

A feasibility assessment of Serenity Integrated Mentoring (SIM) implementation in London, England

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ABSTRACT

Introduction. Serenity Integrated Mentoring (SIM) is a new program being introduced in London aimed at improving coping mechanisms and reducing emergency service use in High Intensity Service Users (HISUs). **Trial Design.** Feasibility study. **Methods.** The feasibility of carrying out an evaluation of SIM effectiveness was assessed using demographic data. Three SIM boroughs (Greenwich, Camden and Islington, N=22) were compared with a non-SIM borough (Enfield, N=10) on emergency service use and costs in the 12 months prior to SIM and 9 months after. Qualitative interviews were conducted with SIM practitioners and service users. **Results.** Practices of SIM in London boroughs are too heterogeneous to support a randomised control trial. Some emergency service use was observed to decrease, but trial was too small to detect meaningful differences between the groups. Similar observations were made for service use and economic data. Most service users could not be interviewed, but professionals involved felt positively about SIM, stressing the need for long term intervention. **Conclusion.** We recommend a Phase I trial with a pre-post design and follow-up, which will require further work to standardise data on emergency service use, and consideration of the limitations this study encountered in obtaining meaningful self-report information. Despite the challenges, we recommend that this unique service be urgently evaluated if it is to be widely used within the NHS.

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ABBREVIATIONS

A&E	Accident and Emergency
BEH	Barnet, Enfield and Haringey
C&I	Camden and Islington
CBO	Criminal Behaviour Order
EIA	Equality Impact Assessment
EQ-5D-5L	A self-report measure of generic health status
EUPD	Emotionally Unstable Personality Disorder
HISU	High Intensity Service User
HRQoL	Health-related quality of life
IMD	Index of Multiple Deprivation
MDT	Multidisciplinary team
MH	Mental Health
MHA	Mental Health Act
NHS	National Health Service
NTW	Northumberland, Tyne and Wear
PC	Police Constable
PD	Personality Disorder
QALY	Quality-adjusted life years
S136	Section 136 of the Mental Health Act 1983 (Amended 2007)
SIM	Serenity Integrated Mentoring

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PLAIN ENGLISH SUMMARY

Some people with mental health problems (often those with a diagnosis of Borderline Personality Disorder) have difficulties in managing crises in an effective way. Some repeatedly seek help from emergency services: for example, by calling ambulances, attending Accident & Emergency, or getting arrested because they are acting dangerously in public. Serenity Integrated Mentoring (SIM) is a new program to help service users develop better coping strategies. SIM teams consist of a mental health professional and a police officer who work with the service user to improve their mental health and coping strategies, and fix any underlying problems that could be causing them to use emergency services frequently. This report examines how SIM is being received in London, and asks whether it is possible to carry out a full study to establish if SIM is more effective than other existing programs.

We compared two NHS Trusts that implemented SIM (Oxleas and Camden & Islington, 22 service users) with one who has not (Barnet, Enfield, and Haringey, 10 service users). We found that service users did attend A&E less, and were being arrested less, but this was true for both SIM and non-SIM participants. The economic analysis also showed that, at this stage, we cannot see any cost savings to service use yet. These results are something we expected because of the small scale of the study. However, we found that the quality of the data that is recorded by emergency services would allow us to carry out a full-scale study which would give us clearer answers.

We conducted interviews with clinicians and police officers who were involved in the delivery of SIM in their Trusts, and found that overall they felt positively about SIM and felt that it had the potential to help people, but they also noted that it can take a long time to see improvements. They felt that the combination of mental health and police support is an important part of the service. It was difficult to interview most service users, because most had not been in SIM very long, and their acute mental health problems meant that they or the research team felt that it was not in their best interest to take part in research. The small number of service users who did agree to be interviewed were somewhat split in their opinion of SIM.

In conclusion, SIM seems to be promising and acceptable to mental health professionals in London, but a large-scale, long-term study is urgently needed to evaluate its effects.

INTRODUCTION

Background

The number of detentions made under Section 136 of the Mental Health Act has been steadily increasing over the past decade^{1,2} with estimates of a six-fold rise in more recent years³. “High intensity service users” (HISUs) are detained especially frequently, and are also often seen by emergency services, such as crisis teams, ambulance services and Accident & Emergency. While emergency services are able to help them manage the crisis, ongoing mental health support in the community and outside of crisis times for these service users is lacking. As a result, they repeatedly reach a crisis point before seeking help, which is detrimental to their well-being and costly to services. Although street triage involving both police and mental health (MH) workers is becoming more common, there are few resources available to these service users. Serenity Integrated Mentoring (SIM) is a program which aims to help them manage how they respond to mental health crises in a healthier and more constructive way. The program has been piloted on the Isle of Wight in 2013, and despite the small sample size saw significant improvements in service users’ crisis management, psychological well-being, and maladaptive behaviour. The SIM program is currently being introduced across England; however, it is unclear whether it can be effectively transported to a more urban, heterogeneous environment like London. The purpose of the present study is to evaluate the feasibility of SIM implementation in this context, and the feasibility of evaluating its effectiveness in a full-scale, formal trial, such as a randomised control trial (RCT).

High intensity service users

Section 136 of the Mental Health Act⁴ was introduced in 1983 and amended in 2007. Under s136, police officers have the power to detain individuals who are behaving in dangerous or erratic ways in public. Detained individuals are then moved to a “place of safety” (usually a psychiatric emergency ward, specialist suite or police cell) until they can be evaluated by a mental health professional and either discharged or referred on (for example, to inpatient treatment). The number of s136 detentions has been increasing. Across the UK, 29,662 individuals were detained under Section 136 in 2017/2018 compared to 21,814 people in 2012/2013 (a 36% increase in five years)⁵. Furthermore, around 5,300 section 136 detentions are made in London alone each year.

Part of the reason that high intensity service users are frequently detained under s136 is that their mental health needs are not being adequately provided for. Often, these service users have a diagnosis of Borderline Personality Disorder (BPD), also called Emotionally Unstable Personality Disorder (EUPD). In a crisis, they are frequently unable to cope and as a result repeatedly seek help from emergency services and mental health crisis teams. This leads to a “revolving door” where services can only manage crises enough to discharge the service user into the community, where they do not receive long-term help and support. Although empirical evidence is lacking, findings from the Isle of Wight study⁶ suggest that around 3,500 people across England and Wales frequently need crisis intervention either on a weekly or monthly basis. Additionally, there are links between repeat calls to emergency services and wider social risks; repeat callers are disproportionately likely to be offenders, behave in an anti-social manner, go missing and be involved in multi-agency safeguarding processes⁶.

Often these individuals have poor social networks and have lost contact with family members who feel that they can no longer support them. Social support is associated with mental wellbeing⁷, whereby social integration is essential for improving mental health⁸. Social integration can be challenging for these individuals as they can often face stigma from their community⁹; this results in them having a smaller social network size than others¹⁰. Loneliness could be a contributing factor to seeking out emergency services rather than other coping strategies. Having a small social network has been linked to more frequent hospitalisations¹¹ and is a predictor of severity of negative symptoms in individuals with schizophrenia^{12, 13}. It has also been shown that people who have a secure, supportive social network recover quicker from mental health problems than those who lack this strong social support^{14, 15}. All of these factors can contribute to frequent detentions under s136.

High intensity service users typically require multi-agency support. The practice of deinstitutionalisation, whereby these service users are cared in their local community rather than being admitted in hospital¹⁶ is being increasingly preferred within clinical practice, and there has been a reduction in the duration of stay in hospitals for high intensity service users in 193 countries, including the UK, over a 10 year period (from 2001 to 2011)¹⁷. This has led to an increase in community based care: estimates show that in the UK, over 60,000 people with severe mental illness currently receive housing support to be able to manage their mental health in the community^{16, 18}). Support from drug and alcohol services are also on the rise as up to 50% of people with severe mental illness are affected by substance misuse¹⁹. High intensity service users often have a “dual diagnosis”, which is a term used to describe co-occurring mental health and substance misuse problems. In fact, the prevalence of dual diagnosis is higher among people in crisis settings such as hospital, jails and emergency rooms²⁰ and tend to persist over many years among this client group²¹. In comparison to people who have either a mental health problem, substance misuse disorder or those with no psychiatric diagnosis, individuals with a dual diagnosis are more likely to be involved with the criminal justice system, perpetrators of interpersonal violence, need more hospitalisations and more likely to present themselves to emergency departments^{22, 23}.

In terms of their clinical profile, high intensity service users often have a personality disorder diagnosis; estimates show that personality disorders can affect up to 52% of psychiatric out-patients and up to 60-80% of the prison population²⁴. People with a personality disorder diagnosis typically have long-term, unhealthy patterns in the way they behave, think and feel²⁵. They account for a substantial proportion of mental health resources in the UK²⁶ and are more likely to be repeat users of emergency services²⁷. Although people with personality disorders can have a good quality of life with the right support, they can face many challenges which leads them to depend heavily on the support of mental health services and people in their community²⁶. Individuals with personality disorders can experience difficulties sustaining close relationships if they experience dramatic shifts in feelings and thoughts towards people. These intense emotional fluctuations often stem from a fear of abandonment and rejection from close ones and in some cases, cause family and friends to withdraw from them. Other challenges include experiencing greater impairment in cognitive functioning such as decision making skills²⁸ and at an increased risk to engage in impulsive behaviours such as excessive alcohol and substance use, self-harm and suicide, which could be explained as means to cope with acute distress²⁶.

Interventions currently available to high-intensity service users

The interim review of the Mental Health Act²⁹ suggests that the rise in Section 136 detentions in England could be due to the fact that community-based interventions aimed at *preventing* people reaching a crisis point are not always readily available. Key issues that have emerged are that police workers have not received sufficient training in mental health and there is lack of collaboration between police and mental health teams. To address these issues and provide effective treatment to high intensity service users, some initiatives have been developed to form a cohesion of police resources and mental health expertise. These include street triage, liaison and diversion teams, and user groups.

Street triage was developed to provide timely access to mental health support for individuals who come to contact with the police. Street triage aims to cut out the 'middle man' of taking people detained under s136 to a place of safety. Instead, police officers and mental health clinicians work collaboratively, where the MH professional provides 'real time' advice to the police officer. The MH worker can, for example, issue a verdict on an individual's condition and put in an appropriate referral. Mental Health workers also have access to the service user's clinical records, including their mental health history and diagnoses, which can help in recommending appropriate action. Prior to this programme, it was the sole responsibility of the police to assess individuals alone and consider the use of s136 powers in cases where concerns about an individual's mental state were raised to them. Northumberland, Tyne and Wear (NTW) NHS Mental Health and Disability Trust reported successful outcomes of the Street Triage. Overall across NTW there was a substantial decrease of 50 fewer s136 detention a month³⁰. These findings were replicated in the Cleveland Street Triage team, funded by Tees, Esk, and Wear Valleys NHS Foundation Trust as they also found reduced s136 detentions after introducing the Street Triage programme³¹. Street Triage has also been reported by stakeholders to be a positive collaboration between police and mental health networks and without this service, police would continue to make 'risk-adverse' decisions about people in mental health crisis and not consider utilising different options other than s136 powers³².

Control room triage is another approach to improving collaboration between MH services and the police. The service takes place in a police or ambulance control room; MH professionals assist police in cases where an individual's behaviour has given a cause of concern possibly due to mental health problems. Mental health professionals have access to NHS patient records to triage and assess the individual during the initial call screening and liaise with relevant service to provide the right support for the individual.

Liaison and Diversion Teams are a somewhat similar approach to control room triage. Instead of being located in a control room, MH clinicians are based within police custody blocks. They work alongside the criminal justice system with the aim to divert criminals from the justice system and link them to suitable community mental health services, therefore preventing hospitalisation or imprisonment³³. Evidence of the effectiveness of liaison and diversion teams from a systematic review show that this initiative has a beneficial impact on forensic and mental health outcomes³⁴. In particular, in comparison to the traditional criminal justice system, liaison and diversion teams were more successful in identifying offenders with mental health problems³⁴.

Finally, high intensity user groups are designed for proactive, rather than reactive, response to service users who come into frequent contact with the police as a result of mental health problems. Meetings are held between the police, MH teams, ambulance services and A&E teams to discuss frequent emergency service users and then agree on how to provide more effective care next time the service user calls. This service is aimed specifically at service users who frequently contact

emergency services and need additional support or a different response. This approach is more effective when crisis plans are written in collaboration with the service user.

Serenity Integrated Mentoring

Serenity Integrated Mentoring (SIM) aims to fill the gaps in the provisions available to high intensity service users, by providing more focused, intensive, ongoing support outside of crisis times. The primary aim is to help service users manage mental health crises in a more constructive way. The program is delivered by a collaborative team consisting of a mental health professional and a police officer. SIM consists of eight 'essential' and two 'preferred' features. Essential features include combining clinical and behavioural input, producing response plans which has been discussed with service user to improve crisis response behaviour, focus on strengthening support networks and promoting lifestyle changes, and training non-clinical staff in mental and behavioural health. These principles comply with recommendations, in regards to patient autonomy, shared decision making and individualised care plans, made in the review of the Mental Health Act³⁵. The SIM program is described in more detail in the "Intervention (SIM)" section.

OBJECTIVES

The primary objective of the study was to evaluate the feasibility of carrying out a full-scale, formal trial of SIM. Secondary objectives were designed to evaluate the feasibility of programme implementation in an urban setting, the scale of the problem in London, and a qualitative component to evaluate the subjective experiences with the program from the perspective of service users, their carers, and professionals.

Objective 1: Determine the feasibility of carrying out a formal trial to estimate the effect of SIM intervention.

Several distinct questions were raised in order to address this objective, including:

- The feasibility of developing a standardised definition of a "high intensity service user" which could be implemented across different London boroughs.
- The recruitment rate and the number of HISUs recruited into the program within the follow-up period of the study.
- Retention and drop-out rates for service users who were recruited into SIM
- Availability and quality of the 5 Stream Data collected as part of the SIM program
- Recruitment and completion of qualitative interviews among SIM users

Objective 2: Establish the size of the problem in London

This objective is directly associated with the sub-sections of Objective 1, relating to defining and recruiting HISUs. The prevalence of s136 detentions within each study borough was estimated for the 12 months prior in order to contrast relative service use between different London boroughs. This, and additional 5 Stream Data was used to estimate the economic burden associated with HISUs and the potential for savings.

Objective 3: Determine the feasibility of implementing SIM in an urban setting

The only prior evaluation of SIM was conducted on the Isle of Wight, which has significant systemic and demographic differences to London. This objective aims to evaluate 1) the feasibility of matching borough clusters on the basis of population size, ethnic makeup, and Index of Multiple Deprivation, and 2) characteristics of service, including staff training, supervision, and number and frequency of patient contacts.

Objective 4: Determine the size of the immediate impact of SIM implementation

Comparisons of SIM service users was made on the basis of 5 Stream Data from 12 months prior to baseline until 9 months after. The 5 Stream Data is routinely collected as part of the SIM program, and includes 1) number of s136 detentions and assessments, 2) frequency of police deployment, 3) frequency of ambulance deployment, 4) frequency of A&E visits, and 5) Mental Health Bed occupancy per 24 hour period.

An additional measure was included to aid in this assessment, the EQ-5D-5L, a brief self-report measure of physical and mental well-being.

Objective 5: Qualitative analysis of service users' and professionals' experiences

Semi-structured qualitative interviews were carried out with service users, and people close to them who could be informally described as their "carers" in order to try to better understand their experiences of and attitudes towards SIM. Interviews with professionals involved in the delivery of SIM were also carried out in order to understand their perceptions of SIM, as well as the barriers and facilitators to program delivery. The interviews were also designed to inform some aspects of the other objectives, such as identifying less quantifiable aspects of program impact and describing the intervention.

METHODS

Study design

The trial was designed as a multi-component, mixed-methods study. The primary statistical analysis was designed as a pre-post analysis of retrospective (for data collected prior to SIM baseline) and prospective (for data collected following the SIM baseline) data. Qualitative interviews were conducted and analysed using Thematic Analysis³⁶. Approaches to the other objectives were predominantly descriptive, either using data collected directly from the Trusts (e.g., for objective 1) or from national databases such as NHS and census data (e.g., for objectives 2 and 3). Specific information on the participant sample and the methods used is detailed below.

Changes to methods

Several changes had to be made to the trial design for practical reasons. First, the control borough was changed from Haringey to Enfield. This was a decision made by the Trust, due to the corresponding change to the borough in which SIM was due to be implemented. Both Haringey and Enfield are boroughs within the same Trust (Barnet, Enfield, and Haringey Mental Health Trust) and are in close geographic proximity.

