm reduction strategies[38].

6.2.12 Neurostimulation techniques

Five systematic reviews included evidence on the effect of neurostimulation techniques across various outcome measures.[19, 39-42] Of these, a high-quality review reported mixed findings for repetitive transcranial magnetic stimulation (rTMS) (6 RCTs) and continuous theta burst stimulation (2 RCTs) in people with cocaine dependence, with some short-term benefit for reduction in cocaine use, cravings and impulsivity, depending on the area of the pre-frontal cortex stimulated.[39] Evidence from four low-quality reviews indicated:

- transcranial direct current stimulation effectively reduced cravings (4 RCTs)[41]
- rTMS improved abstinence and reduced cocaine use (at follow-up but not at end of treatment) and cocaine cravings (transient yet significant) (5 RCTs)[42]
- intermittent theta burst stimulation reduced cocaine and other drug use with no adverse side effects (one RCT)[40]

- electroencephalogram with operant conditioning training or biofeedback improved abstinence, retention in treatment, self-reported depression and increased length of time in housing (2 RCTs).[19]

6.2.13 Holistic/adjunct therapies

Evidence for holistic and adjunct therapies was identified in five reviews; two assessing acupuncture,[12, 19] three on yoga breathing/meditation techniques[21, 29, 43] and one on exercise therapy.[29]

Evidence from two studies showed limited or no benefit of acupuncture in reducing cocaine harm, with:

- one moderate-quality review of reviews concluding that supplementary (i.e. lower-quality) reviews provided only 'tentative evidence' of effectiveness of acupuncture for reducing cocaine use among people with cocaine dependence[12]

- a low-quality review reporting ancillary acupuncture offered no benefit for treatment outcomes (6 RCTs) but improved treatment attendance (one RCT)[19]

Three systematic reviews that examined yogic breathing practices (2 RCTs)[43] and yoga meditation (one RCT)[21, 29] were all rated as low quality, but suggested improvements in abstinence rates, mental health and quality of life.

Exercise as an adjunct to other interventions (i.e. CBT and CM rewards) did not provide benefit for outcomes of abstinence and craving, but improved fitness, with evidence from one low-quality systematic review[29] that included two cocaine studies.

6.2.14 Cyber health interventions

Only one low-quality systematic review looked at the use of cyber health interventions (i.e. virtual reality in psychotherapy, mHealth, mCessation, smartphone applications) in the treatment of people with polysubstance dependence[44] but the authors found no evidence on the use of such tools for cocaine treatment.

7. Findings from in-progress research

Key findings

- We identified 13 relevant citations for harm reduction and psychosocial interventions from clinical trial registries.
- We identified two studies that looked at equipment provision, such as safe inhalation pipes. In addition, risk management and drug checking services were areas of recent published research in harm reduction.
- For psychosocial interventions, new research tended to focus on CM and delivery using technology such as online platforms, smartphone apps and virtual reality simulation.

To answer research question 3, we explored new developments in harm reduction and psychosocial interventions that are being researched in clinical trial registries.

Thirteen citations were identified from our horizon scanning exercise, including conference abstracts (n=2), conference posters (n=2), registered trials (n=4) and published primary studies (n=5). Nearly half of the studies we identified were undertaken in the UK (n=6), but other countries include the US (n=2), France (n=1), Switzerland (n=1), Poland (n=1) and Spain (n=1) (see Table 6.1 in the Technical Report).

We found new developments in harm reduction (n=7) and psychosocial interventions (n=6).

New categories of harm reduction include interventions that manage risk behaviours, in the form of a toolkit and an interactive visual tool (n=2)[45, 46] and drug checking services (n=2)[47, 48]. Two published primary studies on pilots of community-based drug checking services were based in the UK; one study evaluated the feasibility of a community-based drug safety testing service across a range of venues (a drugs

service, a community centre and a church) and cities [47] and one study demonstrated the proof-of-concept of a pharmacist-led drug checking service in a community substance use service[48].

Developments in terms of equipment provision include two studies on inhalation pipes in people who use crack cocaine.[49, 50] One of these is an evaluation of a safe inhalation pipe provision kit, distributed via drug treatment services and peer networks, to reduce crack-related health harms (associated with pipe sharing) and to inform legislative review.[50] This is currently an ongoing UK trial which is due to complete late 2025. Results are not yet available but could provide evidence of effectiveness.

