Full Title: Violence prevention and support for and by sex workers: evaluation of a community-based intervention

Short title: Sex Workers Evaluate Reports of Violence (SWERV)

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Contents

BACKGROUND AND RATIONALE

Depending on working environments, sex workers may experience varied forms and levels of violence including physical, coercive, economic, emotional or verbal abuse. Despite high levels of violence and victimisation, they are frequently denied justice and access to appropriate services. Although levels vary widely between populations, global reviews estimate that 19-44% of sex workers meeting clients in person report violence by clients, 15%-61% by intimate partners and up to 18% by police or acquaintances.(1) Sex workers advertising services online also report other abuses, such as stalking and harassment.(2) In London, 73% of street-based sex workers and 36% of sex workers working indoors (e.g. flats, saunas, hotels) have experienced violence from clients in the past six months and 1 in 5 had experienced violence by police.(3) Violence can have severe consequences for mental health, including post-traumatic stress, depression and anxiety.(4, 5) Sex workers frequently lack access to appropriate, non-judgemental mental healthcare and some self-manage with alcohol or other drugs, which can worsen mental health and vulnerability to violence.(6-8) In London, 35% of indoor and 71% of street-based sex workers reported anxiety and depression. Respectively, 31% and 53% wanted mental healthcare but had not received it.(3) Sex workers also lacked access to wider health and support services.(9, 10)

National Ugly Mugs (NUM), a community-based organisation, provides violence prevention and support services for and by sex workers across the UK. NUM receives reports of violence from sex workers, services and police and uses these to distribute SMS and email alerts about violent perpetrators to sex workers, venues and support services. In an initial evaluation of its pilot programme in 2012, 16% of 92 participants avoided a potential client as a result of the information provided.(11) NUM has since expanded to over 9000 members, introducing a national database to help sex workers screen clients ('NUMchecker') and 'casework' for victims of violence i.e. individually-tailored mental health support and facilitated access to desired health and social/welfare services. A focus on desired services recognises that some sex workers may not wish to be referred to certain agencies or report violence to police because of historic and ongoing mistreatment, criminalisation, and/or not being taken seriously.(2, 9) NUM received 603 and 682 reports of harm against sex workers respectively in 2020 and 2021. In 2020 these included physical/sexual violence (41%), fraud and robbery (24%), stalking and harassment (23%). NUM has sent 1.72 million alerts since its inception. NUM staff includes people with active and former experience in sex industries and the organisation supports other providers to replicate their services nationally and internationally.

Sex workers are prioritised in the UK's Inclusion Health agenda because of the extreme health inequalities they face as a community.(12) However, they are rarely consulted over service design, delivery and evaluation, despite growing emphasis on patient and public involvement and engagement (PPIE).(13) Sex workers face far greater violence, murder rates and poor mental health than the rest of the population, with the highest rates among women who sell sex on street.(3, 14-16) Evidence shows that sex workers who have experienced police enforcement (arrest, displacement from work area, prison, police violence) experience higher levels of client violence that those who have not experienced enforcement.(3, 9, 17) There are also inequalities within sex worker populations. In London, racially- and ethnically-minoritised sex workers are more likely than white sex workers to experience abuse and harassment (17), be ignored or mistreated when reporting violence to police, and be arrested. Those identifying as lesbian, gay or bisexual are more likely to have been raped, abused and harassed than heterosexually-identifying sex workers.(17)

Internationally, sex workers experience widespread police enforcement and abuses, which hinder opportunities to enact safety strategies and access health and social services, including police and legal systems (e.g. to report violence).(18) Across Europe, sex workers are experiencing growing criminalisation, precarity and cuts to specialist services (9, 10, 19) and becoming less willing to report violence to police.(2) In the UK, cuts to sex worker support services have removed vital, person-centred care, particularly affecting more marginalised sex workers in the context of stigmatisation in mainstream services.(9, 10) Funding cuts have been linked to an increasing enforcement-agenda (treating sex workers as threats to communities rather than community members requiring support), and shifts towards commissioning 'exiting' services (encouraging people to stop selling sex) which sex workers report do not meet their health and support needs. (9, 10) Sex workers globally face increased precarity since the Covid-19 pandemic, and more people are selling sex as living costs increase.(19) Financial insecurity and lack of access to sex worker support services have been consistently linked to violence and mental ill-health, in the UK and internationally.(1, 3) Research is urgently needed to inform violence prevention and support serving this marginalised, dynamic and growing population, in contexts of high levels of police violence and sexual

misconduct, and denied access to justice.(9, 20) This requires sex-worker involvement at the heart of such interventions and research.(21)

Existing research demonstrates the potential of violence prevention (e.g. alerts) and support services (e.g. casework) for and by sex workers but lacks a rigorous evaluative evidence base, particularly in relation to community-led interventions.(22) In Canada, surveys indicated that community alerts about violent perpetrators (communicated via a mobile van) made street-based sex workers feel safer and had prevented physical and sexual assault against them.(23) In the UK, observational data show associations between screening and refusing clients and reduced odds of violence from clients among indoor-based sex workers, but to date there has been no evaluation of any kind of prevention interventions.(3) Community-led crisis responses, access to legal support and unionization have reduced sex workers' exposure to violence and improved access to services in India and Brazil (7, 24, 25) but there is a lack of evidence in Europe, despite active sex worker organising. Appropriate, trauma-informed support is vital to sex workers' mental health and wellbeing but access is lacking, amid widespread stigma.(4, 5, 8, 22)

Theoretical framework for the research

In this study, we will use realist evaluation and participatory approaches. Realist evaluation focuses on understanding how mechanisms triggered by use of intervention resources interact with context to generate outcomes. Exploration and testing of context-mechanism-outcome configurations (CMOCs) helps to provide a theoretical and empirical basis for understanding how interventions work, for whom, where and under what conditions (see Theory of Change section below for this intervention's initial CMOCs). This can be used to inform intervention transfer and scale-up, as well as broader scientific understanding and theories around how interventions achieve their effects. It can also be used to assess the strengths and limitations of the current intervention in situ, asking who benefits and who does not, and evaluating impacts on inequalities and which factors are limiting effectiveness, so that the intervention can be refined and optimised by the provider. In our proposal we are interpreting mechanisms as the provision of economic, informational or other resources that enable new responses, actions and interactions from people or the enactment of intervention activities.(26) Mechanisms are causal processes that are triggered by, but distinct from, intervention activities and that, in turn, generate intervention outcomes. We are interpreting context to be the capacities and relationships between individual actors, institutional settings and wider social structures which precede the intervention and which may interact with the mechanisms triggered to produce outcomes.(26, 27)

Realist approaches can help to partially compensate for the difficulties in quasi-experimental studies of attributing outcomes to interventions, because they build up a stronger picture of the plausibility of intervention mechanisms. Meanwhile, qualitative research can help to examine complex mechanisms, such as "chains of causation or feedback loops" that are not easily measured through standard quantitative approaches.(26) It can also help to refine understanding of how interventions work based on the experiences and perspectives of those delivering and receiving them, which may differ considerably from existing academic theory and evidence. Realist evaluation approaches therefore align well with participatory research.

Realist evaluation is rooted in social science critical realism theory, which prioritises introducing the lived experiences of research communities before, during and after reviews of academic literature, to challenge current academic theories. This is particularly relevant in the context of research pertaining to sex work because sex workers' narratives are often spoken over by those claiming "ownership" because of academic interest and/or engagement in activism.(28) Sex workers' widespread exclusion from developing and delivering services, policy and research that affect them has often led to interventions and research that do not meet or reflect their diverse needs.(29) Participatory approaches aim to interrupt such tendencies and related power imbalances, by involving members of affected communities in designing, conducting and disseminating research, in recognition of their lived expertise, and to ensure that research responds to community priorities and drives related action.(21) Dedicated time, resource-commitment and reflexivity are essential to the success of such projects, to ensure that community members have sufficient support and financing to be able to shape the research and that the research is responsive to this, amid potentially differing expectations, timeframes and agendas, and traditional power dynamics between 'experts' and 'communities'. (13, 21, 30)

Intervention
National Ugly Mugs (NUM), a violence prevention and support for and by sex workers, has been operating in the UK since 2012. NUM work from the basis that sex workers are the experts and consequently work with them to design and deliver safety tools and support services. NUM aims to improve sex workers' rights, safety and inclusion by facilitating them to make decisions about their own safety, by supporting sex workers who are victims of violence to manage consequence of violence and seek justice (if desired), and by influencing local and national policy that shapes context in which sex work operates.

We will evaluate four aspects of NUM's violence prevention and support: (1) community alerts about violent perpetrators; (2) community-based violence reporting system; (3) NUMchecker tool allowing sex workers to screen clients (by contact details, profile names and vehicle registration) against national database; and (4) casework for victims of violence and linked engagement with referral services.

Reporting system and community alerts: NUM receives and processes reports of violence, attempted murder, rape, and sexual violence, on and offline stalking and harassment, spiking (e.g. drinks being drugged), theft and other crimes against sex workers, from sex workers, venues, support services and police, by phone and through an online reporting system. NUM uses these reports to produce and disseminate SMS and email alerts to sex workers, sex work venues and services who have signed up to receive them, to raise awareness about dangerous people and conditions that pose a threat to sex workers. Members can also access alerts by logging into NUM's platform. With the service user's consent, NUM shares anonymous intel with the National Crime Agency and police intelligence to improve community safety.

NUMchecker*:* NUM holds the national database on violence and other crimes against sex workers and hosts the corresponding NUMchecker tool. Sex workers can use this tool to screen potential clients against this database, using email addresses, profile names, vehicle registrations and phone numbers.

Casework*:* NUM also provides support to victims of violence, termed 'casework'. A multidisciplinary casework team, including Independent Sexual Violence Advisors, offers individually-tailored, trauma-informed support. This may include: brief interventions, emergency resources for those fleeing violence, support for mental health and alcohol and other drug use issues, facilitating access to (mental) healthcare and other public and community services (e.g. housing, debt counselling, welfare) and providing ongoing support in complex cases. If the individual wishes, NUM offers support reporting to police through to court. As part of this casework, NUM advocates for respectful, sensitive treatment of sex workers in referral services, in contexts of widespread stigma, discrimination and criminalisation.