The second change refers to the EQ-5D-5L measure of physical and mental well-being. Unfortunately, it was not possible to collect this data from the SIM service users. There were several reasons for this. First of all, Sim service users often have complex mental health needs that can lead to difficulty keeping regular scheduled appointments. Even when a user did attend a meeting, it was often in their interests to prioritise therapeutic work over attempting data collection. Second, the clinical team within the control borough (Enfield) felt that the service users were unlikely to understand the purpose of the questionnaire and would not react favourably to being asked to complete it. Finally, by the time ethical approval for the study was granted (October 2018), most participants had already been engaged in the SIM program for several months, and even starting data collection immediately would not have yielded “true” baseline data, but rather data collected after the intervention had already begun.

It should also be noted that at the time of project planning, it was understood that the SIM program at Camden and Islington NHS Foundation Trust would be implemented in the borough of Camden only. However, service users were invited to take part in the program from both boroughs (Camden and Islington), and the results reported here therefore reflect this.

Finally, the initial study design projected data analysis in 3-month blocks. However, it became clear that 5 Stream Data would be available to the research team by month. As a result, we have analysed the data monthly as this was more suitable and allowed for more detailed analysis.

Eligibility criteria

The inclusion and exclusion criteria were deliberately relaxed in order to include as many service users taking part in SIM as possible. Exclusion criteria were mostly focused on harm prevention, where taking part in the study would negatively affect the service user. However, the 5 Stream Data was collected anonymously and indirectly (from the SIM team rather than the service user), and

therefore involved no potential for harm. The inclusion criterion based on s136 detentions was intended to mimic the inclusion criterion for the SIM programme itself.

Inclusion criteria

- Aged 18 to 65
- Have been detained under Section 136 of the Mental Health Act two or more times between January 2017 and December 2017
- Have agreed to take part in the SIM programme

Exclusion criteria

- Service user's SIM team has determined that participating in the study is likely to have a negative impact on their well-being
- Participant poses a substantial safety risk to the researcher due to history of dangerous or violent behaviour
- IQ<70, or any learning or developmental disability which affect the service user's ability to give informed consent

Settings and locations

Data collection took part within three London NHS Trusts: Camden & Islington NHS Foundation Trust, Oxleas NHS Foundation Trust, and Barnet, Enfield & Haringey Mental Health NHS Trust. Quantitative data (5 Stream Data) was transferred electronically from the SIM teams (or, for Enfield data, the relevant services) to the research team.

Qualitative interviews took place either within NHS buildings, or in the participant's home.

Service user recruitment

In Oxleas, an initial pool of participants (N=30) was identified on the basis of frequent s136 detentions (more than 1 in the past 12 months). This pool was narrowed down to a cohort of 3 service users based on additional factors. These included diagnosis (primarily Emotionally Unstable Personality Disorder (EUPD), alternatively termed Borderline Personality Disorder (BPD)), residence or GP registration within the borough of Greenwich, and frequent use of emergency services. The SIM service capacity at the time of writing was five service users, but a smaller cohort was recruited to begin with, with the intention of expanding to full capacity once the program was running smoothly.

A similar approach was taken at Camden and Islington. Only participants local to the Trust were eligible to take part. The initial cohort (N=12) was selected on the basis on the frequency and severity of emergency service use within the past year (s136, MH bed days, A&E attendance, police and ambulance phone calls and deployments). Detentions under s136 were cross-referenced between the Trust and Metropolitan Police records. Service users had to have a primary mental health diagnosis to qualify for inclusion in the initial cohort. From this, a total of 7 participants were included in the SIM program.

All SIM service users met the inclusion criteria for the study, and therefore none were excluded from the quantitative (5 Stream Data) portion of the study. Because all data was anonymised by the Trusts before being transferred to the research team, consent procedures were not necessary. For the

qualitative portion, three service users gave their consent to be contacted by the research team. Of these, two agreed to take part in the qualitative interview while the third could not be reached despite repeated attempts. One carer was interviewed, as the second service user could not identify anyone they would perceive as a “carer”. No attempts were made to contact the remaining SIM service users, as in all cases their SIM team felt that taking part was not in their best interests, or would not be appropriate in that point in time, per the first point of the exclusion criteria.

In Enfield, a cohort of control participants was identified using s136 data for the borough in the 12 months preceding July 2018. This “baseline” was selected to match the actual baseline dates of SIM participants in Oxleas. A total of 11 users with the highest number of s136 detentions within that time frame were identified and used as the comparison sample for all analyses. The number of detentions ranged from 22 to 3, with an average of 6.73.

Intervention (SIM)

The SIM program is aimed at high intensity service users with complex mental health needs, who exhibit high-risk crisis behaviours and thus are often frequent users of the emergency services. The programme focuses on a multi-dimensional team approach by bringing together both mental health professionals and police officers to work with the service users. The implementation of the programme in London involves around 60 Met Police officers, who receive specialist training in mental health high intensity behaviour, risk management, and basic clinical theory. Police officers are employed by the Met Police, but work in NHS Trusts under honorary contracts. All clinical and non-clinical professionals receive introductory 2 day SIM training aimed at providing them with a guide on how to identify and engage with HISUs, as well as the relevant skills needed to act compassionately, and formulate an effective and realistic response plan. Service users not only benefit from help received from a mental health professional, but also from the police officer aiding them in understanding how their behaviours may be perceived by others and may lead to police involvement. The SIM program is overseen by the SIM London Strategic Delivery Board (consisting of representatives from Mental Health, police, ambulance services, A&E representatives, the Health Innovation Network, and program founder Paul Jennings), which reports to the London Mental Health Transformation Board.

By combining the health professional’s clinical knowledge with the police officer’s boundary setting skills, the team are able to work intensively with the service user to create a care and response plan. The plan enables the service user to adapt safer boundaries for crisis behaviour and avoid criminal justice outcomes, gradually helping prevent high intensity behaviours all together. Service users are also encouraged to take positive risks in order to develop a sense of responsibility for their actions. This will prevent them from escalating their problems and behaviours, and avoid being detained under Section 136 of the Mental Health Act (MHA). By providing HISUs with new coping strategies and safer ways of managing their mental health, the programme aims to reduce crisis calls to emergency services, police and ambulance deployments, A&E attendance, and mental health bed admissions, and ultimately reducing the cost incurred by these public services.

The first implementation of the SIM programme on the Isle of White ran for 18 months and proved to be a success by showing significant clinical improvements⁶. The pilot study involved a small cohort of four HISUs who had an extensive history of mental health issues, all with a diagnosis of borderline personality disorder, and some with comorbid diagnoses. They were chosen following an assessment of their MHA detentions and use of emergency, mental health, and other NHS services. This allowed the team to prioritise issues that would be tackled within the mentoring sessions. Not all sessions

involved a police officer as the team felt that HISU would benefit from private meetings with the mental health professional. During the meetings with police officer involvement, the officer would aim to discuss all that is known to have happened to the HISU since their previous meeting and the serious consequences of some of their actions, as well as what could be done to support them. By the end of the pilot programme all four HISUs showed improved behaviours and clinical progress. Professionals agreed that the programme made HISUs feel more supported, less isolated, and improved their engagement with their treatment. The involvement of a police officer not only reinforced the boundaries for the HISU, but also made mental health professionals more confident and consistent in their approach, as well as improved their wellbeing and welfare at work. HISUs showed improved attendance to appointments, made fewer calls to services, and improved relationships with their care coordinators. Although the pilot programme was not directly designed to reduce service use costs, it was found that after 18 months a saving of £11,780 per HISU was made through prevention of demand.

A report from the first year of the South London implementation of SIM was published in 2019³⁷, covering SIM implementation in four South London boroughs (Greenwich, Southwark, Kingston and Richmond), with a total of 19 service users. In the first year of implementation, emergency service use and associated costs had descriptively decreased for 11 of the 19 users (mostly in mental health bed occupancy) – however, these findings were not analysed for statistical significance. Case studies presented in the report discuss service users' improvements following their engagement with SIM – including decreases in dangerous behaviours, better coping mechanisms (beyond emergency service use), and better engagement with other support services.

Sample size

Table 1 below summarises the number of service users within each borough. All service users within the SIM boroughs were automatically considered eligible for study participation. The 5 Stream Data was collected for every service user taking part in SIM. Service users in the control site were identified using the methods outlined above.

Table 1. *Total number of service users by borough*

Trust	Borough	N
Oxleas NHS Foundation Trust	Greenwich	4
Camden & Islington NHS Foundation Trust	Camden	3
Camden & Islington NHS Foundation Trust	Islington	4
Barnet, Enfield & Haringey Mental Health Trust	Enfield	11
TOTAL		22

Table 2 below summarises the qualitative interviews which were carried out by site.

Table 2. *Number of qualitative interviews by borough*

Trust	Group	N
Oxleas NHS Foundation Trust	Service users	1
	Carers	0
	Professionals	2
Camden & Islington NHS Foundation Trust	Service users	1

Carers	1
Professionals	5
TOTAL	10

Statistical methods

Outcomes for objectives 1, 2, and 3 are descriptive and were not subject to statistical analysis. For objective 4, the outcome variables (5 Stream Data) were measured as a time-series for 12 months prior to service users starting SIM, and for 9 months after. Months were standardised to 30 days. For service users in the control group, a “baseline” month was selected to match when SIM service users started the program. The 5 Stream Data consisted of:

- Number of detentions made under s136, per month
- Number of police deployments, per month
- Number of ambulance deployments, per month
- Number of A&E visits made by the service user, per month
- Mental Health Bed occupancy per 24 hour period, per month

Interrupted time series regression models for count outcomes were used to estimate the size of the intervention effect. The analysis did not statistically differentiate between the two SIM sites; this assumes that the treatment effect, if one exists, does not differ by site. We considered that we would not have been able to detect site-specific treatment effects in this small feasibility study. A full trial should account for the possibility of site-specific treatment effects in its analysis design.

All analyses were conducted in R³⁸, using the following packages: lme4, boot, catspec, psych, and ggplot2.

Qualitative analysis

Qualitative interviews were conducted using a semi-structured interview schedule, which can be found in Appendix 1. All interviews were audio recorded and transcribed, redacting identifying personal information. The transcripts were then analysed using Thematic Analysis, based on guidelines outlined in Braun and Clarke (2006). The analysis was conducted in six stages. Examples of how the data was coded and interpreted at each stage can be found in Appendix 2.

- Stage 1: Coders familiarised themselves with the data
- Stage 2: Initial codes were systematically generated for each transcript
- Stage 3: Preliminary themes were created using the codes generated in Stage 2.
- Stage 4: Themes were reviewed at the data level (does the data fit into the theme framework?) and at the theme level (visualised into a thematic map)
- Stage 5: Themes were named and defined. Two independent coders were familiarised with the theme framework and coded all transcripts to ensure good concordance rates. Coding was conducted using NVivo 12.
- Stage 6: The results were reported in the Results section of this report

RESULTS

Baseline data

Table 3 below summarises the demographic characteristics of the participants at baseline

Table 3. *Demographic characteristics of participants at baseline*

Borough	N	Gender	Age ranges	Ethnicity	Baseline month
Oxleas	4	4 male 0 female	18-25: 0 25-34: 1 35-44: 1 45-54: 1 55-64: 1 65+: 0	2 White 2 Black 0 Asian 0 Mixed 0 Other	3 in July 2018 1 in November 2018
Islington	4	3 male 1 female	18-25: 0 25-34: 2 35-44: 1 45-54: 0 55-64: 0 65+: 1	3 White 0 Black 1 Asian 0 Mixed 0 Other	All June 2018
Camden	3	1 male 2 female	18-25: 0 25-34: 0 35-44: 2 45-54: 0 55-64: 1 65+: 0	3 White 0 Black 0 Asian 0 Mixed 0 Other	All June 2018
Enfield	11	5 male 6 female	18-25: 2 25-34: 4 35-44: 2 45-54: 3 55-64: 0 65+: 0	8 White 1 Black 0 Asian 1 Mixed 1 Other	All July 2018
Total	22	13 male 9 female	18-25: 2 25-34: 7 35-44: 6 45-54: 4 55-64: 2 65+: 1	13 White 3 Black 1 Asian 1 Mixed 1 Other	

Numbers analysed

For the SIM sites, one service user was marked as having dropped out of SIM due to failure to engage with the program; however, data were still provided for that month, so a complete dataset was available for that service user. Another service user dropped out of SIM due to moving out of

the area in the second month of post-intervention data collection, and no data was available after this month. Finally, one service user started SIM about four months after the other service users, therefore only five months of post-intervention data was available for this person.

Descriptive and statistical outcomes

Objective 1

Defining the “high intensity service user”

Throughout the present study, the term “high intensity service user” (HISU) has been defined in different ways. The SIM program broadly defines HISUs as people who repeatedly use emergency services (per 5 Stream Data), with an emphasis on a high number of s136 detentions. We used the number of s136 detentions to identify HISUs for the control site, Enfield. However, it can be argued that this did not result in an accurate comparison, as descriptively the mean number of s136 detentions were considerably higher in Enfield than it was in the SIM boroughs. This suggests that the severity of service use can vary significantly by borough, and using a blanket cut-off point (e.g., “a minimum of two s136 detentions in the past 12 months”) may not be appropriate.

The outcomes of qualitative interviews, and informal conversations with SIM program staff also suggest that s136 is not the only, or sometimes even the main, indicator used to evaluate a service user’s suitability for SIM. The frequency and severity of high-risk behaviours resulting in emergency service use are also taken into account. Even if service use is not very frequent, the severity of the behaviours may still warrant a referral into the SIM program. Defining “high intensity service users” for the purposes of SIM referrals is not advisable solely on the basis of emergency service use frequency. Rather, inclusion criteria should involve a combination of frequency *and* severity of emergency service use (where this information is available), as well as mental health diagnoses.

Rate of recruitment

The total number of service users recruited into the SIM program at each Trust is summarised in Table 1. Although the capacity of the SIM program is recommended to be limited at 10 service users, the Trusts elected to begin program implementation with a smaller number of users (4 in Oxleas and 7 in C&I) before recruiting more. All service users in this initial ‘wave’ were referred into the program at the same time (June 2018 at C&I and July 2018 at Oxleas), with the exception of one service user in Oxleas who joined four months later.

Service user retention

Two service users dropped out of the program, both at C&I. One of the drop-outs was circumstantial (the service user moved out of the area), the other was determined to have poor engagement after 8 months of involvement in SIM. This indicates a relatively high engagement rate (9 out of 11 service users, or 82%) and suggests that SIM is acceptable to service users.

Availability and quality of the 5 Stream Data

Within the SIM sites, 5 Stream Data was available for the entire study period (from 12 months prior to baseline, to 9 months post baseline). Because data collection is a requirement of the SIM program, the datasets from both Trusts followed the same format and were recorded using the same template.

However, it must be noted that some level of subjective judgement must be used by SIM officers in the recording and formatting the data. For example, recording MH bed occupancy can be challenging without the specific details of the situation. When a service user is accepted for an evaluation, they may be discharged, or admitted into an in-patient unit. Stays in an in-patient facility are fairly easy to record in terms of bed occupancy, as admission and discharge are recorded. If a person is accepted for an evaluation, these can vary substantially in duration. For example, if a person is admitted at 9pm and then discharged at 10am the next day, this can fairly unambiguously be recorded as MH bed occupancy. Other discharges can happen fairly quickly (e.g., a person was admitted at 2pm and discharged at 5pm), in which case qualifying occupancy is more difficult without knowing whether the recorded time period involved evaluation and referral, or simply reflects the patient waiting to see a member of staff, followed by immediate discharge. If the SIM officer recording the data is aware of the circumstances of the admission, they can make an accurate judgement call for ambiguous data. However, this may not always be possible.

Although the research team had access to MH bed occupancy data for Enfield, this data consisted of admission and discharge dates and times only. As a result, we adopted a set of criteria in order to code the data appropriately. MH bed occupancy where the patient was admitted between 6pm and midnight, and was not discharged for a minimum of 6 hours (i.e., overnight stays or longer), were counted as one instance of occupancy. Shorter stays were coded as zero, as these were less likely to be full admissions.

Another problem affecting the accuracy of 5 Stream Data is the reality of police records. When a police unit is deployed, PCs do not necessarily record the identities of everyone at the scene. The people are not always required (or able, or willing) to provide proof of their identities, which means that police records will not always have this information, or may have inaccurate information. Human error, such as spelling mistakes, mean that searching records may not capture all instances of police deployment for the same service user. For example, if police are called to an altercation in public, in which several people including the SIM service user are involved, whether or not this instance of police deployment will be recorded depends on whether the PCs determined it necessary to record the identities of those involved, that the SIM user accurately disclosed their name, and that their name was recorded correctly. It should be noted that some of these problems associated with 5 Stream Data collection were also reported in the SIM South London end of year report³⁷.