We also identified further research around CM (either alone or combined); all three were published primary studies.[51-53] One intervention combined elements of both tertiary and secondary prevention measures; Smith and colleagues evaluated a novel initiative that combined CM as well as four harm reduction measures (i.e. known as the WAND initiative: Wound care, Assessment of injecting, Naloxone, and Dried blood-spot test).[51]

In terms of psychosocial interventions, recent and ongoing research indicated a shift towards delivering psychosocial interventions using different forms of technology, such as CBT using the web-based platforms[54, 55] or virtual reality[56] and psychological therapy on smartphone app.[57] We have not been able to identify when these trials will complete.

8. Strengths and limitations

Although scoping reviews do not normally include critical appraisal, we assessed the methodological quality of all reviews using a validated tool which helps to stratify the reliability of the included reviews. This does not reflect the individual quality of the primary studies included in the reviews, but we recorded the review authors' own risk of bias assessments where available. In addition, with the horizon scanning search, we have also identified new developments in research and recent published primary studies on interventions to reduce cocaine harms.

There were limitations in the evidence base we identified, such as:

- Most reviews included RCTs which may not be representative of real-world interventions amongst marginalised populations.
- In some reviews with polydrug use populations (such as opioid dependence, people who inject drugs), cocaine-related studies were a small proportion of the total studies and the authors' conclusions for the intervention were not generalisable to cocaine.
- Several of the included reviews were published at the beginning of the 10-year timeframe (i.e. 2014) and included primary studies with older evidence which may be outdated (i.e. early 1990s) due to changing intervention approaches, cohorts and contexts.
- Some systematic reviews contained limited detail about an intervention of interest limiting comparability across reviews; for example, definitions of CM were broadly consistent but the specifics of the incentives and context were not given and could have been different.
- The most common area of methodological weakness within included systematic reviews was a lack of assessment of publication bias (two-thirds of the reviews). However, the implication of this is that there is a risk of overestimating the effectiveness of an intervention. Lack of quality appraisal and not reporting robust study selection, critical appraisal or extraction methods were also commonly rated as weak. This has implications for

internal validity of the reviews and for the review authors' interpretation of study results (i.e. weighting the findings of included studies the same when they are of mixed quality).

Our approach also has some limitations that should be considered:

- We mapped review-level evidence across intervention categories to highlight where the evidence is available but it also shows where there is limited or no evidence available. It is important to note that gaps may mean that there is no review-level evidence rather than an absence of evidence (i.e. there may be individual primary studies that have not yet been synthesised as a review). There is a large evidence gap between reviews and clinical trial registries; we had hoped to explore primary literature, but this was not possible due to time constraints.

- We had broad eligibility criteria in terms of interventions and outcomes; this meant the included studies are very heterogeneous and discerning the overall direction of effect for harm reduction outcomes has been challenging. As such, we have only been able to provide a high-level synthesis of findings.

- We noted that some reviews have included the same primary studies, particularly for reviews on mixed psychosocial interventions. Where overlap has been identified, it has been acknowledged, but it may not have been consistently identified.

- We encountered challenges in categorising psychosocial interventions into 'harm reduction' (i.e. Tier 1/2) and 'treatment' (i.e. Tier 3/4) using the LPASS definitions as reviews included psychosocial interventions mapping to more than one tier or did not provide sufficient detail (e.g. who delivered intervention, how many sessions) to allow categorisation. As such we have grouped all the psychosocial interventions (Tiers 1-4) together but acknowledge differences in level of intensity of interventions, setting and staff who deliver them.

9. Conclusions

Our scoping review exploring the breadth and quality of evidence on harm reduction and psychosocial interventions highlighted that the review-level evidence base is sizeable and mixed in quality. It is more heavily weighted towards research in psychosocial interventions and covers a wide range of interventions.

This scoping review provides only a high-level synthesis of authors' conclusions on the effectiveness of these interventions. The most studied psychosocial intervention was CM, with some evidence of additional benefit when CM was combined with other strategies. We found fewer reviews exploring other psychosocial approaches and the findings were mixed but there was some evidence to support neurostimulation techniques. From the reviews, psychosocial interventions are often implemented as part of a multicomponent intervention.

While the evidence base was limited for harm reduction interventions, syringe provision programmes are important harm reduction measures.

In addition to mapping where there is review-level evidence, our review highlighted areas where there are review-level evidence gaps including early intervention, safer drug consumption facilities and tools that involve technology. Exploration of primary literature could be a key next step.

We also explored new developments from clinical trials which included safe inhalation pipes and delivery of psychosocial approaches using technology. These may provide evidence of effectiveness in the future.

This scoping review is a starting point for more robust and specific evidence work to inform and deliver appropriate evidence-based practice on responses to reduce cocaine harms. Until then, these conclusions may assist service managers, and third sector agencies prioritise interventions in this area.

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