NUM has over 9000 members, of whom 83% are sex workers (the others are service providers), 7% working solely online (e.g. webcamming), 87% in indoor venues (home, flats, hotels, escorting) and 6% exclusively on the street. In 2020, NUM received reports of 713 acts of harm, including physical/sexual violence (41%), fraud and robbery (24%), stalking and harassment (23%). A total of 164,716 alerts were disseminated in 2020. NUM is a national organisation providing services to adults in sex industries in England, Scotland, Wales and Northern Ireland. Their main offices are in Manchester and they have a drop-in wellbeing space, NUMbrella Lane, for sex workers in Glasgow. In addition to sex worker members, NUM has a network of over 1,200 practitioner organisations around the country who engage with sex workers at shelters, outreach programs, GP surgeries and so on.

Theory of change underpinning NUM's violence prevention and casework
We will use realist evaluation principles to theorise and test how the intervention activities trigger relevant mechanisms and, through the interactions of these with contexts, generate health and wellbeing outcomes. Here we present our starting theory of change and corresponding context-mechanism-outcome configurations (CMOCs), which will be refined through dialogue workshops, mapping and realist evidence review (Work Package A), and process evaluation (Work Package B) and then tested via statistical analysis as part of the impact evaluation (Work Package C). In our preliminary logic model (see attachment), we highlight the intervention resources, planned activities, mechanisms triggered and the intermediate and longer term outcomes generated. This logic model does not include context as this would make for too complicated a diagram.(26) The logic model should be read alongside the text below to explain our proposed CMOCs.

CMOC 1. CONTEXT: For sex workers who need casework after experiencing violence; who lack existing, appropriate support; and who trust, can access and benefit from new support, because they have the

time/schedule, technology and language skills* to do so, consider themselves a sex worker and do not have competing needs or concerns that prevent them from doing so (e.g. because they have drug/alcohol dependency, fear being reported to police/immigration/social services or being 'outed'). MECHANISM: Provision of respectful, trauma-informed, accessible casework by NUM – which includes mental health support and referrals for sex worker-friendly counselling/therapy - creates a space in which sex workers can discuss their experiences of violence, wider needs and concerns regarding safety and wellbeing, develop strategies for coping with the consequences of violence, and develop strategies for coping with ongoing mental health issues (e.g. loneliness, anxiety, depression, suicidal ideation). This increases awareness of resources available that are safe for sex workers to access, and resilience. OUTCOME: This generates improved mental wellbeing.

**NUM provides services in English, Spanish, Brazilian Portuguese, and Urdu.*

CMOC 2. CONTEXT: In settings where NUM has been able to develop strengthened working relations and referral pathways with health and social/welfare services that are inclusive of sex workers' diverse lived experiences; where there is policy support for sex worker rights and adequate funding of specialist services, mental health and welfare; and for sex workers who have sufficient trust and consider it safe to use these services (e.g. because they do not fear that they will report them to police/immigration/social services or discriminate against them). MECHANISM: Respectful, trauma-informed, accessible welfare and support services, via referral and advocacy by NUM caseworkers, provides resources (e.g. housing, welfare, drug treatment) to sex workers that can help them implement safety and harm reduction strategies e.g. avoiding situations and environments where they could otherwise be exposed to violence and mental-health stressors. OUTCOME: This generates reduction in experience of violence and improved mental wellbeing.

CMOC 3. CONTEXT: For sex workers who have sufficient resources (e.g. technology, language skills, time and/or access to frontline services) and trust to use NUM's reporting system and violence prevention tools, and/or have alternative access to information circulated in alerts (e.g. via peer networks/organisations, venues, services); who are able (financially or otherwise) to be selective over their clients and working practices; and whose working practices are not disrupted by police/immigration enforcement and criminalisation. MECHANISM: Alerts and NUMchecker increase sex workers' awareness of and opportunity to avoid potentially violent individuals and dangerous situations (e.g. by screening clients, working with others instead of alone, avoiding certain individuals/spaces), and help them to feel safer at work. They help them feel informed, more in control of their approaches to work, and incorporate these tools (e.g. review alerts, use NUMchecker) into their working routine. OUTCOME: This generates reduction in experience of violence and improved mental health.

We base these CMOCs upon evidence from the UK and other settings that person-centred, community-led, rights-oriented casework can improve sex workers' access to existing services, by helping to navigate rigid and sometimes hostile health and welfare systems and by securing more respectful, appropriately-tailored support in such services.(9, 25, 31) We also base this upon evidence of structural factors (e.g. discrimination, housing and financial insecurity) that increase sex workers' vulnerability to violence and mental ill-health, and of how sex-worker friendly services can improve mental wellbeing and help to address these structural inequalities.(8, 9) We do not theorise that the intervention will increase reporting to police as it is not intended to do so, given that many sex workers do not wish to be referred to police/the legal system because of historic and ongoing police violence, mistreatment and enforcement.(2, 9) We also draw here on evidence from the UK and elsewhere that community-based alerts can improve feelings of safety and help sex workers to avoid potentially violent individuals, when they have the resources to do so.(3, 32) These mechanisms may lead to outcomes of sex workers being more informed about threats to their safety and – for those who are able to select which clients they see – feeling safer, being less exposed to violence, and experiencing improvements in their mental health.

Existing evidence demonstrates that tensions over sex work governance can restrict information-sharing between police and services, and that sex workers and venue managers can be wary of engaging with unknown services in contexts of heavy or feared police and immigration enforcement.(9) Research also demonstrates that sex workers' opportunities (e.g. economic, autonomy at work) to screen clients and/or work with others.(1, 33, 34) are contingent upon whether these working practices are disrupted by police

and immigration enforcement (e.g. rushing negotiations with clients and/or moving to more isolated locations to avoid detection), criminalisation (e.g. outlawing working and sharing information with other sex workers, clients unwilling to share contact information) (18), and sex workers' experiences of violence by police – all of which disproportionately affect sex workers who sell sex on street and use drugs, are migrants, racially- or ethnically- minoritised, and/or experiencing precarity or debt.(3, 18)

Each of these mechanisms is also likely to be shaped by how and where sex workers operate, their (perceived) entitlements to healthcare and public funds, intersecting stigma and precarity. For example, sex workers operating online who are underserved by existing sex worker support, health and welfare services, and who have the technology, financial capacity, service awareness and trust to use NUM's violence reporting and prevention tools, may be more able to benefit from the interventions. Whereas sex workers who sell sex on street, use drugs and face high levels of violence and unmet mental health and welfare needs may stand to benefit greatly from these interventions but not have the financial capacity to be selective over clients and/or the necessary technology to engage in these services. Sex workers who do not know about or want to use NUM, because of language barriers, not seeing themselves as sex workers, fears about links to authorities, and lack of entitlement to public funds and healthcare, may also be less likely to benefit. Lack of access to technology, resources in different languages, frontline support services can pose important barriers to accessing online and phone-based services, for example for migrant sex workers who do not speak English and/or who lack recourse to public funds (35), and sex workers selling sex on-street who do not have smartphones/internet access.(10) These mechanisms are also dependent upon the extent to which sex work venues, services and police report violence to NUM.

NUM ability to develop strengthened working relations and referral pathways with community and public sector services (health, social/welfare) is also likely to be contingent upon wider policy support for sex worker rights as opposed to services and practices that punish, stigmatise, discriminate against and/or criminalise sex workers. It is also likely to depend upon how well services cater to and are inclusive of sex workers' diverse lived experiences and circumstances, at the intersections of race and ethnicity, immigration status/citizenship, sexual and gender identity, disability, poverty and drug use. Health and support services for sex workers often do not adequately serve or meet the needs of specific minoritised groups.(9, 10, 17) This is also likely to be contingent upon sex workers' prior experiences with and perceptions of the police, specific police officers' and stations' responses to sex workers and NUM, and wider institutional attitudes towards sex workers, in contexts of longstanding history of sex workers being treated as unreliable witnesses, criminalised and/or abused within police and courts systems.(9, 18)

Unintended consequences

There is also potential for unintended, harmful consequences of the interventions.(36) For example, there is a risk that services to which NUM refers sex workers via casework do not offer adequate and/or respectful support, including but not limited to the contexts described above, which could impact negatively on their mental health and wellbeing. There is also the risk that those who choose to report violence to the police are denied justice or further mistreated, worsening the existing consequences of violence and mental health. Receiving alerts and using the NUMchecker could lead to increased anxiety about violence, particularly for those who are unable to screen or select clients consistently because of poverty and precarity, venue policies, lack of autonomy at work, drug use, police enforcement and/or criminalisation.

Concepts underpinning our theory of change

This theory of change is underpinned by concepts of *necropolitical assemblages* and *restorative social justice*, which we employed in our recent NIHR-funded study, building on existing social theories.(37-39) We used these concepts to analyse how police enforcement and cuts to frontline services in London harmed sex workers' safety and health, and the alternative approaches that sex workers envisioned and/or developed. We used the term '*necropolitical assemblages*' to describe the interactions and tensions between police, immigration, (public) health and social welfare services (*assemblages*) that led to increasingly unsafe and precarious working and living conditions for sex workers in this context (*necropolitics*). This included police violence and harassment, reports of violence being dismissed, and rights-based, harm reduction services being defunded because they did not align with dominant approaches i.e. treating sex workers as threats to communities rather than as residents who may have unmet health and welfare needs (*necropolitics*). We used the concept of restorative social justice – whereby excluded communities can, with appropriate resources, recognition and representation (40), claim justice and support "in and on their own terms, in the contexts of their lives" rather than through hostile

systems (9, 39) – to analyse how sex workers advocated for and set up peer-led safety and support systems to mitigate against these harms. NUM's violence prevention, reporting and casework can be theorised as examples of this, by: dedicating resources to interventions that respond to sex workers' expressed needs; and by enabling sex workers to screen clients, report violence and receive support on their own terms, in the context of an often harmful police and legal system and sometimes rigid and hostile wider health and welfare services. We focus on health-related *practices* (41, 42) rather than individual behaviours and capabilities (43), to examine how individual and collective actions in response to intervention activities are contingent on multiple social and material factors, systems and power dynamics.