Anecdotally, calls made by the service user themselves (whether or not they result in police deployment), are often made from unknown phone numbers (e.g., if the service user changes their mobile number, or uses a friend's phone, or calls from a public phone box), so linking the calls to the specific person can be impossible if they do not disclose their identity.

Geographic locations of service use also complicate the data collection process. There are currently no nation-wide databases for any of the services used in 5 Stream Data. If SIM officers are able, they may search beyond the areas covered by the Trust in order to build a more complete picture of service use. However, it would not be practical to manually search all UK county databases. This means that the accuracy of the recorded 5 Stream Data may be compromised. If a SIM service user discloses that they were out of area and were seen by services, the SIM officer can find this data in the relevant database to corroborate. However, if a service user based in, for example, Greenwich, visits an A&E in Manchester but does not disclose this, then the visit would not be recorded in their 5 Stream Data.

For the non-SIM borough (Enfield), data collection was attempted directly from the five emergency services. Unlike the SIM boroughs, there were no data sharing agreements in place. It was possible

to collect data on s136 detentions, A&E visits, and mental health bed occupancy. Police deployment data was not possible to collect, as the local police did not have the capacity to manually extract the data, and it was not possible for a member of the research team to gain access to the systems. Some ambulance deployment data was collected, but was only available for the last 10 months of the follow-up period, and was not consistently available for all service users.

The difficulties associated with obtaining the data from the non-SIM site suggest that if a similar approach is used in the future (e.g., a cluster randomised trial), independent data sharing agreements specifically for the project should be put in place. In theory, boroughs should begin 5 Stream Data collection prior to service user recruitment, during the set-up phase. However, the data collection is typically allocated to the SIM officer (rather than the mental health nurse), so in practice it cannot start until the post is filled.

Completion of qualitative interviews

The number of service users interviewed was significantly lower than projected (N=2; a third was referred but could not be contacted) and carers (N=1; the second service user interviewed could not identify someone in their life they would consider a carer and was available to approach). Part of this is due to recruitment numbers; we anticipated up to 10 service users to be recruited in each SIM Trust. However setting up the program is a lengthy process (as reflected in the qualitative interviews, see Qualitative Outcomes), and Trusts preferred to recruit in smaller numbers (4 in Oxleas, 7 in C&I) when the SIM programme launched, eventually expanding to full capacity. Reaching full capacity was not within the time scales of the current study.

In addition, the research team could not approach the service users directly, so initial contact (introducing and explaining the study) was made by members of the SIM team. Because SIM is aimed at service users with complex mental health problems, disorganised lives, and high-risk behaviour (see Qualitative Outcomes), approaching them about study participation was often not in their best interests as crisis management should take precedence. The study was designed to interview service users first, after which consent could be obtained (from the service user) to invite their carer to take part. The number of carers we could interview was therefore limited by the number of service users who agreed to take part.

If future studies are planned on longer time scales, it may be possible to recruit a higher proportion of users to take part in qualitative interviews, particularly if or when they approach discharge as they are likely to be in a more stable place. However, what these findings indicate is that finding suitable candidates for qualitative interviews within the SIM population is likely to be challenging and is unlikely to be feasible within short follow-up windows.

Objective 2

The aim of objective 2 was to determine the prevalence of s136 detentions in London, as a proxy for estimating the size of the problem and its associated costs. The most recent NHS Digital Mental Health Act Statistics estimate that the number of s136 orders to hospital alone was 16,539 in 2017/18 - the highest figure for the past 5 years (see Table 4). However, according to the Home Office police powers and procedures report (2017/18), this number rises to 25,792, with 20,231 orders to hospital, 408 detentions in police custody, and a further 5,153 to other or unknown places of safety. Males tend to make up more than half (57% on average, since 2013) of the total number of

individuals detained under s136. Similarly, where gender was recorded in the Home Office data, 54% of those detained were male. In terms of ethnicity, the NHS data indicates that for the past 5 years white individuals were detained most often (over 65% each year). However, census data for 11 indicates that 80.5% of people in England and Wales identified as White British. This suggests that BAME individuals are being disproportionately detained under s136.

Table 4. *Annual number of Section 136 orders for period 2013-2018, where place of safety was a hospital only.*

	2013/14	2014/15	2015/16	2016/17	2017/18
Total¹	10,365	11,247	10,091	15,050	16,539
Total gender ²	10,361	11,242	10,083	14,252	15,903
Male	6,074 (59%)	6,567 (58%)	5,826 (58%)	8,007 (56%)	8,653 (54%)
Female	4,287 (41%)	4,675 (42%)	4,257 (42%)	6,245 (44%)	7,250 (46%)

¹ Totals are based on incomplete data, so actual figures are higher than shown.

² Gender total does not include those whose gender was invalid or missing.

Of the London NHS Trusts with current live or planned SIM sites, Central and North West London NHS Foundation Trust has the highest recorded number of s136 orders at 1,085. In contrast, Barnet, Enfield and Haringey Mental Health NHS Trusts holds the lowest number of orders at 370. However, when taking into account relative population size of the boroughs serviced by each trust (see Table 6), there appears to be substantial variation in the prevalence of s136 detentions. On average, 11 s136 detentions were made per 10,000 residents. Within South West London and St. George's Mental Health NHS Trust this number was lowest, at 5.04 detentions made per 10,000 residents. This was substantially higher in the Central and North West London NHS Foundation Trust with 35.01 detentions made per 10,000 residents. Table 5 compares the number of s136 detentions in each Trust, relative to population size, and the total cost (assuming detention costs are static).

However, it is not clear from the available data whether there are differences in repeated detentions. For example, in the present study, SIM users in Oxleas and C&I had an average of 3.25 and 3.14 s136 detentions in the 12 months prior to baseline. The average number of detentions in the service users selected for the study in BEH was 6.27. Although this is not an accurate comparison (BEH service users were selected on the basis of s136 detentions only, while SIM users were chosen on the basis of additional factors), this hints at a possible disparity in high intensity service users' service use.

Data on s136 detentions was not available for the Camden and Islington NHS Foundation. As s136 data is only available by NHS Trust, it was not possible to evaluate whether there was substantial disparity in s136 detentions between boroughs.

Table 5. Section 136 orders by London NHS Trust for the year 2017/18

NHS Trust	Number of Section 136 orders	S136 orders per 10,000 residents	Total cost (at £530 per incident) ¹
Camden and Islington NHS Foundation Trust	--	--	--
South West London and St. George's Mental Health NHS Trust	460	5.04	£243,800
South London and Maudsley NHS Foundation Trust	835	8.63	£442,550
Oxleas NHS Foundation Trust	510	5.86	£270,300
Barnet, Enfield and Haringey Mental Health NHS Trust	370	5.95	£196,100
North East London NHS Foundation Trust	630	22.22	£333,900
East London NHS Foundation Trust	640	18.12	£339,200
West London Mental Health NHS Trust	445	15.99	£235,850
Central and North West London NHS Foundation Trust	1085	35.01	£575,050
Average	622	11.00	£329,594

¹ Heslin, M., Callaghan, L., Barrett, B., Lea, S., Eick, S., Morgan, J., ... & Patel, A. (2017). Costs of the police service and mental healthcare pathways experienced by individuals with enduring mental health needs. *The British Journal of Psychiatry*, 210(2), 157-164.

For the purposes of clarity, the results of the economic analysis are described following the statistical analysis of the 5 Stream Data under Objective 4

Objective 3

The purpose of this objective was to evaluate the feasibility of implementing (and evaluating) SIM within an urban context. This consisted of two aims: determining the feasibility of matching borough clusters in future evaluations, and characterising the service (including staff training and patient contacts).

Cluster matching

Table 6 below illustrates the relative population size, ethnic make-up, and deprivation index of each boroughs serviced by Trusts where SIM is currently being delivered, or is planned to launch.

Table 6. *Demographic characteristics of SIM (current or planned) boroughs*

Trust	Borough	Population ¹	% White ²	% Asian	% Black	Index of Multiple Deprivation ³
Camden and Islington NHS Foundation Trust	Islington	238,267	70%	7%	11%	13
	Camden	252,637	62%	15%	7%	69
South West London and St George's Mental Health NHS Trust	Richmond	199,419	87%	6%	Unknown	296
South London and Maudsley NHS Foundation Trust	Kingston	179,581	69%	17%	2%	278
	Merton	209,421	65%	17%	8%	212
	Wandsworth	324,400	75%	6%	12%	147
	Lambeth	334,724	53%	9%	23%	22
Oxleas NHS Foundation Trust	Southwark	322,302	63%	5%	20%	23
	Lewisham	310,324	63%	8%	19%	26
	Bromley	332,733	81%	5%	6%	220
	Bexley	249,999	79%	7%	8%	195
Barnet, Enfield and Haringey Mental Health NS Trust	Greenwich	286,997	63%	14%	17%	50
	Enfield	337,697	61%	11%	22%	53
North East London NHS Foundation Trust	Haringey	284,288	65%	7%	12%	21
	Waltham Forest	283,524	51%	16%	16%	15
East London NHS Foundation Trust	Newham	353,245	32%	47%	13%	8
West London Mental Health NHS Trust	Hounslow	278,264	48%	32%	9%	86
Central and North West London NHS foundation Trust	Hillingdon	309,926	50%	33%	8%	153

¹ Data from 2018 London Area Profiles, <https://data.london.gov.uk/london-area-profiles/>

² Data from 2018 census, <https://data.london.gov.uk/dataset/ethnic-groups-borough>

³ Data from 2015 English Indices of Deprivation, <https://data.london.gov.uk/dataset/indices-of-deprivation-2015>

In determining whether it is feasible to match clusters by borough, it is important to consider what the main comparison should be. Matching boroughs primarily on the basis on the proportionate number of s136 detentions (see Table 5) is likely to capture the primary type of service user which SIM targets, and one the aims of the program (reduction in inappropriate service use). Some examples of borough matches made based on s136 detentions are illustrated in Table 7.

Table 7. Matched London clusters by prevalence of s136 detentions

Trust	S136 orders per 10,000 residents	Population	% White	% Asian	% Black	Index of Multiple Deprivation
Cluster match 1						
East London NHS Foundation Trust	18.12	353,245	32%	47%	13%	8
West London Mental Health NHS Trust	15.99	278,264	48%	32%	9%	86
Cluster match 2						
South West London and St. George's Mental Health NHS Trust	5.04	912,821	74%	12%	7%	233
South London and Maudsley NHS Foundation Trust	8.63	967,350	60%	7%	21%	24

All values reproduced from Table 5 and Table 6

The proposed clusters appear to be fairly well matched on the basis of total population size. However, the ethnic make-up and the IMD are substantially different. There is no correlation between the proportion of s136 arrests and IMD ($r = -.109$, $p = .797$), which suggests that there is no direct relationship between deprivation (income, employment, levels of education, barriers to housing and services, and crime) and s136 arrests. However, as noted earlier in this report, s136 detentions seem to disproportionately affect BAME individuals; this trend is consistent in the proposed matched clusters, with the Match 1 clusters having both a higher proportion of s136 arrests, and a higher percentage of non-white residents.

However, the discrepancies are sufficient to counter-indicate cluster matching as the central design of any follow-up studies of SIM effectiveness. We recommend that future SIM evaluations adopt either a) an individually randomised controlled trial design, with participants randomised within the Trust to either SIM or management as usual, or b) a prospective longitudinal study, evaluating service use and well-being prior to SIM and at long-term follow-up.

Staff training

All SIM team members underwent an initial 3-day training course which introduced SIM principles, task delegation, the approach to writing care plans, risk management, the best way to achieve cohesion between mental health nursing and policing, and gives attendees practical and compassionate solutions to problems they may encounter along the way. The training sessions were led by Paul Jennings, the founder of the SIM program.

Following the initial training, ongoing online training was made available to all SIM team members. However, this was more accurately described as a 'resource' rather than formal on-going study. Several SIM professionals informally spoke about engaging in self-directed study in order to best understand their new role and patient cohort.

Supervision

SIM officers were supervised by both a police sergeant, and a clinical supervisor. Meetings were loosely arranged on a monthly or bi-monthly basis, but typically took place as and when necessary. Mental health nurses involved in the delivery of SIM also receive regular supervision from their clinical line manager. SIM professionals additionally use monthly high intensity user group meetings as a reflective space. The founder of the SIM program, Paul Jennings, also lends continued support to the SIM sites through quarterly support visits and additional availability on an as-needed basis. The High Intensity Network, supported by the NHS Innovation Accelerator and the Academic Health Science Network national programme, is also available to Trusts implementing SIM for support and guidance.

Number and frequency of patient contacts

In Oxleas, participant contacts varied between two hours per month (two 1-hour sessions) to 12 hours per month (four 2-hour in-person sessions, plus four 1-hour telephone sessions). This variability reflects the diversity of SIM participants' needs, and suggests that a standardised or prescribed contact schedule may not be appropriate within the model.

Similar variability in patient needs was observed at C&I, but on average service users were seen at least twice a week.

Objective 4: Statistical analysis

Figures 1-5 below illustrate the changes over time in the 5 Stream Data for SIM and (where available) non-SIM service users. All values were standardised to a 30-day month.

Figure 1. Mean number of A&E attendances per person per month, by treatment group

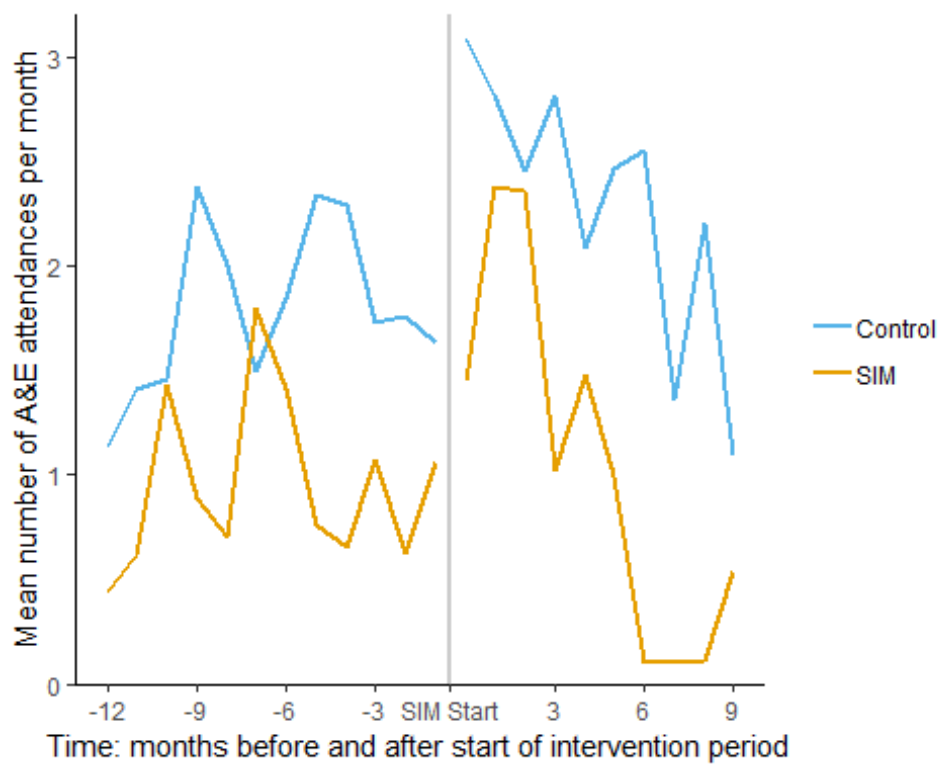


Figure 2. Mean number of s136 detentions per person per month, by treatment group

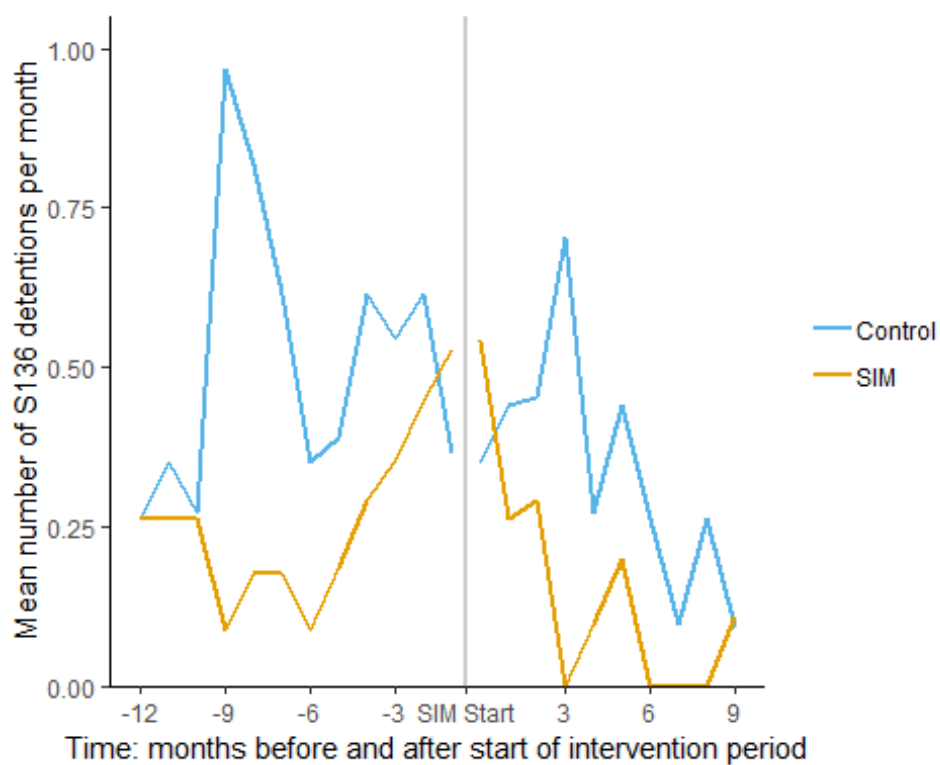


Figure 3. Mean number of mental health inpatient bed days per person per month, by treatment group