Previous and formative research: results of NIHR-funded study

The value of this proposed research is evident from the findings of our recent NIHR-funded mixed-methods study in East London, which showed extremely high levels of violence from clients, perpetrated towards 73% of sex workers working on street and 36% of those working in-person indoors (flats, saunas, hotels). Across both sectors, 1 in 5 sex workers had experienced violence by police and 40% by others (e.g. local residents, strangers).(3) Few had reported any violence to the police, with reasons including not being taken seriously, as well as fear, or prior experience of, deportation, being mistreated, attacked or arrested by police.(3, 9) Sex workers with less financial security were more likely to experience violence. Since the Covid-19 pandemic sex workers have faced increasing precarity, lacking access to government financial support schemes(10, 44), and more people are starting to sell sex as living costs rapidly increase.(45) Our research provided further evidence of the profound harms of criminalisation and enforcement, particularly for the most marginalised sex workers who already experience the most discrimination and disadvantage. This includes sex workers operating from street-based settings, those who use drugs, migrants, and members of racially- and/or ethnically- minoritised, sexual- and gender-minority communities.(3, 9, 17) This research supported systematic review evidence generated by this team documenting the harms of repressive police enforcement practices for risk of violence and poor sexual and mental health outcomes, across diverse locations and sex work settings internationally.(18) One recommendation arising from this work was the need for realist-informed research on community-led safety and service access initiatives, to provide evidence on effective interventions to improve sex workers' safety and wellbeing as well as understanding how intervention delivery and mechanisms of action are influenced and interact with context. Since then, we have worked with sex-worker led organisations to develop the research questions, design, approach, ethical considerations, and assess the community relevance of the proposed research. We will continue to do so throughout the project (see Design, Work Packages A and E, and PPIE below).

RESEARCH AIMS AND OBJECTIVES AND RESEARCH QUESTIONS

Aim

The aim of the study is to evaluate the implementation, impact, cost and cost-effectiveness of a community-based violence prevention and support service on sex workers' safety, mental health, and access to services. This will involve 5 linked work packages (WP): (A) first dialogue workshops and mapping, including rapid realist review; (B) process evaluation; (C) impact evaluation; (D) economic evaluation; (E) second dialogue workshops and research into action.

Objectives

1. Measure the effect of violence prevention tools (alerts/NUMchecker) on sex workers' safety (including working strategies) and mental health (WP A, C)
2. Explore mechanisms through which violence prevention tools affect sex workers' safety and mental health (WP A B)
3. Explore mechanisms and related contexts through which support for victims of violence (casework) affects sex workers' mental health, access to and experience of services (e.g. health, welfare) (WP A B)
4. Develop and test a theory of change, comprising context-mechanism-outcome configurations, to understand how the interventions (alerts/NUMchecker, reporting, casework) work, for whom, where and under what conditions (WP A-C)
5. Evaluate the acceptability, accessibility, fidelity and equity of the interventions (WP B C)
6. Understand how NUM's engagement with services and police, via casework, affects: a) reporting of violence to NUM; b) uptake of alerts and NUMchecker; c) sex workers' access to services (WP B)

7. Identify priority health and wellbeing outcomes of NUM's violence prevention and support service, from sex workers' perspectives (WP B)
8. Estimate the cost of alerts, NUMchecker and casework support (WP D)
9. Estimate the cost-effectiveness of use of alerts and NUMchecker (vs. no intervention) to prevent an episode of violence and cost per QALY (WP D)
10. Co-produce with sex workers and practitioners the study design, theory of change and recommendations to improve community alerts, reporting and casework, for use by NUM and other services in the UK and elsewhere (WP A, E)

Research Questions**:** a) How, b) to what extent, c) for whom and in what circumstances does a community-based violence prevention and support service affect sex workers' safety, mental health and access to services?

RESEARCH METHODS

Design

We will use a participatory mixed-method, quasi-experimental design informed by realist evaluation principles. Five work packages consist of: (A) first dialogue workshops and mapping, including rapid realist review, to refine study design; (B) qualitative and quantitative process evaluation; (C) quantitative impact evaluation (pre and post cohort study with non-equivalent comparison group); (D) economic evaluation comprising costing of interventions and cost-effectiveness analysis; (E) second dialogue workshops and research into action: translating findings into policy and practice. Traditional experimental designs cannot be used, as it would not be ethical for services to refuse support to sex workers based on randomisation. WPs A & B will inform refinement of our theory of change, development of indicators for the structured questionnaire, analysis and interpretation.

The participatory methodology proposed in this project is framed by the DEPTH (Dialogue, Evidence, Participation and Translation for Health) approach, which uses dialogues with communities and practitioners to co-produce action-oriented health research(46) (See Attachment: Flow Diagram of study design). This approach provides a framework to guide 'public and patient involvement and engagement' (see PPIE section) and collaboration with diverse stakeholders, while retaining academic rigour and quality. The DEPTH approach involves: mapping, to identify key groups and evidence; first dialogue workshops, to co-design the research with key groups (WP A); data generation and preliminary analysis (WPs B-D); second dialogue workshops, to co-create final analysis and ideas for action; and research into action: working together to change policy and practice (WP E). The participatory approach will also involve recruiting a group of community co-researchers and advisors with diverse lived experiences of sex work to join the study team and steering group to co-design, -deliver (data collection, analysis and write-up), -steer and -disseminate the findings and recommendations of the research (see Project Management, and Public Patient Involvement and Engagement).

Study population

Adults (18 years or older) who have sold sex in the last three months (WP C) in the study sites (see below) or who consider themselves current sex workers even if they have not sold sex in the past 3 months (WPs A & B), and who have capacity to consent, will be eligible to participate in the study. For WP C we have limited recruitment into the baseline survey to sex workers who have sold direct sexual services in the last 3 months, reflecting most NUM members who provide direct sexual services (>60%). Restricting recruitment to those who have worked more recently will facilitate recall on experience of violence while still allowing us to measure change between baseline and follow-up. We will measure frequency of engagement in sex work and can conduct sub-group analyses to measure differential effects of the intervention based on this or other changes (e.g. moving from escorting to independent working) to account for some of the fluidity in sex work.

For WP B, we will include adults of all genders who sell sex in any sector (including on and off-street and online) and who do and do not use NUM. We will also include NUM staff and other service providers who work with sex workers in the study sites.

For WP C, we will focus on sex workers working primarily in indoor venues who have sold in-person sexual services and who constitute the majority of NUM's membership (those who work in both street and indoor locations will also be included). NUM report that 77% of their members are off-street independent workers,

while only 6% work exclusively on the street. We will exclude people who are under 18 years, in secure services, lack capacity to consent and who do have not recent experience of selling in-person sexual services.

Addressing inequalities

Sex workers are a highly diverse and marginalised community who experience extreme health inequalities in relation to violence, mental health and access to services (see Background for references). Participatory research seeks to prioritise the lived expertise and concerns of marginalised communities who are often excluded from or less heard in research, policy and practice spaces.(21) Such involvement is critical to redress the absence of sex workers' voices in much sex work policy and research to date. Through this approach, we aim to document and challenge the power imbalances and exclusion that contribute to sex workers' health inequalities. We will ensure diverse representation during the recruitment of our co-researchers and purposively sample for diversity in WP B in relation to gender, sexual and ethnic/racial identity, as well as sector of sex work. Street sex workers experience the highest rates of violence, mental ill-health and precarity and have been strongly impacted by cuts to frontline sex worker health and support services.(3, 9, 10, 47, 48) Yet online workers are also widely underserved by and underrepresented in current research, practice and policy which has tended to focus on more visible forms of sex work. For WP C, which will focus on sex workers operating indoors and online, programmatic data from newly registered NUM members (not using casework) suggest considerable diversity in membership: 60% identify as lesbian, gay or bisexual (LGB); 4% as transgender or non binary, and 22% as racially or ethnically minoritised, which our recruitment strategy will reflect. Our previous research among indoor-based sex workers recruited via social networks also suggests a highly diverse sample, 19% of whom identified as racially/ethnically minoritised (including Asian, Black, Gypsy, Roma, Traveller racial/ethnic identities) and 50% as LGB, with linked inequalities in experiences of violence, mental health and access to services.(9, 17) We were less successful in recruiting transgender and non-binary participants, who made up less than 1% of our survey respondents.(3) We will ensure diversity in our comparison sample by selecting people to initiate recruitment - and, where possible, co-researchers - from these minoritised groups, with a particular focus on gendered minorities.(17) We will also be facilitated by NUM's service and community links with queer, trans and racially- and ethnically-minoritised sex workers. We have a strong track record of engaging diverse and highly marginalised sex workers as research participants and collaborators.(3, 9, 10, 17) The aim of the research is to strengthen the evidence available to policy makers and service providers regarding this population to prevent and address the consequences of violence, ultimately improving health and reducing health and social inequalities.