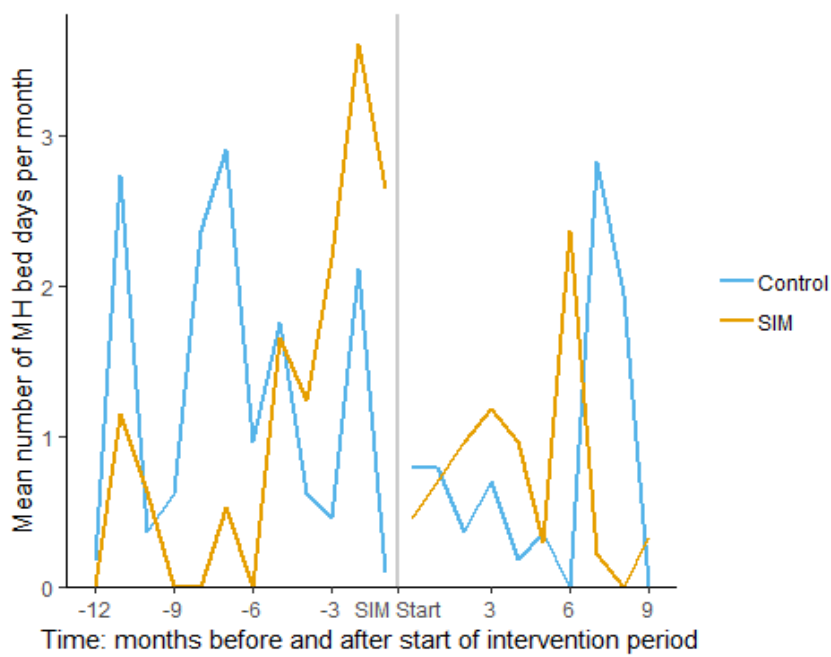


Figure 4. Mean number of police deployments per person per month (SIM participants only)

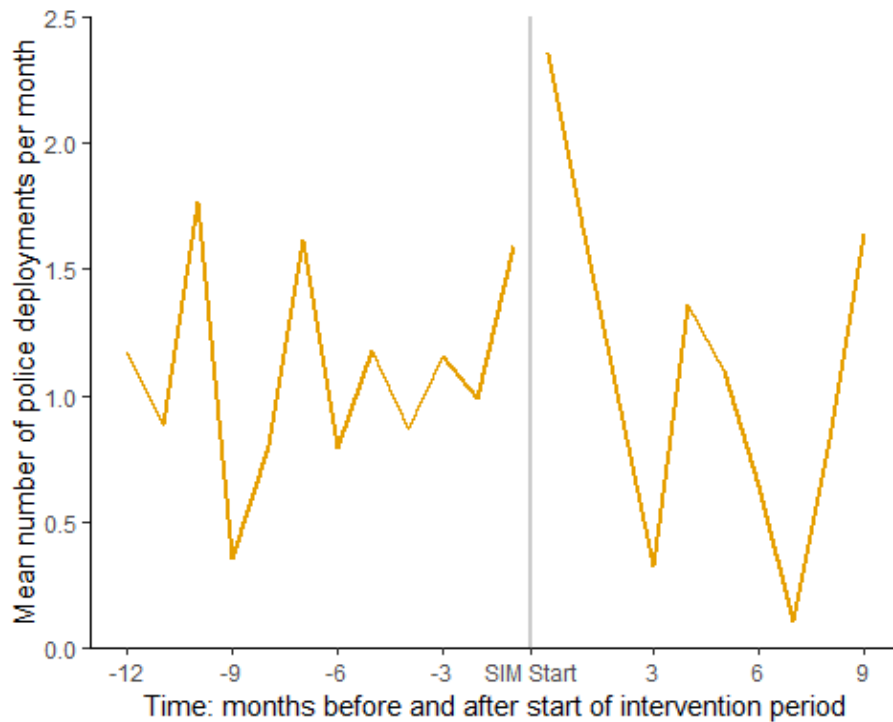
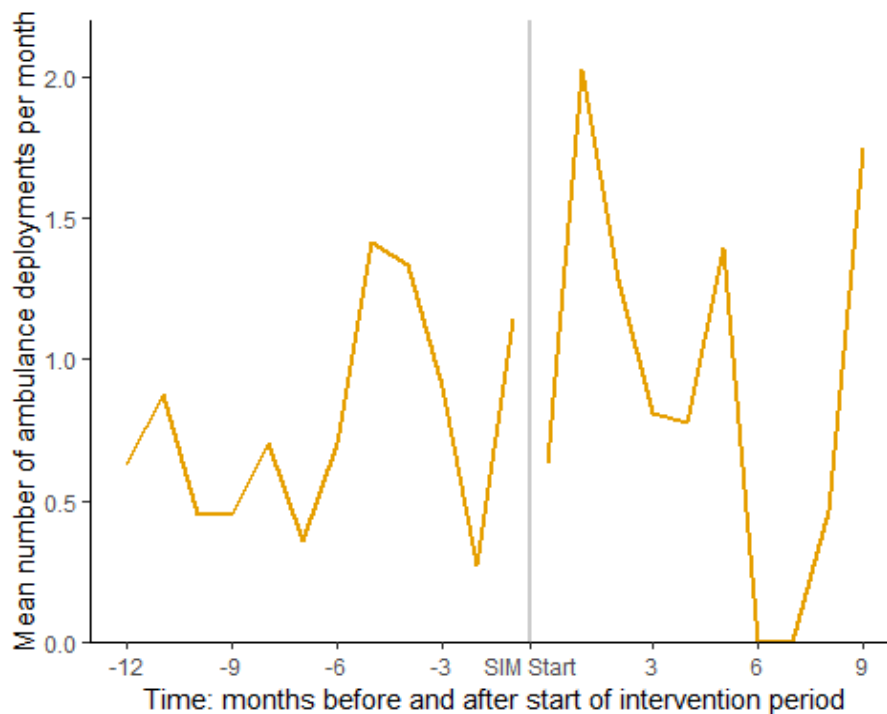


Figure 5. Mean number of ambulance deployments per person per month (SIM participants only)



We modelled each outcome using generalised linear mixed effects models. All outcomes are counts of events. After initial data exploration, it appeared that all outcomes were overdispersed, with the possible exception of s136 detentions. We fitted Poisson and negative binomial models to each outcome and used Akaike’s Information Criterion (AIC) and the Bayesian Information Criterion (BIC) to evaluate which error distribution was more consistent with the observed data.

Each distribution was fit two model types: a simple means comparison and an interrupted time series (ITS) regression model. The full model specifications can be found in Appendix 3. The ITS models aim to evaluate the effectiveness of SIM in two ways:

- (1) via an estimation of the ‘step change’ associated with SIM – the immediate change in the outcome in the first month of the intervention
- (2) via an estimation of the ‘trend change’ associated with SIM – the change in the temporal trend in the outcome in the intervention period, compared to the pre-intervention period.

The models estimate the step change via the main effect of a dummy variable ‘intervention period’, and the trend change via an interaction between this dummy variable and the variable ‘time’ (Intervention*Time). The variable ‘time’ is a monthly counter, coded zero for the month immediately prior to the start of the intervention period; other pre-intervention months have the values -12 to -1, months in the intervention period have the values 1 to 9.

Where data from the control participants was available, the models additionally estimated the difference between SIM and control participants in both step and trend change, via a two-way interaction Group*Intervention, and a three-way interaction Group*InterventionPeriod*Time. This is the standard way to set up ITS models in the presence of a comparator group.

The full statistical outcomes of the models can be found in Appendix 4 but the key findings are described below. Choosing only the best fitting models for each outcome, two coefficients of

interest had a p-value smaller than 0.05, relating to Accident & Emergency Attendance, and s136 detentions, as detailed below. It should be noted that data for non-SIM service users was not available for ambulance or police deployment, so a comparison between SIM and control participants was not possible for these measures.

Accident & Emergency Attendance

The 'time * intervention' rate ratio was estimated to be 0.79 (95 % C.I.: 0.69 to 0.90). This would suggest that SIM is associated with a 10 % to 31 % reduction in the slope over time, compared to the pre-intervention period. This is roughly consistent with Figure 1 (where we see an approximately zero slope in the pre-intervention period, and a negative slope in the intervention period, for the SIM participants). However, the model did not suggest that the slope change differed between the SIM and control groups.

s136 detentions

The 'time * intervention' rate ratio was estimated to be 0.69 (95 % C.I.: 0.51 to 0.91). This would suggest that SIM is associated with a 9 % to 49 % reduction in the slope over time, compared to the pre-intervention period. This is roughly consistent with Figure 2 (where we see an upward slope in the pre-intervention period, and a downward slope in the intervention period, for the SIM participants). However, the model did not suggest that the slope change differed between the SIM and control groups.

It may be noteworthy that the time*intervention interaction coefficient had a negative estimate in all five ITS regression models. Although 'statistically significant' in only two cases, this result may tentatively suggest that the effectiveness of SIM, if it does exist, may reveal itself in the shape of a gradual reduction of adverse outcomes, rather than as an immediate 'step change' at the point at which the intervention begins. However, this tentative conclusion needs to be verified in a new and larger data set.

Objective 4: Economic analysis

The SIM model of care ⁶ combines clinical expertise of mental health professionals with boundary settings skills of police force to enable change in behaviour of high-intensity service users (HISUs). In terms of costs, there are 5 important cost components that may change as a result of the SIM intervention: ambulance deployment, A&E attendances, mental health inpatient care (in bed days), police deployment and the overall cost of s136 detentions. Table 8 compiles individual cost components in the most recent publicly available estimates. The cost of s136 detentions has been previously estimated and includes mental health costs as well as costs to the police. However, it does not include the cost of ambulance deployment or A&E attendances.

Table 8. *SIM-relevant cost components*

Costs (in 2016-2017 £)	Mean [range]	Source:
Ambulance deployment	£120 [£107; £127]	39
A&E attendance (per contact)	£196 [£148; £241]	39
Mental health bed day (medium level)	£ 502 [£453; £564]	39
Police deployment	£2,686 [£2,095; £3,574]	40
s136 detentions*	£15,364 [£10,689; £24,960]	40

Note: The cost of S136 detention has been previously estimated by Heslin et al, 2017, and includes mental health costs (including bed days), police involvement (including deployment), but it does not include A&E attendances and ambulance deployment.

The calculations used in the economic analysis can be found in Appendix 5. The results are illustrated in Tables 9 and 10 below.

Table 9. *Difference-in-difference cost estimates and confidence intervals*

	Difference-in-differences (in 2016-17 £)	
	Observed	Bootstrap 95 % C.I.
A&E attendances	-69.15	(-234.89, 90.84)
Mental health bed days	39.66	(-654.20, 728.45)
S136 detentions	1,173.81	(-2084.89, 4784.35)

Note: Negative numbers indicate cost-savings evidence in favour of SIM.

Note 2: The cost of S136 detention has been previously estimated by Heslin et al, 2017, and includes mental health costs (including bed days), police involvement (including deployment), but it does not include A&E attendances and ambulance deployment.

Table 10. *Post – pre cost differences among SIM participants and confidence intervals*

	Difference Post – Pre (in 2016-17 £)	
	Observed	Bootstrap 95 % C.I.
Police deployments	93.74	(-1109.32, 1331.18)
Ambulance deployments	19.84	(-33.73, 77.35)

Note: Negative numbers indicate cost-savings, i.e. evidence in favour of SIM.

From these analyses, since all confidence interval include the value zero, there is no strong evidence to suggest any difference between SIM and the control group on any of the measures.

Outcome analysis

Although we had originally planned in this feasibility study to estimate health outcomes by looking into health-related quality of life (HRQoL), we have been unable to routinely use the EQ-5D questionnaires. Therefore, no utility scores could be calculated.

As there is no previous UK-valid research that has used HRQoL questionnaires (EQ-5D or others), we have been unable to estimate QALY gains attributable to the SIM intervention and, thus, we were unable to estimate a cost-utility model of the SIM service.

Qualitative Outcomes

Because only two service users (one from each site) and one carer agreed to take part in the qualitative interviews, it is not possible to fully report on the findings. The participant numbers are insufficient to carry out a full-scale Thematic Analysis. The alternative, reporting each interview as a case study, would de-anonymise the participants to their clinical teams. The outcomes of the qualitative interviews with this group is instead briefly summarised in terms of perceived positive aspects of their experiences, and perceived difficulties.

Four key themes emerged from the analysis of the professionals' qualitative interviews. Table 11 contains the quote counts for each theme and/or sub-theme. Theme 4 was only discussed by one person interviewed, but its salience was determined to be significant enough for inclusion in the report.

Table 11. *Professionals' qualitative interviews: quotations per theme*

Theme	# Interviews ¹	# Quotes ²
1. Service users have complex needs and chaotic lives	7	32
2. SIM gives flexibility to professionals and a structure to service users		
2a. SIM gives professionals a framework, but they can use their skills and judgement flexibly	4	12
2b. Service users need consistency and boundaries to give structure to their chaotic lives	6	28
3. SIM takes a long time		
3a. Setting up the program takes time	5	17
3b. Gaining the trust of service users takes time	6	11
3c. Seeing results takes time	5	13
4. Staff must be protected	2	3

¹ Number of interviews in which the theme was present

² Total number of quotes comprising the theme

Quotations illustrating the theme are included in italics. Each quote is annotated with the number of the source interview.

Theme 1: Service users have complex needs and chaotic lives

A general consensus arose between the professionals on the complexity of HISUs, and the unpredictable and chaotic nature of their lives. Although the majority of service users involved in SIM have a personality disorder (PD) diagnosis, or traits, it is clear that this is not the only cause of crisis. Service users are often faced with chronic issues, often perceived by the professionals as stemming from their childhood, as well as poor coping strategies, high-risk behaviours, lack of meaningful relationships, loneliness, and comorbidities. The complex presentations of the service users makes it difficult for them to engage in the traditional mental health services offered to them, which can over time lead to a crisis due to them feelings like their basic needs are “not being met historically” (006). This then leaves service users responsible for their own high-risk behaviours leading up to crisis “without then earning access into services” (004). SIM provides the service users with a dedicated service aimed at teaching them “alternative ways of coping” (002) with everyday life and help to bring about “some form of stability” (005) in their lives.

[S]ervices don't engage with them as well often. You know it almost feels a little bit like they're discriminated against because nobody knows how to help them, because they can't... the way- you know there's no flexibility in the way that services are being offered to them before [...] they've got a need that's not being met, until now. (007)

According to professionals, most SIM participants tend to have a personality disorder, with some (004, 005) suggesting that the initial cohort of clients that SIM was aimed at were those with a diagnosis of an emotionally unstable personality disorder (EUPD). However, it was soon clear that many suffered from more than just a PD and have to manage other symptoms, stressors, and diagnoses. This in particular makes it difficult for the service users to attain the help they need as they require access to multiple services. Further, certain issues may exacerbate symptoms of other issues - for example, financial difficulties can increase stress and anxiety, which in turn could negatively affect the PD symptoms and may lead to crisis. Professionals also face the issue of fluctuating symptoms and undiagnosed conditions, which may affect service users during their time with the SIM project and make it difficult to progress with their mentoring by offsetting positive changes and causing them to regress.

Um, so these clients have complex presentations, both mental health and physical as well as social, er, sometimes financial as well. Um, and these are the- these are clients who often don't get the service, um, that they need, to address their issues because there isn't one service that does that. It's multiple services. (005)

The professionals felt that the service users they see most often are those with an extensive history of using the services to varying levels of success. Their involvement in the services often began in their childhood, with one professional remarking that many of the service users they've seen have a history of receiving “some form of care in the care system” (002). This history of using services starting in childhood, may indicate that behaviours are learnt and repeated, and without childhood stability and behaviour corrections, they become high-risk crisis behaviours in adulthood - SIM provides these corrections and stability.