Outcome measures

The primary outcome for evaluating the impact of violence prevention interventions (alerts and NUMchecker) is self-reported violence in the last 6 months (enacted, threatened or attempted) by clients, other parties at work, police. This is defined as physical, including sexual, and emotional violence. Physical violence encompasses direct attack (being hit, attacked with a weapon or kidnapped) as well as theft, spiking (e.g. drugs put into drink), damage to personal property. Emotional violence includes verbal abuse (being belittled, humiliated, having abusive or insulting language such as racist remarks directed at you), being outed as a sex worker, stalking (online or in person). Sexual violence includes forced sex; touched against one's will, removal of condom, and forced/tricked into providing a sexual service (e.g. unprotected sex) without consent or payment. These indicators will be refined through WPs A & B and in discussion with the steering group, to reflect the study population's experiences and minimise distress to participants. All measures of violence will draw on indicators used in our own and others research across diverse settings and populations and will facilitate comparability.(3, 7, 17, 24, 34, 47, 49-51)

Secondary outcomes include intermediate outcomes such as fear of violence, adapted working strategies (cancellation and/or avoidance of clients; client screening, working with others, use of CCTV/security); awareness of reporting systems/support services, contact with services (sex worker specific/mental health/housing, drug treatment, welfare services). Longer-term outcomes include mental health - depression and anxiety and self-rated health measures (e.g. PHQ4, EQ5D-5L) that have been well validated in UK primary care and among sex workers and homeless populations including by our team.(3, 52, 53)

Study sites

The research will be conducted in cities which have the highest NUM membership and/or where NUM has a physical presence or works closely with other sex worker support services. NUM have approximately 2100 sex worker members in London, 643 in the Northwest and 484 in Scotland. Provisional sites of Glasgow, London and Manchester have been selected based on: i) the extent of sex work in these urban areas to facilitate recruitment among NUM members and comparison groups, and minimising cross-over; ii) numbers of NUM members; iii) access to NUM facilities or partner organisations to support the research; and iv) existence of established network of practitioner and Inclusion Health groups for referrals.

NUM has over 1,200 practitioner members throughout the UK. Sex worker-led groups such as the English Collective of Prostitutes (London), Sex worker Advocacy and resistance movement (London), Sex worker breakfasts (London), SWAI (Ireland), UglyMugs.ie (Ireland), Decrim Now (London), ScotPEP (Edinburgh/Glasgow) are close partners in advocacy and casework support. NUM also works with specialist sex worker-serving organisations, such as Basis Yorkshire and POW Nottingham to standardise caseork, drop-in support and outreach services. NUM collaborates with other organisations that have less frequent contact with sex workers such as sexual assault referral centres, mental health services, racial justice groups, shelters, and homelessness organisations, to provide referral pathways on a case-by-case basis. Other potential sites could include Leeds and Nottingham. Study sites will be finalised in dialogue with sex workers and other stakeholders during WP A.

DELIVERY PLAN

WORK PACKAGE A: Dialogues and mapping, including realist evidence review

(Objectives 1-4, 10) (Leads: LP, PG, CB)

Working with sex workers, sex worker-led organisations, NUM and other support services, we will identify key groups, organisations and individuals to participate in ‘first dialogues’ (46) to refine the study design. Dialogues will include small group workshops facilitated by the (co-)researchers, in which the team present and seek community and practitioner input on the proposed research questions, data collection methods, study sites, and theory of change/logic model that guides the intervention and its evaluation. Dialogues will also include other informal, ad hoc discussions with key groups.

We will identify diverse key stakeholders (including sex-worker-led organisations, health and social/welfare services that do and do not advocate for the same policies as NUM/research team members) to participate in these dialogues. NUM has extensive experience of engaging practitioners from varied sectors across the sex-work policy spectrum through workshops, sharing resources and partnering on ending violence initiatives.

We will also conduct a rapid review of existing evidence on violence prevention and support interventions for and by sex workers. We will document interventions, their mechanisms and outcomes, and how they interact with contexts, using realist theory principles.(54) Research questions will be refined through dialogues sessions oriented around: a) What is the evidence for violence prevention/ support interventions relating to what health and social determinants?; b) What are the mechanisms or pathways through which interventions influence outcomes relating to health, social determinants and service access?; and c) How do contexts such as finances/precarity, working location, and sex work policies interact with these mechanisms to affect violence, health and service access for sex workers? We will include any programme or intervention aimed at sex workers (delivered formally by a service or informally among peers) which aims to prevent violence and/or support victims of violence, in any setting (e.g. outreach, community settings, specialist or mainstream health or social care services), in any country.

We will pay attention to different aspects of context, including in relation to adverse childhood experience, past trauma, and domestic violence, while remaining careful not to reinforce stereotypes about sex workers and routes into sex work. We will map prevention/support services in relation to violence from all parties (including domestic/family violence), to ensure that we can accurately measure the range of services used by sex workers and explore any moderating effect in WP C.

We will conduct this review in parallel with WPs B and C (see Timetable). Lengthy research and peer review processes mean that there is often a time lag between current conditions experienced by sex workers and those discussed in the relevant literature. For example, we know from our community networks that living in an increasingly cashless society has changed the nature of theft against sex workers but this has yet to be evidenced in the academic literature. Our iterative process of dialogues, interviews and focus groups with sex workers alongside the rapid realist review will provide a more nuanced understanding of the current context in which sex workers experience the interventions.

Search strategy

We will conduct a comprehensive search of peer-reviewed and 'grey' literature reporting on research studies and/or intervention delivery. We will search MEDLINE, Scopus, Global Health, Web of Science, EMBASE, Psych INFO, CINAHL and Cochrane Library. We will search grey literature databases (e.g. PsychExtra and OpenGrey, Google/Scholar) and contact key organisations working with sex workers (e.g. Global Network of Sex Work Projects, Sex Workers Advocacy and Resistance Movement, European Sex Worker Alliance, Harm Reduction International, UNAIDS, WHO) for reports and suggestions of other organisations and resources to consult. Our search will be conducted using the following key words and MeSH terms. A provisional run of this strategy in Medline identified 1771 papers (with no time limits):

1. (sex work* OR prostitute* OR street walker* OR escort* OR rent boy* OR sell sex OR sold sex OR selling sex OR exchanged sex OR exchange sex OR exchanged sex OR sex trade OR commercial sex OR sex industry OR bar hostess OR red light district)

AND

2. (prevent* OR intervention OR service OR survivor support OR victim support OR peer support OR peer network OR peer-led OR community-led OR community)

AND

3. (violen* OR rape OR assault* OR attack* OR intimate partner violence OR domestic violence OR abus* OR harras* OR intimidat* OR theft OR robbery OR fraud OR stalk* OR spiked* OR dox*)

MeSH TERMS:
1.Sex work/ or Sex workers/
2. Primary prevention
3. Workplace Violence/ or Exposure to Violence/ or Intimate Partner Violence/ or Domestic Violence/ or Ethnic Violence/ or Gender-Based Violence/ or Violence/

Inclusion criteria: Articles will report on an intervention or project which: (i) aims to prevent violence against sex workers or provide victims of violence with mental health, welfare and/or other support, and (ii) reports primary data about experiences of receiving and delivering the intervention. We will include qualitative and quantitative studies (intervention and observational), peer-reviewed and grey literature.

Exclusion criteria: Editorials and commentaries, no intervention, no primary data reported, conference posters and abstracts.

Control/comparator group: Studies would not need to include a control or comparison group, but examples of comparisons would be sex workers who do not receive the intervention.

Strategy for reviewing literature

Two members of the research team will review each title and abstract to decide if they meet the inclusion criteria, with disagreements resolved through discussion. Full texts of studies that meet the inclusion criteria will be reviewed. We will develop an extraction/synthesis table including information on: study design; sample size; demographic characteristics; key results (separated by qualitative and quantitative data); limitations; contextual factors accounted for and using what approach.

We will evaluate work according to relevance and rigour guided by Critical Appraisal Skills Programme (https://casp-uk.net/) but we will not conduct a formal quality assessment given that this is not a systematic review and the aim of the review is develop key CMOCs. We will code the literature according to population, study methods, key emerging themes, mechanisms, contexts and outcomes. We will use a narrative approach to data synthesis, developing thematic summaries of the evidence around a realist framework, to identify key CMOCs. We will use this to refine our theory of change for how violence prevention and support interventions may lead to reduced violence, improved mental health and other

health and social welfare outcomes. We will iterate between the findings of this review and dialogues with communities, paying particular attention to what works, for whom, under what circumstances.(54). This will help us to further refine the synthesis and assess its relevance to our existing theory of change.

WORK PACKAGE B: Process Evaluation

(Objectives 2-7) (Lead PG, RS)

Qualitative sampling and sample size

We will conduct up to 60 semi-structured interviews and up to 6 focus groups with: sex workers who do and do not use NUM services (reporting, casework, alerts, NUMchecker); NUM staff; and other key stakeholders (e.g. service providers, police). At least two-thirds of interviews/focus groups will be with sex workers, sampled purposively for maximum diversity regarding: gender- (inclusive of cis and trans women, men and non-binary people), sexual- and racial/ethnic identities; migration status; sex work sectors (e.g. online, indoor venues, street); NUM membership (e.g. new, long-term, former, never); and, for current/previous NUM members, experiences of different aspects of the intervention. Sampling for diversity in socio-demographics and work sectors and recruiting via multiple routes (e.g. services, community networks, direct outreach) is likely to achieve diversity in respect to how people frame their involvement in sex industries (e.g. the varying extent to which they consider it sex work and/or exploitative labour across their working life). However, if there is under-representation of differing perspectives on this topic in initial interviews, we will sample further to encompass this. We will purposively recruit NUM frontline and management staff involved in developing and delivering different aspects of the intervention - i.e. reporting, casework, alerts and NUMchecker – including racially-minoritised staff with active and former experience in sex industries (i.e. to reflect aspects of 'peer' service delivery). We will also recruit representatives from sex worker organisations and services that work with sex workers, sampling for diversity in: sector (e.g. specialist/mainstream; mental health/welfare/violence prevention; police/legal system; council/third sector); role type (e.g. frontline, managerial) and experience; engagement with NUM; and approach/policies relating to working with sex workers (e.g. harm reduction/exiting). The final number of interviews will balance theoretical considerations - continuing data collection until no new themes arise i.e. 'theoretical saturation' - and recruitment opportunities. This approach will help us to explore CMOCs including and beyond those outlined in our initial theory of change.

We will advertise the study to NUM members via NUM's channels for communicating with members about research (e.g. social media). We will recruit sex workers who are non-members through a range of approaches to be refined with the co-research team, steering group and in first dialogue workshops. These are likely to include the (co-)research team's networks, collaborating sex worker and other organisations in the study sites (e.g. those working with queer and trans communities), and direct outreach (e.g. on online sex worker forums that accept research advertisements, visiting sex work areas/venues where the team has existing links and where it is considered appropriate and acceptable for (co-)researchers to be present).

Qualitative data collection methods

We will conduct a realist qualitative process evaluation to refine our theory of change and CMOCs.(54) We will use semi-structured individual interviews, focus groups and ethnographic observations to collect qualitative data on observed and reported processes of intervention implementation/delivery and receipt, and their consequences for NUM service users and service providers.(26) We will also explore the intervention's acceptability, accessibility and fidelity (the extent to which it was implemented as intended), from the perspectives of service users and providers. We will explore sex workers' and services providers' views on our working theory of change and CMOCs directly, via focus groups.

In interviews and focus groups with NUM service users and providers, we will ask participants about their experiences of receiving/delivering the intervention (casework, reporting violence, receiving alerts and using NUMchecker), how their actions were influenced/triggered by the intervention resources and activities; the meanings and goals they attributed to these actions; conditions within which they experienced the intervention; and the consequences of these experiences, intended and unintended, beneficial and harmful. In focus groups, we will ask participants directly about how they believe the interventions work, including but extending beyond their views on our working theory of change and CMOCs, allowing us to explore aspects of consensus and divergence among service users and providers. We will ask participants about how the intervention(s) have worked, or may work, differently for different communities of sex

workers, in different locations and times, and to compare experiences before and after interacting with these interventions. In interviews with sex workers who do not currently use NUM, we will explore their experiences of reporting violence, barriers to reporting, who they report to/share information with now, receiving/providing violence- and mental health-related support, and any prior experiences and perspectives of NUM. Interviews will allow us to explore varied individual, personal/sensitive accounts and experiences in-depth, including topics that some participants may not want to discuss in focus groups (such as distressing or traumatic events). Focus groups will allow us to identify shared and divergent mechanisms, contexts and outcomes among groups of participants.

We will also conduct up to 10 ethnographic observations of relevant meetings at NUM and in other services/community spaces (e.g. among NUM staff, NUM engaging with services/police), to deepen our understanding of the policy, practice and organisational contexts in which the intervention is implemented, and related mechanisms that the intervention triggers. We will not observe appointments between NUM staff, service users and referring services given the sensitive and confidential nature of these encounters. The final number of observations will depend upon opportunities (e.g. meetings scheduled and participants agreeing to our presence) and richness of data generated (i.e. we will not continue observations of NUM staff meetings when this no longer generates new insights to understand the intervention context).

Qualitative data analysis methods

We will analyse qualitative data using an inductive approach that draws on grounded theory.(55) This will move beyond a thematic approach to explore how the intervention operates in relation to its broad *context* (e.g. social, political, legal, economic), local *conditions* (that support, hinder or shape relation actions), *processes/mechanisms* (actions/interactions resulting from the intervention), *consequences* and *outcomes*.(56) We will audio-record and transcribe verbatim interviews and focus groups and write detailed fieldnotes from observations. We will analyse transcripts and fieldnotes to identify and refine codes and sub-codes, aided by NVivo qualitative analysis software. We will compare emerging codes within and between accounts, data sources and coders (researchers coding data), moving from descriptive accounts to cross-cutting conceptually-driven categories, similar to methods of constant comparison similar to grounded theory. Our coding framework will prioritise identifying CMOCs that emerge from participants' accounts, before comparing these with our proposed theory of change to refine and expand our theorisation of how the intervention operates.

We will pay close attention to the mechanisms that intervention activities trigger, and their interactions with broad contexts and specific conditions (e.g. sex work policies, policing, funding, stigma, working environments/conditions, precarity, technology access, language, being connected with other sex workers) and intersecting inequities (e.g. in relation to sex work sector, race/ethnicity, class, migration status, gender/sexual identity, disability). This will allow us to explore how the interventions achieve intended and unintended outcomes, for whom and under which conditions. We will use restorative social justice theory (39) to frame analyses of intervention acceptability and accessibility, specifically sex workers' and service providers' views on the extent to which the distribution and implementation of intervention resources (financial and otherwise) recognises, represents and responds to the diverse lives and needs of sex workers on their own terms. This qualitative analysis will offer a thick descriptive account and this will then be drawn on to refine the CMOCs. While the qualitative research provides an in-depth account of mechanisms as they are perceived by various actors, it only offers a partial view of causality, hence the need to test emerging CMOCs with quantitative data.

Co-researchers with lived experience of using NUM services and of sex work will contribute to this analysis process. We will also seek wider community input on the emerging findings and co-producing linked recommendations through the second dialogue workshops (see WP E and PPIE section).

Quantitative data collection and analysis

NUM collects extensive programmatic data on all members including on: geographical location, sex work type (in-person services indoors; online and on street , work location (home, hotel, managed venue), sexual identity, gender, age, type of violent incident reported. Together with information on intervention activities delivered (e.g. number of alerts produced and sent out), these data will be analysed descriptively to assess the fidelity of the intervention (the extent to which it is delivering what it set out to do); intensity in which prevention tools are used and by which population; and reach (what proportion of the population are in contact with the intervention**,** and paying particular attention to sub-populations**).**

WORK PACKAGE C: Impact evaluation

(Objectives 1, 4, 5) (Lead LP, CB, RS)

Data collection, exposure and moderator variables

We will conduct a pre and post cohort study with non-equivalent control group with baseline survey (month 8) and follow-up (month 18) using structured questionnaires administered by co-researchers on tablets, or self-completed online/on tablets. We will use Open Data Kit (ODK) collect software. Contact information will be collected to enable follow up after 6 months. Structured questionnaires will include demographic information, primary and secondary outcomes (see above) and intervention exposure, confounders and moderator variables.

Intervention exposure will be defined as: 1) any receipt of NUM alerts; and/or 2) use of the NUMchecker to screen clients during a 6-month period and/or 3) reporting violence to NUM. Other measures of intervention exposure and contact will be refined through the mapping and first dialogues (WP A). We will measure exposure to the different intervention components, including frequency and intensity of engagement. We will measure intervention process informed by CMOCs developed in WP A & B. One indicator of mechanism is whether screening clients through NUMchecker results in changes to working strategy (e.g. individual and venue-level client screening and refusal).

Confounders and moderator variables which are associated with use of alerts, NUMchecker or reporting of incidents and our outcome (violence) will include structural factors (e.g. unstable housing, police enforcement, stigma and discrimination, migration status, language, technology access), community and work environment factors (e.g. sex work sector such as home, hotel or managed venues; duration and frequency of sex work; safety strategies such as CCTV cameras, security, working with others, contact with sex worker organisations/services) and individual characteristics (e.g. drug use, gender, racial/ethnic, sexual and gender identity). All indicators will be drawn from our own and others research with sex workers and people who use drugs, refined and added to through WP A. (2, 3, 9, 44, 52, 57) We will draw on validated tools such as AUDIT and ASSIST to measure alcohol and other drug use and tools validated among sex worker populations to measure internalised or anticipated stigma.(58)

Recruitment, Assessment and Follow-up

For the pre and post-intervention cohort study, we will recruit sex workers who do and do not receive NUM alerts and/or use NUMchecker at baseline.(59) We will recruit 175 sex workers newly enrolled into NUM, via NUM and other services, and 325 sex workers not enrolled in NUM, via respondent driven sampling (RDS).(60) RDS is a network recruitment method that accounts for the lack of sampling frame of hidden and/or criminalised populations by adjusting for the probability of selection through the recording of social network sizes. Information about the social network of persons recruited into an RDS survey are used to determine the probability of each recruits' selection and to mitigate the biases associated with over or under sampling certain groups. It is inspired by the insight of 'small world theory' that suggests that every person is indirectly associated with every other person through approximately six intermediaries and in a defined population could potentially be reached through several waves of recruitment in a chain-referral sample.(61, 62) Sampling begins with several initial recruits, selected non-randomly to reflect diversity of the population and influence with their peers (technically called seeds). Initial recruits will be identified through collaborating sex worker organisations/networks and through co-researchers in each site, focussing on organisations and co-researchers who are not NUM members Initial recruits participate in the study and receive up to three coupons which they use to recruit their peers. The coupons have unique numbers on them to manage who recruits whom. Recruited participants present coupons to participate in the study. Data are collected on the size of participants' social networks (how many people they know who sell sex who are not members of NUM). This, combined with linked coupon data on the relationship between recruiter and recruited, enables an estimation of selection probabilities and the adjustment for non-random recruitment. Recruits are given a reimbursement for participation in the study and for each person they recruit who enrols into the study. We will recruit both intervention (NUM members) and comparison group (non-NUM members) from the same cities to maximise comparability in terms of key potential confounders (e.g. unstable housing, police enforcement, language, technology access, service availability). We have provisionally selected the cities of Glasgow, London and Manchester as recruitment sites where NUM have a large number of sex worker members (to be confirmed during the dialogue workshops in WP A). We are confident that we will be able to recruit participants into our comparison

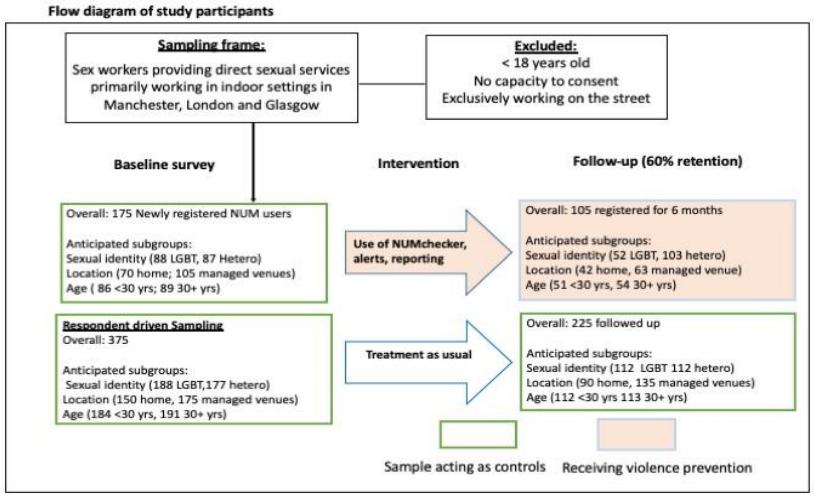
sample who do not engage in NUM for the duration of the study for the following reasons. Firstly, while NUM has substantial membership in these cities, it only represents a small proportion of the sex worker population, we estimate <5%. Secondly, to assemble our comparison group we will select initial recruits into our respondent driving sampling from adult services websites to identify customer wo are non-NUM members (e.g. adultworks or Vivastreet), or via sex worker communities or networks that do not engage with NUM. These approaches will be refined during our first community dialogues (WP A). Thirdly, while we cannot prevent participants in our comparison sample from using NUM services during follow-up we will monitor exposure at follow-up and exclude participants who have subsequently used NUMchecker, alerts or made reports to NUM.