As well as their use of services, service users often have troubled, and even traumatic, childhoods. They are often victims of domestic violence, abuse, and neglect. Growing up in such chaotic environments can often lead to high-risk behaviours such as crime, substance abuse, and self-harm, which then evolve into unhelpful coping strategies in adulthood. Abusive and neglectful household environment will also lead to children developing attachment difficulties and have a negative effect on their self-identity, ultimately contributing to their lack of meaningful relationships in adulthood.

Some professionals (004, 005) identified the volatile emotional environment caused by strained attachments as a contributor to the development of personality disorders, especially the EUPD often seen in SIM participants. Many professionals highlight the importance of understanding how childhood experiences affect the behaviour of the service users in later life, commenting that often they are unable to “figure out exactly what’s really, really happening with them and why that’s happening to them” (002) even in adulthood.

Professionals are clear that service users tend to have learnt “quite a lot of maladaptive coping strategies” (002) and even place themselves in danger by risk-taking, self-harming, and using substances. They believe that poor coping strategies are not a symptom of their mental health difficulties, but are rather the result of their unstable and troubled childhoods. The mentoring they receive from the SIM project provides them with the tools needed to make positive changes to their coping mechanisms.

[I]t’s generally kind of just trying to help them look at ways, alternative ways of coping, or alternative ways of seeking help when they’re in crisis. ‘Cause at the moment they’ve developed one way, which is seen as the maladaptive, um, sort of coping strategies in terms of seeking help. (002)

Due to their chaotic lives, service users will often tend to live a high-risk lifestyle (004) and behave in ways that are not only dangerous to them, but also to others. Professionals describe seeing a lot self-harm behaviours and actions that are indicative of suicidal ideation. One particular professional (002) emphasised that the service users’ high-risk behaviours are not a part of their normal presentation, but are actually acts of despair. According to this professional, the service users’ tendency to use the emergency services frequently, and their self-harm and suicidal behaviours, are a cry for help that they are not receiving from traditional mental health services.

High-risk behaviours also tend to present as violent and dangerous, and especially in a time of crisis the service users “exhibit quite extreme behaviours” (010). This can make it particularly difficult for service users to engage with services in a positive way as they may act inappropriately with staff, making staff fearful and cautious to engage. This disengagement from staff that service users may experience will make them distrustful and even less able to engage in order to get the help they require. The SIM project is therefore helpful in aiding engagement due to the presence of a police mentor who is able to set boundaries and educate service users on how their behaviours may be perceived by others.

The service users described by professionals all have strong feelings of loneliness - they are the “lost and forgotten” (007) people. They tend to have “burnt their bridges” (004) as they are unable to engage with peers and family members in a meaningful way. Some service users may also be unable to form new relationships, making them feel isolated and ostracised. These negative feelings surrounding their social situation can affect their symptoms and increase their suicidal feelings, self-harm behaviours, and will contribute to them reaching a crisis point.

So there is a lot of relational- relationship issues with close members of the, close families, um, arguments, strains from the close families, all have relationships that are not really what you would sort of, in quotes again, would kind of refer to as “meaningful” relationships. (002)

There is a strong feelings from the professionals that the service users’ lack of a strong support system contributes greatly to them having a crisis and using the emergency services. Turning to their support system is a coping strategy most people will utilise in times of distress, however, due to many of them not having someone to turn to when they are at crisis point, service users will seek

help in emergency services. However, in many cases the support received there cannot “really replace a sort of family and friends network” (010) or prevent a crisis, only aid them in dealing with it. The overarching point made is the relationship between PD and social relationships - PD symptoms will affect relationships in a negative way, but good relationships may ease the symptoms of PD.

Theme 2: SIM gives flexibility to professionals and a structure to service users

Sub-theme 1: SIM gives professionals a framework, but they can use their skills and judgement flexibly.

Professionals noted that the SIM model allows for flexibility in the ways they can engage with service users and the skills they can draw upon to do so. Whilst there is a model to work with, professionals noted that they are able to “dig into different types of skill sets and being able to kind of adapt them and use them” (002) in relation to the varied needs of different service users. Professionals felt the flexibility of the SIM model is necessary due the complex and chaotic lives that the service users lead, requiring different approaches for each service user. They noted that the flexibility of the SIM model is especially important, as prior to SIM service users were unable to engage with available services. The services offered were deemed too inflexible for SIM service users who have chaotic, high-risk behaviours. This often resulted in service users being banned from, or unable to access services.

You know it almost feels a little bit like they're discriminated against because nobody knows how to help them, because they can't... the way-- you know there's no flexibility in the way that services are being offered to them before, so they've just kind of been banned from everything. (007).

However, a SIM police officer, whilst noting the necessity of the flexibility offered by the SIM model, felt that the lack of structure provided by the model left them unsure of what their role should entail and how to achieve the aims of SIM in practice. This officer felt that more structure might be useful, however, still maintained that the flexibility the model affords in relation to working with different service users was necessary given their chaotic behaviours.

Er, and I do accept that its gonna be different for each person but maybe a bit more training on what the common threads are or how that's done, or- or is that left to the clinician? Is that what they're doing? Or am I supposed to be doing that? I don't know. So just a bit of guidance I think, might help. (010)

Sub-theme 2: Service users need consistency and boundaries to give structure to their chaotic lives.

Professionals highlighted the chaotic and unstable nature of service users' lives, noting the absence of any kind of meaningful daily structure and support network. As a result of this, professionals emphasised the importance of stability and consistency to give structure to service users' lives and to help them develop healthy coping mechanisms during crises. Consistency in this sense was threefold; professionals emphasised the importance of the SIM team building consistent relationships with the service users, while ensuring service users respond consistently during crisis, and ensuring a consistent response from other services in their relations with service users during crises.

An important thread in ensuring this consistency was the use of crisis plans. These plans are designed to help develop healthy coping strategies for service users during crisis and detail service users' desired responses from other services when they go into crisis. It was noted that it takes a long time to reach a stage where the service user is able to complete a crisis plan as service users are “very difficult to engage, very chaotic” (002), and so it is not clear how successful these plans are yet,

as SIM is relatively new. However, one participant noted that one potential impediment to their success is the absence of a centralised system that all services can use to access crisis plans.

Because it's easy to share care plans when they know how our- the crisis plan response works within our organisation. But it becomes a huge challenge to share that, let alone trying to share that with other NHS organisations that use different systems. (002)

The role of the police officer was also described by professionals as providing boundaries for service users. Enforcing boundaries was considered vital to service users' improvement, reinforcing consequences for their actions and ensuring their safety. Boundary setting was described as "not possible just solely in a mental health setting, and that is actually quite vital to erm, recovery and positive risk taking for people with emotionally unstable personality disorder" (006). However, whilst boundary setting was considered essential for service users with EUPD, it was considered possibly ineffective for participants with antisocial personality disorder (ASPD). In these instances the boundary-setting role of the police officer was considered to be less effective as those with ASPD care much less for bad consequences. The same police officer emphasised that when there are no boundaries to be set for service users then "SIM is ineffective" (006). This was further stressed by another interviewed police officer who questioned the need for a SIM officer if the service user does not commit crimes or does not require the enforcement of consequences for their actions. Whilst discussing their service users, the officer stated:

Like the- some of the- like I say that lady that, erm, just has sort of has stress and there's another lady that's, erm, kind of suicidal but, erm, only intermittently, when things don't go wrong in her life and we have meetings with her, erm, and we can come up with a response plan but I- I do question why I- why am I- why do we need a police officer? You could just have two clinicians that meet with her and empathise, you know. Erm, so yeah, I don't know. (010)

Further, one police officer discussed the importance of criminal behaviour orders (CBO) which were described as last resort boundary-setting measures, and SIM officers' "trump card" (006). The officer detailed how CBOs are very difficult to get and to enforce. This was seen as a result of "a lack of mental health understanding basically, especially around personality disorder" (006). As a result, the officer emphasised that the courts lack the will to enforce CBOs, which in turn means that this boundary setting measure becomes ineffectual.

Theme 3: SIM takes a long time

Sub-theme 1: Setting up the program takes time. Professionals discussed the length of time it took to set-up the programme. The SIM training was praised by most professionals, and the high-intensity network website was considered by one professional to be very useful and full of resources to assist with setting-up SIM (004). Nevertheless, setting-up the programme was a very lengthy process for SIM teams, one professional stated that "it has taken a lot of time and probably 18 months' worth of kind of planning and preparation" (004). Professionals noted that this was partially down to the fact that the programme is new, but many mentioned the difficulties that they faced getting a multidisciplinary team (MDT) in place to support SIM. The MDT were considered by professionals to be an integral part of SIM as their involvement is critical for the clinical care of SIM service users.

The mid-level is- was not necessarily thought about at the start, I think, so your consultant psychiatrists and things like that who have a very important role to play in this and are the responsible clinicians for our service users, so need to have a view of the positive risk taking and all those sorts of things that the project entails. Um, they weren't as on board to start

with, so that has been a real challenge to try turn that around so that now they buy into it and support some of the work that we're doing. (006)

The MDT's involvement in referrals meeting was also mentioned, with professionals noting that getting referrals meetings set-up takes a long time, and that needing a psychology input has "been another issue that we hadn't anticipated at the beginning" (006). One professional noted that perhaps the key health professionals in the MDT had a "lack of knowledge about what we were trying to do, maybe seeing it as additional work" (007), or having a lack of resources in the department. It was also noted that it has been easier to get professionals on board as the project has progressed and its profile has been raised. However, during the initial set-up, delays in MDT involvement contributed to how long it took to get the programme running. As a result of this, many professionals emphasised the need for the MDT to attend the initial SIM training.

I think definitely get the, uh, consultant psychiatrists on board from the start, they need to feed into the training actually, because their expertise is- is fantastic and they really need to buy into it to be able to adequately support the project. (006)

Some professionals also struggled to get a SIM police officer, resulting in delays with setting-up the programme. One professional (002) described how they had been largely operating without a SIM police officer since the start of the programme. They explained how a couple of police officers had come and gone in that time, causing delays due to needing to rebuild trust with service users and for the officers to get to know their history. Another professional (004) noted that one of the main issues they had at the outset of the programme had been negotiating funding for the police role. The role was eventually funded by the police, however, the initial issues guaranteeing funding significantly contributed to delaying the set-up of SIM.

Sub-theme 3: Gaining the trust of service users takes time. Most professionals stressed the fact that gaining a service user's trust takes a long time. This in turn means that making progress with service users takes a long time. As a result, professionals stressed the long-term nature of the project.

So the way I see the SIM model going is it's quite a strategic project, it's not short-term, I don't think you're going to get short-term results from it. I think you need to gain a service user's trust, build a rapport for them to trust you and a bit of continuity and then you can go from there. (010)

Professionals referenced service users' previous negative experiences with services, the police and clinicians as foremost reasons for the length of time it takes to gain their trust. Professionals noted that service users' previous experiences with other services has commonly left them banned from these services, or given short-term care and subsequently discharged. This has resulted in "massive dislike for mental health services" (006) because they "they feel that they are asking for help and the help that they need isn't given, which is why they've got worse and worse and worse" (006).

Further, professionals stated that many service users also "have an intense dislike for the police" (010), due to their previous experiences with the police as a result of their chaotic, high-risk behaviour. One professional noted that service users are therefore "quite apprehensive" (002) of having a police officer involved in their care. Consequently, many professionals noted that the characteristics of SIM staff were crucial for the success of SIM, particularly in relation to the ability to gain a service user's trust.

Erm, but I think- I wouldn't necessarily pat myself on the back at all but I think that the success of SIM I think is gunna start and end with how good the people that are doing it are. Erm, if

you're, erm, project has a structure but if you're not engaging with the service user, they don't trust you, you don't have that rapport with them you're never gonna have any success because they don't trust you and, erm and they're not gonna change anything that they do for you so that's- and that takes time as well so. (010)

Not only was hiring the best individuals for the position considered to be important for gaining service users' trust but ensuring that staff are committed to their role was also considered to be very important. Disruption to the programme as a result of staff changes was considered to be very damaging for service users due to the time it takes to build trust in the first place which is compounded by the length of time it takes to make progress with SIM service users.

[...] when one person in the kind of, the triangle of service user, mental health, police, when one person leaves that you have to start from the beginning, everything gets uprooted, all the trust that you might've built up between someone who's been alienated from both services and doesn't feel like they fit in part- in either service, and to be honest neither service feels like they fit in that service either, when you've built up that trust and that understanding and then one of the elements is removed, you start from the beginning. (006)

Sub-theme 4: Seeing results takes time, and these can be hard to quantify: Staff may feel pressure to provide quantifiable results. Professionals emphasised that the SIM programme is a long-term programme, as improvements with service users take a long time to manifest, "I think the results will actually- if they do come, will be in- like I keep saying, a longer term- six months to a year" (010). This is seen to be a result of the complex nature of SIM service users as they are "very difficult to engage, very chaotic" (002). As a result of the long-term nature of the SIM programme, concerns were raised regarding expectations for the delivery of results in the short-term. Professionals did not believe such results were possible and some expressed concern regarding the potential for the withdrawal of funding in the absence of more immediate reductions in service use.

[..] I don't- I don't want it to withdraw really quickly if the data is not showing enough because I think the data will show more over a longer term than short term so that's my anxiety that funding will kind of get pulled through- through that and yeah that's my main- main concern about the future. (004)

In relation to this, both SIM police officers interviewed expressed concerns regarding how difficult it is to quantify improvements for service users. One officer indicated that they do not have a large problem with service users being sectioned in their borough, however, they note that the expectation of their police force is a reduction of repeat s136 sectioning, as this is how the programme was initially proposed to them. As a result, the officer expressed concern that the aims of the programme will not be met locally, but will however result in other improvements for service users, which are harder to quantify.

But what we do have is a small number of service users who when they do come to notice, it's loud, it's vibrant, it's explosive, it's huge, and so if you're trying to reduce repeat 136s, you're not gonna do it here. So if- as it was kind of, um, described as a reduction of repeat 136s, we're never gonna achieve that aim, but what we might achieve is a lot less demand on services for each incident, and a lot safer progress for that service user. That's a lot more difficult to quantify. (006)

In relation to this, the other interviewed police officer (010) stressed that the police are very results-driven. The officer was concerned that results are likely to take time to materialise given the long-term nature of the programme, and the difficulties involved with quantifying service user

improvement. Whilst discussing police expectations, the officer commented that the police superiors want to see monthly results for their investment in the programme. The officer acknowledged that with certain high-intensity service users, results may be easier to quantify, but for others that are not involved with services to the same extent, it becomes more difficult, “Even if it’s a sort of qualitative success that’s quite hard to- to sort of explain” (010). The officer felt that both the police force and the NHS have different organisational aims, leaving the officer “a little bit in the middle” (010). The officer noted that service users rarely caused equal demand for both the police and the NHS, with service users usually causing more demand for one service and less for the other. This led to “very different opinions” (010) in meetings regarding which service users should participate in SIM. The officer was concerned that the balance was skewed in favour of the NHS, leading to apprehension regarding whether his superiors would continue to be invested in SIM if they do not see a reduction in demand for police services.

[...] the sort of discussions that I’m having with my managers is that it’s, erm, that the project is kind of run more, being run by the NHS and we’re just being, sort of, joined in to do it. But I think they’re trying to address that balance really, cause’ otherwise they might, you know, they might not get commissioned much further, if it’s not, if the police are not seeing the value in it. (010)

Theme 4: Staff must be protected

Although only two participants mentioned the need for police officers to be protected in their role, this theme has wider-reaching implications for SIM implementation. One of these participants felt that as a whole, police may be reluctant to take risks in their role as a SIM officer if their professional security could be compromised.

From the police side [...] we are [...] very, very risk averse [...] there’s a massive mistrust in how well we’re gonna be protected as professionals when we’ve tried to do the right thing. (006)

One aspect of the SIM framework is the reduction in emergency service call-outs to service users, in favour of attempts to help these service users learn to manage their own crises in a more constructive way. As a result, this participant expressed some concern about what could happen when if service users are unable to manage their own crises and end up seriously harming themselves or other people. Following a procedure that is not common professional practice in the police workforce and working with a high-risk population, provokes anxiety in police officers as they are aware that eventually something is likely to go wrong, which they will need to justify in court. This participant expresses their concerns of whether they should continue following police procedures, which they are comfortable with, ensuring that they do not face consequences – or follow SIM principles and do what is best for the service user in the long term.