Recruitment will be conducted over a 5-month period, which equates to 9 people a week who are newly enrolled into NUM and 16 people a week not engaged in NUM. A review of NUM's programme data indicates an average of 12 new members enrolling per week, with plans to triple membership over the next two years. The generation of a comparison population using RDS will enable us to make inferences on the impact of the intervention among a diverse sample, including those not in contact with the service. Previous research has also shown RDS to be an efficient and fast method of recruitment.(63) Our own prior research has demonstrated the feasibility of recruiting indoor-based sex workers via social networks and through social media platforms.(3) While we have not applied RDS to this population in this setting previously, and acknowledge its limitations among populations who are not well networked in other countries, prior PPIE work to inform the proposal development suggest this is feasible and appropriate.(63, 64)

We anticipate that up to 40% of participants may be lost to follow-up at time 2. This is a conservative estimate based on our previous longitudinal research with sex workers in London, of whom 80% were recruited independently of services and 45% were vulnerable with high levels of drug use and homelessness, making follow-up difficult. Among the sample recruited through services, follow-up was higher (75%). Experience of longitudinal data collection used in Vancouver and Baltimore that draws on similar models of follow-up as we propose (via service and co-researchers) report higher levels of follow up of between 89% at 6 months and 75% at 12 months.(34, 65) (see Figure Flow of study participants) Approaches for maintaining follow-up with participants to maximise retention will be further refined through dialogues.

Sample size justification

A sample size of 342 (89 NUM, 253 comparison) is sufficient to compare proportional differences in violence at 90% power with significance of p=0.05. We assume that overall 36% will have experienced violence at baseline and that there will be a 20% reduction in violence (47% to 27%) between intervention and comparison (Hypothesis 1) substantiating evidence that screening and refusing clients is associated with reduced client violence among indoor-based clients.(3) Our prior research suggested that 35% of indoor-based sex workers had an elevated PHQ-4 score indicative of symptoms of anxiety and depression and there was a 18% difference between those engaging in safety strategies and those who do not.(3) A sample of 330 (86 NUM 244 comparison) is sufficient to observe an 18% reduction in symptoms of anxiety and depression between intervention and comparison groups at 80% power with significance of p=0.05. (Hypothesis 3) Based on previous research we estimate that only 14% will have reported violence to the police and that there will be a 10% increase in reporting to police and 20% difference in reporting to support services between intervention and comparison samples, substantiating previous evidence.(3, 66) A sample of 189 (49 NUM and 140 comparison) is sufficient to observe increased reporting from 14% to 24% to police or other services. (Hypothesis 3). We include an inflated sample of 325 in



our comparison group to allow for assessment of populations missed by the intervention specifically. Increased samples in both intervention and comparison groups accounts for a 60% retention rate between baseline and follow-up.

Hypotheses to be tested

Based on this evidence and in collaboration with our community collaborators, we have identified 6 hypotheses. Other hypotheses will be developed through WPs A&B. Hypotheses 1-4 focus on overall effect sizes across our population. While we are unable to conduct mediation analysis without an intermediate follow-up measure, we will conduct exploratory analysis on potential mediating effects by adjusting for intermediate outcomes (e.g. increased awareness of clients, change in working strategies; avoidance of clients; working with others) on violence outcomes (Hypothesis 5) based on our CMOCs. Our working CMOCs illustrate how some contexts and mechanisms will change these intermediate outcomes, but when combined may lead to endline or longer-term outcomes. As experience of violence and likely access to the interventions (see Theory of Change) differ within sex-working populations, we will examine differential effects of the intervention among sub-groups (younger age group, those working independently, sexual minorities, migrants, those experiencing financial difficulties) (Hypothesis 6). Our sample size will enable us to examine the extent to which the intervention effects are moderated by these factors, assuming 50% of the sample identify as LGB; 40% of the sample work at home vs 60% in managed venues; 40% are not UK nationals, 49% of the sample are aged between 18 to 30 years, and 50% are in arrears (see Figure Flow of participants). Assumptions are based on characteristics of NUM members and our previous research.(3) If we are sufficiently powered, we will also look at how other aspects of context (e.g. by city, for those working from street-based setting or managed venues or independently) or characteristics/experiences of populations (e.g racially and/or ethnically minoritised communities, gender minorities, drug use) modify intervention effects, but the study is not explicitly powered to do this. We will test the following hypotheses:

1. There will be a 20% reduction in reports of violence between participants engaging with NUMchecker/alerts/reporting and those not engaging
2. Increased exposure to NUMchecker/alerts/reporting will be associated with greater reduction in violence
3. There will be a 20%* reduction in the median score of symptoms of anxiety and depression between participants engaging with NUMchecker/alerts/reporting and those not engaging
4. There will be a 10% increase in reports of violence to the police or other services between NUM members and non-NUM members
5. Violence prevention tools increase awareness of dangerous clients to reduce violence against sex workers
6. Intervention effects on violence will be moderated by participants' sexual identity, age, location of sex work, experience of debt, or racial/ethnic identity
7.

*This estimate is based on our previous research, which suggested an 18% difference in symptoms of anxiety and depression (PHQ4 score) between those who engage in multiple safety strategies (e.g., screening clients, checking profiles) and those who do not. This evidence, alongside the overall high level of anxiety and depression in the population, suggests that this is not overly ambitious. We will revisit this during WP A with a view to adjusting both the measures used to assess mental health as well as the expected change.

Statistical analyses

Step 1: First we will describe the demographic characteristics, working conditions and other potential confounders (unstable housing, experience of enforcement, language, technology access, service availability) for participants stratified by exposure group at baseline and follow-up. We will consider excluding participants from analyses if there is extreme imbalance across groups. We will exclude participants in our comparison sample (non-NUM members) who report using NUMchecker, alerts or reporting during the follow-up period.

Step 2: Second, we will identify potential confounders by comparing baseline characteristics by exposure groups (NUM members vs non-members), calculating standardized effect sizes for continuous variables and for dummy-coded categorial variables. The measures with the largest effect sizes will be considered for inclusion in a propensity score model.

Step 3: Third, we will conduct analyses of primary and secondary outcomes using regression models to estimate the relative risk of the outcome occurrence over 6 months for users of NUM intervention vs non-users, and the corresponding 95% confidence intervals. Appropriate statistical models will be selected (Poisson regression or logistic regression) depending on how the primary and secondary outcomes are coded and structured. The regression models will account for imbalance in baseline characteristics using propensity scores. Work sector, duration of sex work, age, drug use will be included a priori in the propensity score models, along with any variables with evidence of imbalance in step 2 above. Primary analysis will use an adjusted individual-level intention-to-treat approach, categorising all NUM members enrolled at baseline into the intervention group irrespective of their use of NUMcheck/alerts and reporting at follow-up (Hypotheses 1,3-5). The model will include fixed effects for time and intervention exposure and we will explore the appropriateness of including a random effect to account for heterogeneity of participants within cities or a fixed effect to account for heterogeneity across cities. We will explore the need to adjust for clustering within cities using intra-class correlation coefficients.

After creating a propensity score model and calculating treatment probabilities, step 2 will be repeated using inverse probability of treatment weights (IPTW) and rechecked for imbalance. The propensity score model will be revised (e.g. by adding quadratic and interaction terms) until satisfactory balance has been achieved.

Step 4: Fourthly, we will examine evidence of a dose-response relationship between intensity of exposure to NUMchecker/alerts/reporting and primary outcomes using regression models and categorising exposure as a continuous or categorical (1, 2-3, 4-5 6+) variable depending on the distribution of contacts (Hypothesis 2).

Finally, we will conduct exploratory analyses to assess the extent to which individuals' characteristics such as sexual identity, younger age, or context (e.g. city, type of sex work venue, financial status) moderates intervention effects on violence or avoidance of clients through sub-group analyses (Hypothesis 6).

WORK PACKAGE D: Health economic evaluation

(Objectives 8 & 9) (Lead STR)

We will collect primary data on the unit costs of the intervention from the provider perspective. We will estimate costs for: i) the system for alerts; ii) system for reporting violence; iii) tool to screen potentially dangerous clients; iv) and the casework support service, as well as costs of ancillary services and overheads. We will estimate recurrent costs of delivering the intervention as well as start-up costs, such as intervention design and adaptation. Provider cost data will be collected using a mix of top-down and bottom-up approaches to measuring resource use and will reflect real-world implementation of the intervention.

To understand 'value for money', we will perform an economic evaluation of the intervention as compared with a scenario where there is no intervention (a 'do-nothing' scenario). We will carry out a cost-effectiveness analysis (CEA) expressed in terms of the additional cost per case of violence averted and cost per quality-adjusted life year (QALY) gained (using the EQ-5D measure). An inventory of secondary social impact outcomes will also be compiled and presented alongside costs (i.e. cost-consequence analysis), including indicators on fear of violence, awareness of reporting systems/support services and internalised or anticipated stigma. Given that the intervention is likely to be relatively inexpensive to implement, and the difficulty of linking outcomes such as violence future health events, we will restrict the analysis time horizon to the study period; no decision modelling is planned. Appropriate deterministic and probabilistic sensitivity analysis will be undertaken to characterise and measure the effect of different parameters on cost and cost-effectiveness.