Okay, but who is gonna be stood in court with me when it all goes wrong [...] are you gonna be stood in the dock with me saying that you told me to do that? (006)

These concerns may be the product of past experiences (outside of SIM), where police officers faced legal ramifications despite best intentions; therefore, SIM officers may need program-specific protections. If such protections are perceived to be absent, police may be wary to attempt strategies unfamiliar to them to help service users in the long run. The consequences police officers face can have a detrimental impact on their life to the extent that they end up suffering with mental health problems themselves.

Because if I meet with a service user and within 48 hours they are seriously injured by their own actions or they hurt someone else or they die, erm, it’s an automatic suspension,

investigation, coroners, everything [...] during that time I am then- so put them on restricted duties, not allowed any contact with members of the public, not allowed a promotion, sideways move, role change, anything, so your life is on hold completely. (006)

The participant felt that organisations that investigate cases that have gone wrong should be aware of the SIM framework and have a good understanding of the role of police officers in the framework. This is to establish that police staff made efforts to help service users and to avoid punishing them when they have genuinely tried act in the best interests of service users.

Service users and carers' interviews

Some of the topics discussed by service users and the carer echoed the themes which emerged from the qualitative analysis of the professionals' interviews. Service users have a long history of mental health problems and involvement with services. Additional problems often complicate getting adequate help – including physical health problems. Service users' past experiences with other services were not always positive; adequate help is not always available for their needs, whether the appropriate services do not exist, or if existing services offer support which service users viewed as simplistic and patronising. Past experiences with the police also mean that service users can be wary of working with a police officer as part of SIM. However, once trust is established, having their involvement can be motivating to improve antisocial behaviour. Having a good rapport with the SIM team was seen as very important for SIM to be successful.

There were some concerns about whether SIM is able to meet the complex needs of high intensity service users. Participants felt that if SIM is to be successful, the service user must be enthusiastic and committed to change; the motivation to get better should be internal. However, a service user may feel like SIM is their "last resort", and if they do not cooperate (even against their better judgement), they will be left without any support at all. Participants were concerned that police (outside of the SIM program) do not have a good understanding of mental health, and whether the training they receive when they take up their SIM role is adequate. An example of this is the "fine line" between encouraging service users to manage crises without involving emergency services, and leaving them to fend on their own with inadequate tools to do so. Finally, an emphasis was placed on the need for the SIM team to be proactive, as people can be less likely to seek out help when their mental well-being reaches a very low point.

Despite these issues, participants felt that SIM does have benefits and can be helpful either to certain people or under certain circumstances. The crises plans were viewed positively because they a) ensured consistency and predictability from all services, and b) allowed the service user autonomy over their own care. For one service user, the main benefit of SIM was the psychological tools that helped them change their behaviour. These strategies led to better introspection and self-reflection, and ultimately the changes they felt they needed to make.

Harms

No harms were observed over the course of the study.

DISCUSSION

This section outlines the limitations of the study, the interpretation of the findings outlined in the Results section, and makes suggestions for future research. Aspects of the qualitative findings have contributed to the interpretation of the other study objectives, so these are discussed where appropriate throughout, as well as in the section on qualitative findings.

Limitations

There is a clear number of limitations to the present study. However, it was never intended as an evaluation of the SIM program, but rather as a feasibility assessment of a) SIM implementation in an urban, heterogeneous context, and b) designing a follow-on study to evaluate program effectiveness, possibly as a randomised control trial. As a result, several of the limitations were anticipated in the planning stages. These are discussed below, in addition to limitations discovered as part of the research process.

The sample size (both in terms of the number of service users and the number of sites) was clearly too small to draw any meaningful conclusions regarding the effectiveness of SIM. This was true for both the statistical analysis of service use reduction, and the economic analysis of relative service use cost. The pre-intervention and follow-up periods were also likely too short to allow for a meaningful estimation of trends, and the potential trend change associated with SIM. This is consistent with the original Isle of Wight study⁶, which detected meaningful (albeit descriptive) changes from around 18 months post-intervention.

In a related problem, the “baseline” point of measurement was consistent with when service users started SIM. Although this is sensible on the surface, one of the themes which emerged from the qualitative research is the time cost involved in getting service users engaged in SIM and gaining their trust. In effect this means that starting SIM is a more gradual process, rather than an immediate start. Because we evaluated sites implementing SIM for the first time, it is also inevitable that certain “teething problems” would present in the beginning, and affect SIM delivery – these problems also emerged from the qualitative interviews with the professionals. This could also contribute to a more gradual implementation period in the beginning.

An example of the type of problems experienced in SIM set-up are the staffing problems at the C&I site over the course of the study. Although the SIM officer post was filled when the program was ready to launch, various practical issues and staffing changes meant that SIM was effectively delivered by the MH professional alone for a large portion of the follow-up period. Although the principles and basis of the program were unchanged, a large part of what differentiates SIM from other interventions for high intensity service users is the involvement of a police officer. Even once a permanent officer was hired for the role, the aforementioned issues with gaining participants’ trust and engagement would still come into play. These problems would obviously affect service delivery.

Additional limitations are arguably the small number of service users and carers who agreed to take part in the qualitative interviews, as well as the problems identified in the quantitative data (the 5 Stream Data and the EQ-5D-5L). However, these issues are directly related to the objectives of the study, and will therefore be discussed in the next section.

Interpretation

The purpose of the study was to evaluate the feasibility of SIM, both in terms of identifying potential problems in implementation, and the potential of evaluating the program using a Randomised Control Trial. The findings discussed below pertain mostly to issues in implementation, as future research is discussed in the next section. However, references will be made where appropriate.

The term “high intensity service user” (HISU) does not appear to have a consistent, set definition, either in the literature or in terms on SIM. In training materials for SIM, HISUs are loosely identified as people who have been detained under s136 at least twice in the past 12 months. This was also an inclusion criterion which we adopted for the purposes of the study. However, many of the SIM service users have other commonalities. “High intensity” service use refers not only to s136 arrests, but emergency service use in general – this is consistent with the 5 Stream Data collected as part of SIM. It is tacitly understood by the programme coordinators and the professionals delivering SIM that *some* degree of emergency service use is likely, but this can vary in frequency and severity. The number of s136 detentions can vary significantly by borough (see Table 5). This means that, at least in London, blanket guidelines on what frequency or severity of service use would “suffice” to warrant a referral to SIM would not be appropriate.

There are also similarities in the clinical profile of SIM users. Many in the present study had a personality disorder diagnosis, particularly Emotionally Unstable Personality Disorder (EUPD) frequently in combination with other diagnoses. However, in qualitative interviews, professionals spoke about these being commonalities, or perhaps diagnoses which could be well-suited to the provisions of SIM, but none expressed that they felt these clinical profiles to be compulsory for SIM. This could partially be attributed to the fact that many of the service users in the present study have a lengthy history of engagement with services, but their problems were often too complex. In this sense, one benefit of SIM is the tailored, flexible approach it offers to professionals, who can use their experience and judgement to provide the type of support and resources that the individual service user needs. However, a lack of defined service user profile would complicate the design of an empirical study into SIM effectiveness. These outcomes suggest that using s136 alone would not be sufficient as an indicator of severity or need in follow-up research, given that SIM professionals look at many facets of the service user’s clinical profile and needs before accepting them onto the program. This is especially true in London (or presumably any diverse, urban environment), as the “most severe” service users in one borough may be significantly more or less intensive than the “most severe” users in another borough.

Retention in the SIM program appears to be good, based on the data collected. Only two service users dropped out over the course of the follow-up period, and one of those was for practical reasons (moving out of area). This suggests that, at least on the surface, HISUs are willing to work within the SIM program parameters – including working with a police officer as well as a mental health professional. This is also corroborated by the number and frequency of session attendance, although anecdotally SIM staff have mentioned that it is common for appointments to be missed or rescheduled.

Interviewing service users for the study was found to be more challenging. Part of the reason is that referrals to be study had to be made through the SIM team, who understandably had to prioritise the service users’ treatment and well-being above study participation. By definition, HISUs have complex mental health needs, and it may be difficult to schedule a time window where conducting an interview would be appropriate. One of the service users who agreed to be interviewed was nearing their discharge from the program – perhaps with a longer follow-up period it would be more

practical to retrospectively interview service users about their experiences as they near program completion.

Some of the limitations in the objective data quality had already been discussed in the Results section. The SIM program requires 5 Stream Data collection as part of program delivery, which is beneficial for future research, as all data collected is standardised to the same template and collected within the same time frame and format. However, because these data are collected from other services' databases it means that some degree of subjective judgement is necessary. It may be beneficial for the SIM officers (who are typically responsible for data collection) to receive explicit guidance on how to interpret and format data from other sources. This is especially true for, for example, data on mental health bed occupancy. At present this is recorded as a binary (0 or 1) variable, based on whether that service user occupied a bed within a 24-hour period. However, in reality this is not strictly a count variable, but a duration variable, and perhaps ought to be recorded and analysed in a different manner entirely.

As mentioned previously, the geographic separation of NHS databases could also lead to problems in recording service use, such as if a service user calls an ambulance in a different city. In some senses, this issue is an unavoidable limitation – nation-wide databases of ambulance, A&E, or police use simply do not exist. However, the SIM teams work very closely with their service users and are in frequent contact. Given a trusting relationship, it is reasonable for service users to disclose if they travel, or even if they called services while away from home. Of course, reliance on honest disclosure is not fool-proof in all situations, but it can help.

With the exception of specific training on data interpretation, the SIM teams appear to be satisfied with the quality and quantity of the training and support (supervision) which they receive. In general, professionals appear to value the flexibility and freedom which SIM gives them, because it allows them to tailor their approach and professional experience to each individual and their specific needs. Similarly, there is no mandatory framework that specifies how frequently supervision and on-going training should take place. Rather, the SIM team meets with their supervisors on an as-needed basis; this was described positively in the qualitative interviews. The professionals interviewed also appear satisfied with the resources which are available to them for ongoing training and development within the SIM program, although this may be an area worth monitoring as SIM expands to new areas.

The service use outcome data was considerably overdispersed (with the possible exception of s136 detentions). As a result, the Poisson model which was proposed in the study protocol does not appear to be adequate. Models specific to overdispersed data (Poisson Inverse Gaussian, negative binomial, or quasipoisson) may be more suitable for similar analyses in future studies. Despite these limitations, the results suggest that there might have been a reduction in some service use (A&E attendance and s136 detentions). These findings should be viewed as tentative. Our study was not powered to reliably detect an effect of SIM, and it is not clear whether the SIM and control sites are truly comparable. Nonetheless, the observed trends are somewhat consistent with the Isle of Wight pilot study⁶, and suggest that further research evaluating the program on a longer time scale and with a larger sample would be warranted. By the same token, the economic analysis did not identify any cost savings in service use associated with SIM, but this is consistent with the statistical analysis and the limitations of the data. What the analyses do demonstrate is that carrying out both a statistical analysis of service use and an economic analysis of cost savings is feasible for future research evaluating SIM effectiveness.

Additional outcomes from the qualitative interviews suggest some considerations that may be taken into account in future SIM implementation and evaluation. First of all, physical problems are experienced by a substantial proportion of service users in addition to mental health issues. This can complicate data collection on, for example, A&E visits. Second, service users' problems and engagement with services is long-term, often stemming from childhood. This means that building trust and rapport will necessarily take time, so it would be unreasonable to expect quick, measurable outcomes. The high-risk crisis behaviours can be viewed as acts of desperation, borne of inadequate support in the past; once this support is provided, these behaviours would likely decrease, but the improvements will take time. On the flip side of this, professionals engaged with SIM should receive adequate support, practically, professionally, and legally. Finally, crisis plans were viewed favourably by both service users (who saw them as a chance to have autonomy over their care), and services (who welcomed the chance to have helpful information and the opportunity to provide consistent care). Although more research on the facilitators and barriers for crisis plan implementation is necessary, these findings suggest that they could be very valuable tool for improving the standards of HISU care.

Future research

One of the key aims of the present study was to evaluate the feasibility of conducting a rigorous evaluation of the SIM program effectiveness, potentially as an RCT. In the present study we used two types of potential evaluations of SIM effectiveness: a statistical reduction in emergency service use, and an economic analysis of SIM cost-effectiveness compared to management as usual. The sample size and follow-up period were too small to find any meaningful change, but this was consistent with the study aims. However, the quantity, quality, and availability of the service use data appear to be satisfactory for a follow-on study, if the issues raised in the sections above are adequately addressed. Any future investigations would be advised to conduct a power analysis and on that basis decide on an appropriate number of sites, participants within sites, and follow-up period.

Service use reduction and reductions in cost are reasonable outcomes to consider, and are in line with the aims of the SIM program. However, these outcomes are proxy measures for the types of changes that SIM is designed for service users to make. This includes better crisis management, a reduction of emergency service use where this is not appropriate, fostering better, more meaningful relationships, and better management of any clinical pathology, such as personality disorder. Future studies on SIM should consider which outcomes should be taken into account. The answer may depend on which stakeholder group is the target audience. For example, commissioners within emergency services may be interested in the direct reduction to service use and the associated costs. Service users themselves could be interested in the lived experience of others who have gone through SIM, and the long-term improvements to their quality of life and stability. Carers could also be interested in these factors, in addition to increased independence and better crisis management. The SIM program targets service users with a range of complex issues; as a result the benefits of SIM can also be multi-faceted, and this should be taken into account when designing outcome measures.

The study had significant gaps in the data collected from the non-SIM site. If future studies require data collection from control sites, separate data transfer agreements should be negotiated with each of the service providers. This is also true for any control sites which would be implementing SIM at a later date. Although data collected as part of SIM starts prior to programme start (12 months prior to baseline), in practice this data is collected retrospectively. The person responsible for data collection is typically the SIM officer, whose post is only funded once SIM is launched. It is

unlikely that most Trusts would have the capacity to collect this data (which would also imply identifying prospective SIM users) prior to SIM launch.

Although the flexibility of SIM is discussed positively by the SIM teams in terms of patient benefit, the relative lack of manualisation may prove a challenge for research. Because the program relies on expert mental health and police professionals to make judgement calls in how a particular case should be approached, it would be difficult to compare treatment in an RCT setting. A pragmatic, pre-post study may be more advisable, as it would minimise the issue, as well as the problems around geographical differences in HISU severity.

Smaller issues which should be taken into account by future research have been identified throughout the report. For example, inevitable practical issues such as changes in staff should be noted and taken into account, as they can affect the patient experience. Service users' capacity to attend meetings (e.g., for regular self-report data collection) should not be over-estimated, and the burden should be reduced wherever possible: for example, by using brief questionnaire versions, or conducting research online or over the phone. With enough lead-in time, it may be beneficial to embed an evaluation study into SIM implementation, where all staff involved would be aware of the research taking place. Similarly, an initial, brief introduction to the study could be made when service users are first enrolled in SIM.

In broader terms, more research is needed looking at the ways in which mental health services can better liaise with police officers, as well as whether or not these different methods are cost-effective in the long term and also how they impact patient outcomes, particularly in terms of health-related quality of life.

CONCLUSIONS

The SIM program addresses an important gap in service provision to people with complex mental health needs who repeatedly seek out emergency services when experiencing a crisis. Compared to other available interventions, SIM is unique in providing service users with ongoing, intensive support from both mental health professionals and police outside of crisis times. The professionals who took part in the qualitative interviews viewed the combination of mental health support (from MH professionals) and boundary setting (from police officers) as important for high intensity service users.

As expected, the follow-up period of this feasibility study was too brief to see statistically significant decreases in service use and associated costs, although we saw a fall in s136 detentions and A&E attendance. This is consistent with pilot studies of the program, as well as the opinions of professionals, who spoke about the time needed to build rapport with service users and gain their trust before tangible changes could be seen.

The program is not currently at the stage where a randomised control trial could be recommended, and London boroughs are too heterogeneous to allow for meaningful cluster matching. A pragmatic pre/post assessment of effectiveness is more likely to lead to meaningful evaluation of SIM which is currently practiced without a substantial evidence base and requires urgent evaluation. However, study design will need to take into account the difficulties in both subjective and objective data collection. Specifically, the fact that service users (especially in the early stages of SIM engagement)

are not always well enough to take part in research, and the fact that emergency service data can be unreliable.

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OTHER INFORMATION

Registration

The study was sponsored by University College London, sponsor reference number 18/0360.

Protocol

The study was based on protocol version 1.2, 30/07/2018. The protocol is available upon request.

Funding & ethical approval

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The study was reviewed and approved by the London – Surrey Borders Research Ethics Committee (REC reference 18/LO/1546, IRAS project ID 246939)

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APPENDIX 1

Interview schedules

1. Service users

Introduction:

Thank you for agreeing to take part in our research study. We're interested in the experiences of people like yourself who have taken part in the Serenity Integrated Monitoring programme. We'd like to speak to you a bit about your experiences with the programme over the past few months.

1. Tell me a bit about yourself – what kind of difficulties were you having when you first involved with the programme? What was your interaction with the mental health staff at the Trust before you joined the SIM programme like?
 - a. Prompt: Before SIM, did you get help, or were you offered help from anyone else? What did you think about them?
2. What was it like to work with both the mental health staff at the Trust and a police officer? Did your experience change with having a police officer present?
3. In what ways do you think SIM (working with both a police officer and mental health nurse) has affected you, the way you think or act? This can be either positive things or negative ones.
4. What would you have liked to be different about your experiences with SIM?
5. Is there anything you would say to someone in a similar position as you, who's just starting on the programme?
6. Is there something else you'd like to say about your experience with the SIM programme?

Outro: Thank you very much for taking the time to share your experiences with me.

2. Carers

Introduction:

Thank you for agreeing to take part in our research study. We're interested in the experiences of people like yourself who have loved ones who have taken part in the Serenity Integrated Monitoring programme. We'd like to speak to you a bit about your experiences.

1. To start with, could you tell me about your relationship with [the person you care for]?
2. Tell me a bit about [the person you care for] – what kind of difficulties were they having when they first got involved with the programme?
3. Tell me a bit about any support they received before they got involved with the programme? E.g. from the Mental Health Trust
4. Do you think the involvement with SIM had an effect on the person you care for? If so, how?
5. And how has their involvement with SIM affected you, and your relationship with them?
6. Do you know very much about the SIM programme? What's your general opinion about it?
 - a. Prompt: Do you think it can be helpful to other people?

- b. Prompt: Is there anything you would change about it to make it better?
7. What sort of help or support do you think [the person you care for], and other people like [him/her] need the most?
8. Is there something else you'd like to add about your experience with the SIM programme?

Outro: Thank you very much for taking the time to share your experiences with me.

3. Professionals

Introduction:

Thank you for agreeing to take part in our research study. The SIM programme is a very new one in London, so we're interested in the unique experiences and challenges of the professionals who deliver it in order to improve it. I have some questions to help steer the conversation, but if there's anything you think is important to talk about, please go ahead.

1. Tell me a bit about your professional career path and how you got involved with SIM?
2. Now that you've been involved with SIM for some time, how do you feel about the programme?
3. Tell me about the type of person you see as part of the programme – what are they like, what sort of challenges are they dealing with?
4. What type of person do you think SIM can benefit the most?
5. What sort of difficulties have you been experiencing in delivering the SIM programme?
6. What kind of things made delivering the programme easier?
7. What recommendations would you make for the programme going forward?
8. Is there something else you'd like to say about your experience with the SIM programme?

Outro: Thank you very much for taking the time to share your experiences with me.

APPENDIX 2

Examples illustrating stages of qualitative analysis

One theme (“Service users have complex needs and chaotic lives”) was selected from the qualitative analysis to illustrate its evolution from transcript to reporting.

Stage 2: Initial codes were systematically generated for each transcript

Table 12. *Example of stage 2 initial themes coding*

Transcript excerpt	Initial code
P: I think the programme is very, very useful working with complex clients who present complex issues within the community, because they've got a multi- we use often a multi-agency approach to some of our clients who have contact with the criminal justice system, they overuse the 136 suite, um, er, in the mental health unit, um... they, um, may be under probation, um, so we- they may have housing issues or housing difficulties, they may have social issues which impact. (005)	SIM useful for complex, high-intensity SUs due to multi-agency approach
P: Erm, so the common theme throughout them- each of the service users I think seems to be loneliness, erm, or structure to their day, erm, some sort of sense of purpose, erm, so their- each tend to have personality disorder of some kind which they have to manage, erm, but within that, erm, the reason that I think that they end up going into crisis really is because they're- they're not really sure what else to do I think, they don't have a structure to their day, they don't have many friends, they don't have a supportive family (010)	SUs have PD, tend to be lonely, lack structure and purpose
P: Okay. So a variety, so I can kind of look at it, um- So a lot of service users that we're seeing at the moment, yes they have mental health difficulties. Um, and predominantly quite a lot of them have got personality disorder traits or diagnoses. But a lot of it um, a lot of the issues are quite um, when you dig deep and you look at the social factors, actually social factors are the main driving force, um, as well as some of their experiences in childhood. So there's a kind of a general theme going on with the majority of the service users that we're working with. And it's sort of a, you kind of need to kind of understand the schemas that are involved in terms of how the um, childhood literally, literally affects how they're behaving right now. So they've had to learn quite a lot of maladaptive coping strategies or mechanisms in, in, over years.	Most SUs have personality disorder Social factors and childhood main cause of SU's behaviour Maladaptive coping strategies, SIM working to replace these

Stage 3: Preliminary themes were created using the codes generated in Stage 2.

Below is the initial theme proposed on the basis of the type of initial codes generated in Stage 2.

Overarching theme:

Service users have complex needs and chaotic lives

Sub-themes:

- Multiple MH diagnoses, poor coping strategies, risky behaviours, loneliness
- Other services have tried and failed to help them

Stage 4: Themes were reviewed at the data level (does the data fit into the theme framework?) and at the theme level (visualised into a thematic map)

After revising the initial thematic framework proposed in Stage 3, these were revised based on the supporting evidence. Below is an example to the revisions

Overarching theme:

Service users have complex needs and chaotic lives

Potential sub-themes?

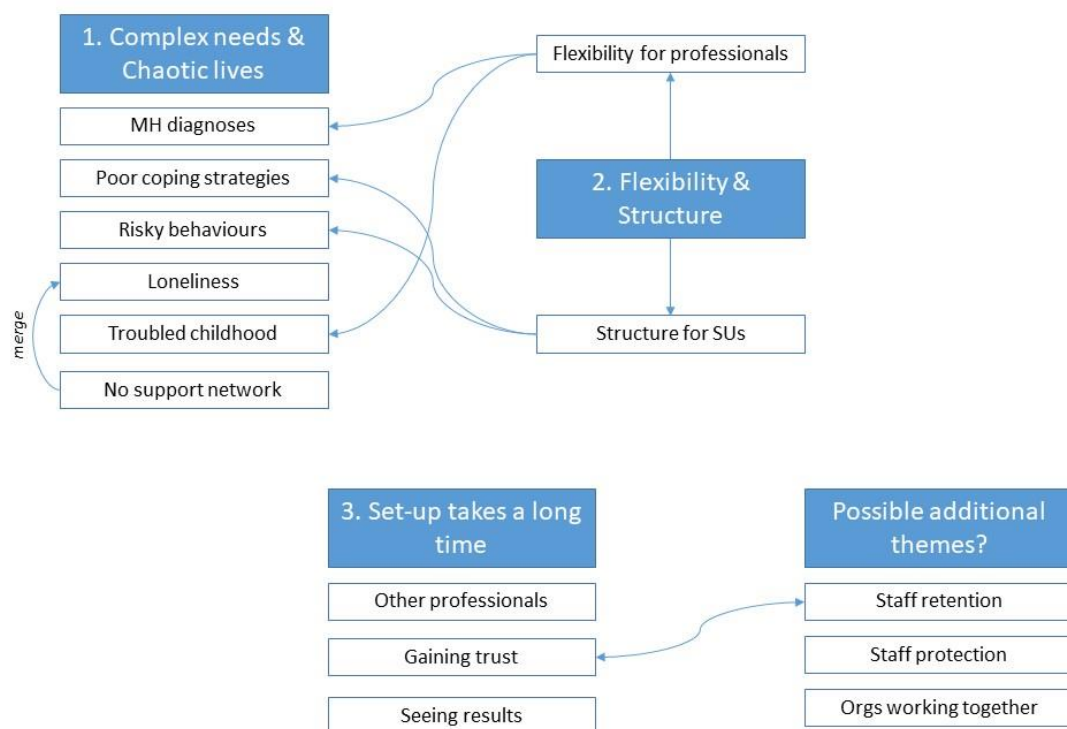
- Multiple MH diagnoses, poor coping strategies, risky behaviours
- Other services have tried and failed to help them
- Loneliness
- Troubled childhood
- Lack of support network

Revisions from Stage 3:

1. Loneliness added as a separate subtheme – many of the interviews really emphasise that as a key theme for the SUs;
2. Troubled childhood as a new subtheme – it's mentioned a few times and attachment is explored, but possibly not enough to warrant a separate mention;
3. Lack of support network as a new subtheme – lack of friendships, family, etc. leading SUs to crisis and no one to advocate for them – felt important enough, though potentially could be merged with loneliness.

Figure 6 is a thematic map created using the revised themes generated at this stage.

Figure 6. Thematic map generated at Stage 4 of the thematic analysis



Stage 5: Themes were named and defined.

The final set of themes was revised again following Stage 4; each theme was given a descriptive title and a brief definition (including sub-themes, where appropriate).

Service users have complex needs and chaotic lives

This is a broad theme which encompasses the complexities of these service users' needs. This includes

- Issues are chronic/long-term, often stemming from childhood
- A mental health diagnosis, or often several
- Poor coping strategies (especially in a crisis)
- High-risk behaviours
- Loneliness: many service users don't have a social support network (friends, family). This means they have nobody to turn to in a crisis (cf. point above), and nobody who can advocate for them.

Quotes supporting this theme can incorporate any/all of the above points

The transcripts were re-coded using the finalised definitions, and the final set of quotes was used to write a detailed description and interpretation of each theme.

APPENDIX 3

Models used in the statistical analysis of 5 Stream Data

Statistical Modelling

We modelled each outcome using generalised linear mixed effects models. All outcomes are counts of events. After initial data exploration, it appeared that all outcomes were overdispersed, with the possible exception of s136 detentions. We fitted Poisson and negative binomial models to each outcome and used AIC and BIC to evaluate which error distribution was more consistent with the observed data.

Each distribution was fit two model types: a simple means comparison and an interrupted time series (ITS) regression model. For the outcomes for which control group data were available:

Means comparison (Model A).

This model compares the means of the outcome between the SIM participants and the control group, in the periods before and during the SIM intervention. The model is defined as follows:

$$\log(\mu_{ij}) = \beta_0 + u_j + \beta_1 CNTR_j + \beta_2 INT_{ij} + \beta_3 CNTR_j \times INT_{ij} + \log\left(\frac{days}{30}\right)$$

$$Y_{ij} \sim \text{Poisson}(\mu_{ij}) \text{ or } Y_{ij} \sim \text{NegBin}(\mu_{ij}, \alpha) \text{ with } \text{Var}(Y_{ij}) = \mu_{ij} + \alpha \mu_{ij}^2,$$

$$u_j \sim N(0, \sigma_u^2), j = 1, \dots, 22, i = 1, \dots, n_j$$

where:

- CNTR is a dummy variable coded 0 = SIM participant, 1 = control group member
- INT is a dummy variable coded 0 = period before SIM start, 1 = period after SIM start
- $\log(days/30)$ is an offset: 'days' indicates the number of days in the month in which the data were observed. Dividing by 30 standardises the results such that each month is considered to have 30 days.

Two coefficients are of particular interest in this model:

- **β_2 , the 'Intervention Period' coefficient:** this estimates the difference in mean event count for the SIM group, during the SIM intervention compared to before intervention start. $\beta_2 < 0$ indicates a reduction in the event count in the SIM period compared to before. So negative β_2 indicate evidence in favour of the SIM intervention being effective in reducing the event count.
- **β_3 , the 'Control * Intervention interaction' coefficient:** this estimates the difference-in-differences between the SIM and control group; $\beta_3 > 0$ indicates that the event count reduced more in the SIM group compared to the control group. So positive β_3 indicate evidence in favour of the SIM intervention being more effective in reducing event counts than the control condition.

ITS Regression (Model B)

$$\log(\mu_{ij}) = \beta_0 + u_j + \beta_1 TIME_{ij} + \beta_2 CNTR_j + \beta_3 INT_{ij} + \beta_4 TIME_{ij} \times CNTR_j + \beta_5 TIME_{ij} \times INT_{ij} + \beta_6 CNTR_j \times INT_{ij} + \beta_7 TIME_{ij} \times CNTR_j \times INT_{ij} + \log\left(\frac{days}{30}\right)$$

$$Y_{ij} \sim \text{Poisson}(\mu_{ij}) \text{ or } Y_{ij} \sim \text{NegBin}(\mu_{ij}, \alpha) \text{ with } Var(Y_{ij}) = \mu_{ij} + \alpha \mu_{ij}^2,$$

$$u_j \sim N(0, \sigma_u^2), j = 1, \dots, 22, i = 1, \dots, n_j$$

where:

- CNTR is a dummy variable coded 0 = SIM participant, 1 = control group member
- INT is a dummy variable coded 0 = period before SIM start, 1 = period after SIM start
- TIME is a continuous variable, measured in months, coded zero at the last month before SIM start

Four coefficients are of particular interest in this model:

- **β_3 , the ‘Intervention Period’ coefficient:** this estimates the change in mean event count in the first month of the intervention period, i.e. a ‘step change’ at the point at which SIM starts. $\beta_3 < 0$ indicates a step-change reduction in the event count, and thus evidence in favour of the SIM intervention leading to an immediate reduction in the outcome.
- **β_6 , the ‘Intervention*Control interaction’ coefficient:** this estimates the difference in ‘step’ change between the Control and SIM groups at the point at which the intervention period started. $\beta_3 > 0$ indicates that the step change was further in the desired direction (downwards) for the SIM group compared to the control group.
- **β_5 , the ‘time*intervention interaction’ coefficient:** this estimates the slope change in the SIM group in the intervention period, compared to the pre-intervention period. $\beta_6 < 0$ indicates a change in trend favourable to the idea that SIM leads to gradual reduction of the outcome event count.
- **β_7 , the ‘time*control*intervention interaction’ coefficient:** this estimates the difference in slope change between the control and the SIM group in the intervention period, compared to the pre-intervention period. $\beta_7 > 0$ indicates a difference in trend change consistent with the idea that SIM leads to more favourable trends than the control condition.

Means comparison (Model C)

When no control outcome data are available (police deployment and ambulance deployment)

This model compares the means of the outcome among the SIM participants in the periods before and during the SIM intervention. The model is defined as follows:

$$\log(\mu_{ij}) = \beta_0 + u_j + \beta_1 INT_{ij}$$

$$Y_{ij} \sim \text{Poisson}(\mu_{ij}) \text{ or } Y_{ij} \sim \text{NegBin}(\mu_{ij}, \alpha) \text{ with } Var(Y_{ij}) = \mu_{ij} + \alpha \mu_{ij}^2 + \log\left(\frac{days}{30}\right),$$

$$u_j \sim N(0, \sigma_u^2), j = 1, \dots, 22, i = 1, \dots, n_j$$

where:

- INT is a dummy variable coded 0 = period before SIM start, 1 = period after SIM start

One coefficient is of particular interest in this model:

- **β_1 , the 'intervention' coefficient.** This estimates the difference in mean event count for the SIM group, during the SIM intervention compared to before intervention start. $\beta_1 < 0$ indicates a reduction in the event count in the SIM period compared to before. So negative β_2 indicate evidence in favour of the SIM intervention being effective in reducing the event count.

ITS Regression (Model D)

$$\log(\mu_{ij}) = \beta_0 + u_j + \beta_1 TIME_{ij} + \beta_2 INT_{ij} + \beta_3 TIME_{ij} \times INT_{ij} + \log\left(\frac{days}{30}\right)$$

$$Y_{ij} \sim \text{Poisson}(\mu_{ij}) \text{ or } Y_{ij} \sim \text{NegBin}(\mu_{ij}, \alpha) \text{ with } \text{Var}(Y_{ij}) = \mu_{ij} + \alpha \mu_{ij}^2,$$

$$u_j \sim N(0, \sigma_u^2), j = 1, \dots, 22, i = 1, \dots, n_j$$

where:

- INT is a dummy variable coded 0 = period before SIM start, 1 = period after SIM start
- TIME is a continuous variable, measured in months, coded zero at the last month before SIM start

Two coefficients are of particular interest in this model:

- **β_2 , the 'intervention' coefficient:** this estimates the difference in event count for the SIM group at the point at which the intervention started, compared to the month immediately prior to the start, taking into account the prior trend in the event count. $\beta_2 < 0$ indicates a step change reduction in the event count at the start of the SIM period. So negative β_2 indicate evidence in favour of the SIM intervention being effective in reducing the event count.
- **β_3 , the 'intervention*time interaction' coefficient:** this estimates the difference in slope among the SIM participants, comparing the intervention period with the period before the intervention; $\beta_3 < 0$ indicates that slope was smaller in the intervention period. So negative β_3 indicate evidence in favour of the SIM intervention leading to a change in trend favourable to gradual reduction of (or a smaller rate of increase in) the event count.