WORK PACKAGE E: Second dialogues & research into action

(Objective 10) (Lead: PG, LP, RS, RB)

Mixed-methods analysis

We will synthesise the results of the mapping, process and impact evaluation (WPs A-C) to refine and expand our theory of change and related CMOCs. This will allow us to combine 'thick' qualitative

descriptions - that acknowledge that intervention causal pathways are likely to be complex and contingent upon multiple interactions and contexts – with quantitative evidence of regularities of mechanisms and how these are moderated depending on macro-structural, community/work-environment and individual factors. (26) Where qualitatively hypothesized CMOCs are not supported by the quantitative data/results, we will interrogate these divergences, including via dialogue workshops (WP E) to consider: how well the quantitative measures have been able to capture CMOCs (some will not be amenable to quantitative testing because we lack the right measures and/or enough power in terms of participants in relevant subgroups); and how fully the qualitative research has been able to identify the complex mechanisms, contexts and outcomes involved.(26)

Dialogue workshops

During 'second dialogue' workshops, members of the (co-)research team will present emerging findings from WPs A-D, and seek input from sex workers, NUM and other services on our analysis and interpretation, including our theory of change and CMOCs. We will use these discussions to generate ideas for actions and outputs. We will invite a diverse group of sex workers, including research participants and others, those who do and do not use NUM, to participate. We will also invite key decision makers and practitioners who work with sex workers and/or in violence prevention/ support and Inclusion Health, in the UK and internationally, building on NUM and collaborating sex worker-led organisations' links. These workshops will generate vital dialogue between sex workers, practitioners and policy makers, and will help to engage those in a position to take forward the findings and recommendations into policy and practice. We will also use the first and second dialogue workshops to establish the most appropriate formats, content and target audiences of project outputs and to ensure that these are inclusive and widely accessible to sex workers who do and do not use NUM and to services who work with them. The (co-)research team will work with community advisors and collaborators to ensure that dialogue workshops and the end-of-project dissemination event (see below) are held in locations, formats and at times that are acceptable to and inclusive of diverse communities of sex workers. This will allow for diverse community involvement in co-producing the recommendations, alongside the more central involvement of community (co-)researchers and advisors in designing, conducting and steering the research (see Public Patient Involvement and Engagement).

Smaller, focused dialogues – including via regular meetings between the (co-) research team, collaborators and steering-group members during data collection and preliminary analysis – will help to ensure that emerging findings can influence policy and practice at NUM in a timely manner. Towards the end of the project, we will hold a roundtable to support NUM to incorporate study recommendations - particularly around feasibility, reach, acceptability and equity of impact - into its organisational strategic plan, to guide and refine intervention activities, their implementation and related fundraising.

Outputs

Outputs will include:

- An end-of-project, hybrid (online and in-person) dissemination event aimed at sex workers, public health and other practitioners (e.g. health and social/welfare services, police) and policy makers who work with sex workers and/or in violence prevention/support and Inclusion Health, in the UK and internationally. This will comprise brief presentation of the main key findings and recommendations, followed by a panel/Q&A discussion (with research team, collaborator, community and practitioner input) and/or facilitated smaller group discussions (depending on audience size and membership) to reflect together on the research findings and develop an action plan for taking forward the recommendations into policy and practice.
- At least two conference presentations (one national and one international) and four open-access journal articles, reporting the main findings and recommendations of WPs A-D respectively, including implications for translating the intervention to other contexts. These will be aimed at public health, social science and community researchers, practitioners and advocates in the fields of sex work studies, violence prevention and support, Inclusion Health, realist and health economic evaluation, and participation/co-production.
- A best-practice guidance document summarising the practice-relevant findings and recommendations of the research to improve community alerts, reporting and casework, in relation to violence prevention and support for and by sex workers in the UK and internationally. This will be aimed at NUM and other services delivering violence prevention and support for and by sex

workers, as well as referral services/agencies that work with sex workers, such as specialist and mainstream sexual and reproductive health, mental health and welfare/social services and police.

- A policy brief, summarising: the main policy-relevant findings and recommendations of the research, focusing on cross-sectoral policy and funding required to enable violence prevention, support and mental healthcare for, with and by sex workers. This will be aimed at national and local policy makers, statutory and third-sector funders/commissioners in public health, social care/welfare and police, health inequalities (e.g. Inclusion Health teams), violence prevention, support, mental healthcare provision and sex work policy/policing (e.g. local councils, ministers, National Police Chiefs' Council).

We will also work with our communications teams and steering group to develop outputs for a broader audience. Other formats are likely to include social media (e.g. YouTube videos, blogs). NUM have two e-learning modules for police and NUM members, within which key findings will be integrated. At least one of the conferences at which we present will be practice-oriented, attended by sex workers and service providers (e.g. International Harm Reduction Conference). We will present at community forums, meetings attended by those whose work affects sex workers' safety (e.g. National Police Chief Council Conference) and to Public Health/Local Authority practitioners and commissioners. We will draw on NUM's contacts with MPs and the Home Office to target national policy makers.

All outputs will be made freely available via a dedicated research project website and promoted via the (co-)research team and collaborators' (NUM and sex worker-led organisations') social media accounts (e.g. Twitter) and networks (e.g. collaborators' membership, the Sex Work Research Hub). They will also be sent directly to key practitioners and policy makers who work with sex workers and/or in violence prevention/support and Inclusion Health, in the UK and internationally, including but not limited to those participating in second dialogue workshops. The research team and collaborators will work closely with institutional Press Offices to generate maximum coverage of key publications (e.g. via press releases and institutional social media accounts). We will provide intermittent updates on progress on a dedicated study website, via social media and collaborating organisations (e.g. via social media and printouts if needed). We will seek guidance from our co-research team, steering group and in dialogue workshops on other potential mechanisms to update participants on study progress to maximise acceptability, accessibility and feasibility. At the time of data collection, we will let study participants know where and how they can access all project updates and outputs.

Impact, scalability, translation and possible barriers for further work

The primary intended impact of this research is to benefit sex workers' safety, health and wellbeing, in and beyond the UK, by way of making recommendations to improve the quality, accessibility, acceptability, feasibility and equity of impact of NUM and other violence prevention and support services, and wider health and welfare, for this community. The research will also have impact for staff working in NUM and other violence prevention and support services, NHS and other health and welfare services, by providing recommendations and best-practice guidance on how to deliver such interventions and wider violence prevention and mental health support to sex workers.

Possible challenges for getting the research recommendations implemented relate to institutional readiness and capacity, and the wider policy and funding environment. This proposal was initiated by RB, the organisation's CEO, out of a concern to critically evaluate the organisation's work and adapt accordingly to best serve the growing, dynamic community of sex Fworkers in the UK and NUM staff were engaged in the development of the study design. We have established mechanisms to feed study findings and recommendations into NUM policy and practice throughout the lifecycle of the project, as described above. These structured, costed and diverse opportunities for NUM staff members' involvement and engagement in the research will help to maximise institutional readiness and capacity to take up and implement the recommendations. Other barriers include resistance among wider health and welfare services, policy makers and funders to take up findings to inform policy and practice. The prevailing policy and funding environment is increasingly hostile towards sex worker services as we have seen with widespread closure of specialist sex worker services and emphasis on services that encourage 'exiting' of sex work.(9, 67) NUM also report difficulties in identifying sex worker-friendly services to refer their clients to, restricting casework, as well as the number of services reporting to NUM and promoting NUM to sex workers. This is compounded by hostility and violence towards sex workers from police and refusal to treat sex workers as victims of crime. These barriers are largely outside of NUM's control, but NUM and collaborating services

are experienced in advocating for policies and institutional practices that respect sex workers' rights, needs and wishes.

We will engage key policy makers and practitioners in the research (WPs A, B and E) to increase their 'buy in' to the research from the outset. We will maintain dialogues when circulating outputs and engaging in policy consultations, as we continue to do as a result of our most recent NIHR-funded study. Findings from our previous research show clear and widespread abuses of police powers and we recommended extensive changes to policing practices and sex work policies as a result.(3, 9, 17) Nonetheless the team maintained constructive dialogue with the police, delivering invited presentations at the National Chief Police Councils conference and advising on revised guidelines on how police approach sex work.

PROJECT MANAGEMENT

We have costed for 20% FTE for a project administrator who will work closely with the co-PIs to oversee the day to day financial and administrative management of the project. The project administrator will be responsible for the management of the project budget and ensuring all procedures are in line with LSHTM and funder regulations, liaising with the School's Research Operations Office and finance office. Together with the PIs (LP, PG) they will track project progress and report against key milestones, targets and deliverable dates to the steering group, collaborators and the funder. Research team meetings with the research fellows (RFs), PPIE co-leads, co-PIs and core CIs will be held weekly or fortnightly, as appropriate. They will provide line management support to the RFs and an opportunity to critically appraise the evidence as it emerges, iterate between the findings of the study work packages, and shape the direction of the study.

The research will be guided by a steering group, including community, practitioner and academic members, that will meet 4 times during the project, chaired by an independent academic. They will oversee the conduct, governance and delivery of the project. They will consist of senior academics with evaluation expertise, sex workers and sex work service providers and those working in related fields (violence prevention, mental health, social welfare). We will select steering group members who value the diverse lived expertise of people who sell sex, as well as having their own expertise in the research topic. The chair of the steering group will be experienced in the different perspectives on sex industries and ensuring that these voices are heard in practitioner and research spaces.