APPENDIX 4

Detailed statistical outcomes

Two methodological notes also arise from the analysis. First: The outcomes of the statistical analysis demonstrate that the outcome data generally have an unusual distribution, with more than half of the values being zeroes in most cases, and extreme skew (see in particular Tables 13-17 in Appendix 4). Because of the relatively small sample size and short follow-up period, the random noise in the data is likely to be considerably larger than any effect of the SIM intervention, if one exists.

Second: All models estimated lead to some large deviance residuals, which raises the possibility that the model estimates are sensitive to outliers in the data and thus unstable. This is explained in more detail in Appendix 4 (see table 23 and commentary), using Mental Health Bed Days data. Zero-inflated models might have been considered, but are difficult to estimate in the context of a mixed effects model, and also potentially difficult to interpret with respect to the research question posed.

Table 13. *Distribution of the number of attendances at A&E departments per month by treatment group, site, and period*

Period	Control		SIM: All		Within SIM:			
	Pre	Post	Pre	Post	Camden & Islington		Oxleas	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Mean	1.79	2.29	0.96	1.11	0.57	0.46	1.62	2.22
SD	2.33	2.70	1.67	2.37	1.00	0.73	2.31	3.54
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Q1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Median	0.97	1.04	0.00	0.00	0.00	0.00	0.00	0.00
Q3	2.90	3.87	1.02	0.99	0.97	0.97	2.90	3.15
Max	11.61	12.58	10.00	15.48	5.81	4.00	10.00	15.48
Observations	132	110	132	98	84	62	48	36
Participants	11	11	11	11	7	7	4	4

Notes: Values were standardised to a 30-day-month. Pre: period before intervention; Post: period during intervention. SD: Standard deviation. Min: minimum. Q1: 1st quartile. Q3: 3rd quartile. Max: maximum.

Table 14. *Distribution of the number of S136 Detentions per month, by treatment group, site, and period*

	Control		SIM: All		Within SIM:			
	Pre	Post	Pre	Post	Camden & Islington		Oxleas	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Mean	0.51	0.34	0.26	0.16	0.26	0.17	0.26	0.14
SD	0.84	0.58	0.62	0.44	0.63	0.49	0.59	0.34
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Q1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Median	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Q3	0.97	0.97	0.00	0.00	0.00	0.00	0.00	0.00
Max	3.87	2.00	2.90	3.00	2.90	3.00	2.90	1.00
Observations	132	110	132	98	84	62	48	36
Participants	11	11	11	11	7	7	4	4

Notes: Values were standardised to a 30-day-month. See notes to Table 1.

Table 15. *Distribution of the number of mental health bed days per month, by treatment group, site, and period*

	Control		SIM: All		Within SIM:			
	Pre	Post	Pre	Post	Camden & Islington		Oxleas	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Mean	1.26	0.79	1.13	0.75	0.07	0.14	3.00	1.78
SD	4.29	3.54	4.38	2.80	0.26	0.35	6.91	4.44
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Q1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Median	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Q3	0.97	0.00	0.00	0.00	0.00	0.00	0.48	0.00
Max	29.03	30.00	30.00	21.29	1.07	1.00	30.00	21.29
Observations	132	110	132	98	84	62	48	36
Participants	11	11	11	11	7	7	4	4

Notes: Values were standardised to a 30-day-month. See notes to Table 1.

Table 16. *Distribution of the number of police deployments per person per month, by site and period*

	Control		SIM: All		Within SIM:			
	Pre	Post	Pre	Post	Camden & Islington		Oxleas	
					Pre	Post	Pre	Post
Mean	-	-	1.10	1.13	1.07	1.08	1.14	1.21
SD	-	-	1.71	1.79	1.74	1.54	1.68	2.17
Min	-	-	0.00	0.00	0.00	0.00	0.00	0.00
Q1	-	-	0.00	0.00	0.00	0.00	0.00	0.00
Median	-	-	0.00	0.00	0.00	0.00	0.48	0.00
Q3	-	-	1.94	1.94	1.94	1.94	1.23	1.94
Max	-	-	10.65	9.00	10.65	5.81	6.77	9.00
Observations	-	-	132	98	84	62	48	36
Participants	-	-	11	11	7	7	4	4

Notes: No observations from the control group were available. Values were standardised to a 30-day-month.
See notes to Table 1.

Table 17. *Distribution of the number of ambulance deployments per person per month, by site and period*

	Control		SIM: All		Within SIM:			
	Pre	Post	Pre	Post	Camden & Islington		Oxleas	
					Pre	Post	Pre	Post
Mean	-	-	0.77	0.94	0.66	0.70	0.96	1.34
SD	-	-	1.64	1.93	1.40	1.76	2.00	2.15
Min	-	-	0.00	0.00	0.00	0.00	0.00	0.00
Q1	-	-	0.00	0.00	0.00	0.00	0.00	0.00
Median	-	-	0.00	0.00	0.00	0.00	0.00	0.00
Q3	-	-	0.97	1.00	0.98	0.00	0.97	1.94
Max	-	-	10.71	11.00	6.77	11.00	10.71	8.00
Observations	-	-	132	98	84	62	48	36
Participants	-	-	11	11	7	7	4	4

Notes: No observations from the control group were available. Values were standardised to a 30-day-month.
See notes to Table 1.

Table 18. AIC & BIC: Indicators of model quality comparing Poisson and negative binomial mixed effects models for simple means comparisons and ITS regression, for 5 Stream outcomes

	AIC				BIC			
	Means comparison		ITS regression		Means comparison		ITS regression	
	Poisson	Neg Bin	Poisson	Neg Bin	Poisson	Neg Bin	Poisson	Neg Bin
A&E	1561	1443	1526	1432	1567	1449	1536	1443
S136	664	666	654	656	670	672	664	667
MH Beds	1862	886	1766	884	1867	893	1775	895
Police	696	640	695	640	697	642	697	642
Ambulance	673	536	671	538	674	538	673	540

Notes: Neg Bin: negative binomial. AIC: Akaike's Information Criterion. BIC: Bayesian Information Criterion. All models are mixed effects models with a random intercept for participants.

- Choose Poisson for S136, negative binomial for everything else.
- ITS regression fitted better for the three measures for which control group data were available.
- Means comparison fitted better for the two measures for which no control group data were available.
- Present both simple means comparison and ITS regression.

Table 19. A&E Attendances: Estimates from the negative binomial means comparison model

	Estimate	SE	IRR	(95 % C.I.)	
Intercept	-0.450	0.325			
Control	0.680	0.456	1.97	0.80	4.77
Intervention	0.029	0.195	1.03	0.71	1.53
Control*Intervention	0.189	0.240	1.21	0.75	1.92
Dispersion	1.019				
Random intercept: Between-person variance	0.963				

Note: Bootstrapped standard errors and confidence intervals (normal assumption) based on 500 bootstrap samples.

Table 20. A&E Attendances: Estimates from the negative binomial ITS Regression model

	Estimate	SE	IRR	(95 % C.I.)	
Intercept	-0.200	0.392			
Time	0.038	0.034	1.04	0.97	1.11
Control	0.547	0.553	1.73	0.58	5.03
Intervention	0.463	0.345	1.59	0.82	3.17
time*Control	-0.019	0.045	0.98	0.90	1.07
Time*Intervention	-0.238	0.066	0.79	0.69	0.90
Control*Intervention	-0.029	0.429	0.97	0.42	2.26
Time*Control*Intervention	0.140	0.086	1.15	0.97	1.36
Dispersion	1.036				
Random intercept: Between-person variance	0.932				

Note: Bootstrapped standard errors and confidence intervals (normal assumption) based on 500 bootstrap samples.

Table 21. S136 detentions: Estimates from the Poisson means comparison model

	Estimate	SE	IRR	(95 % C.I.)	
Intercept	-1.591	0.293			
Control	0.672	0.383	1.96	0.91	4.06
Intervention	-0.443	0.346	0.64	0.34	1.31
Control*Intervention	0.029	0.411	1.03	0.45	2.25
Dispersion	n/a				
Random intercept: Between-person variance	0.500				

Note: Bootstrapped standard errors and confidence intervals (normal assumption) based on 500 bootstrap samples.

Table 22. *S136 detentions: Estimates from the Poisson ITS regression*

	Estimate	SE	IRR	(95 % C.I.)	
Intercept	-1.092	0.401			
Time	0.082	0.056	1.09	0.97	1.21
Control	0.268	0.522	1.31	0.47	3.63
Intervention	0.051	0.495	1.05	0.41	2.88
time*Control	-0.068	0.066	0.93	0.82	1.07
Time*Intervention	-0.413	0.151	0.66	0.51	0.91
Control*Intervention	-0.091	0.625	0.91	0.26	3.04
Time*Control*Intervention	0.282	0.166	1.33	0.94	1.79
Dispersion	n/a				
Random intercept: Between-person variance	0.493				

Note: Bootstrapped standard errors and confidence intervals (normal assumption) based on 500 bootstrap samples.

Table 23. *Mental Health Bed Days: Estimates from the negative binomial means comparison model*

	Estimate	SE	IRR	(95 % C.I.)	
Intercept	-1.636	0.562			
Control	1.485	0.734	4.42	1.02	18.20
Intervention	0.541	0.458	1.72	0.70	4.24
Control*Intervention	-1.483	0.608	0.23	0.07	0.74
Dispersion	0.726				
Random intercept: Between-person variance	1.898				

Note: Bootstrapped standard errors and confidence intervals (normal assumption) based on 500 bootstrap samples.

The estimates in Table 23 appear to contradict the descriptive data, as shown for example in Table 3. Although the mean number of bed days in the SIM group was lower in the intervention compared to the pre-intervention period, the model here estimates a higher mean number of bed days for SIM participants in the intervention period. This apparent paradox is the result of the single participant for whom only 5 months of follow-up data were available. This participant had a high mean number of bed days in their follow-up period. This influenced the descriptive mean relatively little (due to the smaller number of data points relative to other participants), but strongly influenced the model results, since the model essentially assumes that the five available months of data for this person are representative of the whole follow-up period. Removing this participant from the analysis changed the point estimates considerably (Intercept: -1.584, Control: 1.435, Intervention: - 0.034, Control*Intervention: - 0.902). The influence of this participant on the (better fitting) ITS regression model was less strong, as this model controls for the influence of time.

Table 24. *Mental Health Bed Days: Estimates from the negative binomial ITS regression*

	Estimate	SE	IRR	(95 % C.I.)	
Intercept	-0.477	0.797			
Time	0.227	0.097	1.25	1.03	1.51
Control	0.951	1.068	2.59	0.32	20.96
Intervention	-0.600	0.920	0.55	0.10	3.64
time*Control	-0.126	0.127	0.88	0.69	1.14
Time*Intervention	-0.234	0.147	0.79	0.59	1.06
Control*Intervention	-0.353	1.200	0.70	0.06	6.83
Time*Control*Intervention	-0.031	0.209	0.97	0.64	1.46
Dispersion	0.696				
Random intercept: Between-person variance	2.064				

Note: Bootstrapped standard errors and confidence intervals (normal assumption) based on 500 bootstrap samples.

Table 25. *Police deployment: Estimates from the negative binomial means comparison model*

	Estimate	SE	IRR	(95 % C.I.)	
Intercept	-0.223	0.274			
Intervention	0.090	0.198	1.09	0.76	1.64
Dispersion	1.159				
Random intercept: Between-person variance	0.744				

Note: Bootstrapped standard errors and confidence intervals (normal assumption) based on 500 bootstrap samples.

Table 26. *Police deployment: Estimates from the negative binomial ITS regression*

	Estimate	SE	IRR	(95 % C.I.)	
Intercept	-0.103	0.377			
Time	0.020	0.037	1.02	0.95	1.10
Intervention	0.328	0.347	1.39	0.69	2.69
Time*Intervention	-0.112	0.063	0.89	0.79	1.01
Dispersion	1.157				
Random intercept: Between-person variance	0.747				

Note: Bootstrapped standard errors and confidence intervals (normal assumption) based on 500 bootstrap samples.

Table 27. Ambulance deployment: Estimates from the negative binomial means comparison model

	Estimate	SE	IRR	(95 % C.I.)	
Intercept	-0.814	0.408			
Intervention	0.259	0.296	1.30	0.74	2.37
Dispersion	0.853				
Random intercept: Between-person variance	1.374				

Note: Bootstrapped standard errors and confidence intervals (normal assumption) based on 500 bootstrap samples.

Table 28. Ambulance deployment: Estimates from the negative binomial ITS regression

	Estimate	SE	IRR	(95 % C.I.)	
Intercept	-0.441	0.533			
Time	0.062	0.056	1.06	0.95	1.18
Intervention	0.188	0.585	1.21	0.39	3.88
Time*Intervention	-0.138	0.088	0.87	0.73	1.03
Dispersion	0.841				
Random intercept: Between-person variance	1.413				

Note: Bootstrapped standard errors and confidence intervals (normal assumption) based on 500 bootstrap samples.

Non-parametric bootstrap confidence intervals for differences-in-difference and differences in means

When outcome data for both SIM participants and control group members were available, we calculated the difference-in-differences in outcome means as follows:

$$diff.in.diff = \bar{X}_{SIM,Post} - \bar{X}_{SIM,Pre} - (\bar{X}_{CNTR,Post} - \bar{X}_{CNTR,Pre})$$

where \bar{X} is the mean of the outcome of interest (for either SIM or the Control group, and either pre-intervention start or post-intervention start).

A negative diff.in.diff indicates evidence in favour of SIM.

When outcome data were only available for SIM participants, we calculated the difference in means as follows:

$$diff = \bar{X}_{SIM,Post} - \bar{X}_{SIM,Pre}$$

A negative diff indicates evidence in favour of SIM.

For each measure, we estimated 95 % confidence intervals using 1,000 bootstrap samples. The confidence limits were derived from the 2.5th and 97.5th percentiles of the bootstrapped distribution, i.e. no distributional assumptions were made.

Results are shown in Tables 29 and 30.

Table 29. *Difference-in-difference estimates and confidence intervals*

	Difference-in-differences	
	Observed	Bootstrap 95 % C.I.
A&E attendances	-0.3528	(-1.1989, 0.4635)
S136 detentions	0.0764	(-0.1357, 0.3114)
Mental health bed days	0.0790	(-1.3032, 1.4511)

Note: Negative numbers indicate evidence in favour of SIM.

Table 30. *Post – pre differences among SIM participants and confidence intervals*

	Difference Post – Pre	
	Observed	Bootstrap 95 % C.I.
Police deployments	0.0349	(-0.4130, 0.4956)
Ambulance deployments	0.1653	(-0.2811, 0.6446)

Note: Negative numbers indicate evidence in favour of SIM.

APPENDIX 5

Calculations used in the evaluation of the economic outcomes

Differences-in-difference and differences in means in terms of costs

We have been consistent with the statistical methods used in the 5 Stream Data analysis and estimated the difference-in-differences in cost means as follows:

$$diff.in.diff = \bar{X}_{SIM,Post} - \bar{X}_{SIM,Pre} - (\bar{X}_{CCTR,Post} - \bar{X}_{CCTR,Pre})$$

where \bar{X} is the mean of the cost of interest (for either SIM or the Control group, and either pre-intervention start or post-intervention start).

A negative diff.in.diff indicates cost-saving evidence in favour of SIM.

Because outcome data is needed to initially estimate difference in means, when outcome data were only available for SIM participants, we calculated the difference in cost means as follows:

$$diff = \bar{X}_{SIM,Post} - \bar{X}_{SIM,Pre}$$

A negative diff indicates evidence in favour of SIM.

For each measure, we estimated 95 % confidence intervals using 1,000 bootstrap samples. The confidence limits were derived from the 2.5th and 97.5th percentiles of the bootstrapped distribution, i.e. no distributional assumptions were made.

Results are shown in Tables 31 and 32.

Table 31. *Difference-in-difference cost estimates and confidence intervals*

	Difference-in-differences (in 2016-17 £)	
	Observed	Bootstrap 95 % C.I.
A&E attendances	-69.15	(-234.89, 90.84)
Mental health bed days	39.66	(-654.20, 728.45)
S136 detentions	1,173.81	(-2084.89, 4784.35)

Note: Negative numbers indicate cost-savings evidence in favour of SIM.

Note 2: The cost of S136 detention has been previously estimated by Heslin et al, 2017, and includes mental health costs (including bed days), police involvement (including deployment), but it does not include A&E attendances and ambulance deployment.

Table 32. *Post – pre cost differences among SIM participants and confidence intervals*

	Difference Post – Pre (in 2016-17 £)	
	Observed	Bootstrap 95 % C.I.
Police deployments	93.74	(-1109.32, 1331.18)
Ambulance deployments	19.84	(-33.73, 77.35)

Note: Negative numbers indicate cost-savings, i.e. evidence in favour of SIM.