ETHICS

We will obtain ethical and R&D approvals from LSHTM Ethics Committee and local governance bodies. We will reimburse sex workers for their time in line with previous research, community guidance and factoring in increased living costs. This includes £50 for participation in an individual interview or focus group (up to 2 hours) and £20 for participation in the survey (30-minute questionnaire). All data (interviews, focus groups, questionnaires) will be collected with participants' informed consent, by researchers trained and experienced in research ethics and gaining consent. Participants will be offered as long as they need to decide whether or not to participate and will be asked to consider any negative consequences their participation could have for them. We will assure participants of the confidential and anonymous nature of the study and that their decision to participate will not affect the services they receive. We will use trauma-informed approaches to develop data collection tools and procedures that prioritise participant safety and wellbeing. We will offer participants information on relevant sex-worker friendly health and support services, with referral systems in place for those needing and desiring additional support. Data collection will take place at locations, times and on terms that are convenient and acceptable to participants, and participants will be encouraged to take breaks if they need to. Ensuring that the research does not place undue time or emotional burdens on participants or services will remain a focus throughout. All questionnaire data will be collected via the Open Data Kit software (ODK collect) on handheld password protected devices or participants own computers. Once an interview is completed, and closed, ODK applies an asymmetric public key encryption which is irreversible and ensures that data cannot be tampered with. Data can only decrypted by the data manager (LP). Data will be sent to a secure server at LSHTM and stored within designated project folders. Contact information for follow-up will be delinked and stored separately from questionnaire data Access to each project folder is restricted to members of LSHTM who have been nominated by the co-PIs. LSHTM administrative and IT services will support data and financial management in accord with contractual requirements and the Data Protection Act 2018 (regarding collection, storage, processing and disclosure of personal information). All data will be anonymised and reported/published in such a way that participants are not deductively identifiable (by ensuring that cell sizes remaining above 5 in quantitative analyses and removing names, places and specific biographical details from qualitative data).

PATIENT AND PUBLIC INVOLVEMENT AND ENGAGEMENT (PPIE)

This project involves dialogues between academics, communities and practitioners (see WPs A and E above), and draws on varied forms of expertise and knowledge, to co-produce research design, analysis and recommendations. The research will be delivered through a participatory approach, by a team of researchers (co-investigators, hired researchers and freelance co-researchers) and collaborators (NUM and sex worker-led organisations) including people with diverse lived experiences of current and former sex work and of receiving and delivering NUM services.

The project steering group will include community members with diverse lived experience of sex work who are and are not NUM members. We will use language that reflects this diversity when hiring co-researchers, who will have lived experience of sex work and/or of working closely with sex workers and will contribute to study design, conduct, analysis, write-up and dissemination. We will advice from the steering group on this and aim to create involvement opportunities that suit co-researchers' needs/circumstances.
Co-researchers .

Co-researchers will participate in mutual-learning sessions, during which the co-PIs/co-Is provide training in research methods, ethics and the study protocol, and co-researchers advise on study methods, procedures and contexts. Additional support will be provided via regular team meetings and one-to-one debriefings. Co-researchers will receive £150/day (£20/hour) for all research-related activities (training, meetings, data collection, analysis/writing, dissemination). Co-researchers and other researchers involved in data collection will also have access to up to 10 free counselling sessions with a provider (e.g. via NUM's directory) who is sex-worker friendly and has expertise in other issues related to the research that might require specialist support (e.g. trauma related to violence). NUM have a network of counsellors experienced in working with sex workers, that we can refer staff to for specialist support as needed.

We will also encourage applications to hired researcher positions from qualified individuals with lived experience of sex work.
We will seek input from wider, diverse communities of sex workers via dialogue workshops.

Involvement and engagement activities will be carefully designed – in terms of formats, locations, times and payments - to maximise acceptability, access and inclusivity for diverse communities of sex workers across the study sites. Throughout the project, we will reflect critically on how our (overlapping) roles as academics, practitioners and sex workers shape study design, data generation, analysis and interpretation. The research questions addressed in this research were initiated by NUM staff. Funded by a PHRADA award, we held a co-production workshop with 7 representatives of sex worker-led organisations across the UK (Sex Worker Advocacy & Resistance Movement, English Collective of Prostitutes, Sex Workers Alliance Ireland, ScotPep, Ugly Mugs Ireland) and NUM staff, inviting critical input on research questions, design, approach, ethical considerations, and community relevance. Participants considered the proposed research of high importance and expressed interest in joining the project steering group. They identified ways to avoid the 'survey fatigue' that many sex workers are experiencing (e.g. keeping surveys short and carefully constructed, NUM not circulating non-essential surveys in the lead up to this study).

RESEARCH TEAM AND COLLABORATORS' EXPERTISE

We are a multi-disciplinary team with expertise in working to improve health and welfare for, with and by people who sell sex. **LP**, Professor of Public Health Epidemiology, has expertise in quantitative and mixed-methods evaluations of complex interventions among sex workers and other marginalised populations, including in relation to violence and mental health. She will lead the impact evaluation, the rapid realist review and supervise the quantitative RF. **PG**, Assistant Professor in Public Health Sociology, has expertise in theory-driven and applied qualitative, mixed-methods, participatory research and process evaluation, with sex workers and other marginalised populations, in relation to violence, mental health, sexual and reproductive health and rights. She will lead the qualitative process evaluation, supervise the qualitative RF, co-lead the PPIE and co-supervise the co-research team. **RB** is Chief Executive Officer of National Ugly Mugs and has a PhD in sociology with expertise in qualitative, mixed-methods, participant-driven research and implementing health and safety services and interventions by, with and for sex workers. She will advise on acceptability and feasibility of research methods, analyses and interpretation, providing access to NUM's operations. She will supervise the research manager/RF at NUM. **CB**, Professor of Public Health and Sociology, has expertise in qualitative and mixed-methods realist evaluation of complex public health interventions, including structural approaches to violence and bullying prevention, and mental health. He will advise on realist evaluation methodologies. **RS**, Assistant Professor in Criminology, has expertise in community-led and applied realist research with and by sex workers and other marginalised populations, including in relation to changing landscapes of violence, service provision, mental health and criminalisation. She has strong links to the community and will support and co-lead the participatory approach. **SS**, Assistant Professor in Health Economics, has expertise in health economic evaluation methods, including in relation to violence prevention.She will lead the economic evaluation.

SUCCESS CRITERIA AND BARRIERS TO PROPOSED WORK

We will monitor progress against a set of activity indicators outlined under the delivery plan and planned research timelines (see below). Our criteria for success will be the completion of each activity in line with the project timeline. The steering group will provide feedback and advice on progress. We will conduct ongoing critical appraisal of the project and any barriers or facilitators to its implementation including our participatory approach. We will present a timeline reflecting key activities for each work package and present it to the steering group for critical input. The criteria for success will be good performance against these indicators.

Risks	Mitigation
Dissolution of partnerships or recommissioning of services limiting	NUM has established strong relationships with funders who invest in the organisation over the past 10 years. During the COVID-19 pandemic its funding increased to over £400K in 2020. NUM has financial strategies in place and conducted scenario planning in the event of reductions in funding. In this case, NUM would continue their

Risks	Mitigation
access to intervention.	national reporting and alerting mechanism but limit casework services to London, Manchester/Northwest and Scotland where their offices and most members are based.
We are unable to engage sex workers and other stakeholders in dialogue workshops or the qualitative process evaluation	We will build on our team's extensive networks and experience in participatory research to recruit participants for dialogue workshops and WP B. For interviews and focus groups we will use a diverse range of established recruitment approaches to reach sex workers who are not NUM members. We will use formats, locations and group compositions that maximise acceptability, accessibility and inclusivity for interviews, focus groups and dialogue workshops. We have budgeted to compensate sex workers, and other stakeholders who are unwaged or whose role do not cover activities such as this, for their involvement.
We are unable to recruit participants to cohort study as planned.	We have set recruitment targets into the intervention group in accordance with service engagement at NUM. We have set recruitment strategies for the comparison sample conservatively and are confident that these can be met, given support from sex worker organisations and previous experience. We will assess recruitment against targets weekly. If at week 2 and 4, 10% and 20% of the target has not been met, we will consider revising eligibility criteria to include participants engaged in NUM within last 3 months rather than new engagements. At week 6 if 30% of the total target has not been met we will discuss reconfiguring the study to a needs assessment of sex workers in relation to violence prevention and support completing the baseline survey without follow-up.
Underplaying effects of the intervention in the quantitative analyses.	Use of multiple methods will reduce misclassification biases and improve measurement. The realist evaluation approach will help build up a stronger picture of the plausibility of the intervention mechanisms. Integration of findings from the qualitative study and rapid realist review will help understand reason for null effects.
Co-production and participatory approaches reinforce hierarchies between sex workers and academic researchers, burdens co-researchers with accounts of difficult experiences	We will draw on our extensive experience of participatory research with sex workers and managing dynamics within a diverse team and will engage academics with experience of participatory methods onto our steering group. Careful recruitment and training, regular debriefing and team meetings in locations/formats that maximise opportunities for everyone to take part, and opportunities to air concerns individually or in a group will help to support co-researchers' involvement in the research, identify, reflect on and address divergent expectations, approaches and goals, process difficult accounts, and manage research responsibilities/workloads. We will facilitate co-researchers' access to support services in the same way as research participants.

RESEARCH **TIMETABLE**

	2023		2024											2025											2026			
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
WP A: Mapping and Dialogues																														
Ethics approval																														
Mapping/identifying key groups																														
First Dialogue workshops																														
Evidence review																														
Co-researcher recruitment & training																														
WP B: Process evaluation																														
Focus Groups																														
In depth interviews																														
Ethnographic observations																														
Preliminary analysis																														
WP C: Impact evaluation																														
Develop & finalise questionnaire																														
Baseline survey of cohort study																														
Intervention implementation																														
Follow-up cohort study																														
WP D: Economic evaluation																														
Costing																														
Cost effectivness analysis																														
WP E: Research into action																														
Analyses																														
Second dialogue workshops																														
Co-production of policy brief and best-practice guidance																														
Drafting peer-reviewed outputs																														
Dissemination meeting																														
Final report																														

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