Coproducing and evaluating public health communication of invasive group A streptococcal infection (iGAS) for people experiencing homelessness and people who inject drugs

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Abstract

Background

Invasive group A streptococcal (iGAS) disease is a rare but serious bacterial infection affecting a broad cross-section of people. Public health advice is routinely provided to close contacts of iGAS cases to encourage early presentation to medical facilities, given the elevated risk of secondary transmission. Despite being at heightened risk, people experiencing homelessness (PEH) and people who inject drugs (PWID) have not been involved in developing this guidance. Materials previously available through Public Health England were not coproduced and therefore may not be accessible, understandable, or actionable for these groups.

Objective

This project (1) explored the experiences and communication needs of PEH and PWID; (2) coproduced iGAS factsheets with PEH and PWID; and (3) evaluated whether the coproduced materials were accessible, understandable, non-stigmatising, and actionable.

Methods

We used the Agile Co-production and Evaluation (ACE) framework to rapidly and iteratively optimise and evaluate iGAS public health materials with PEH and PWID. A multidisciplinary steering group including public health experts, service providers, and researchers guided the study. The protocol was pre-registered (OSF: z4268) and the study is reported in accordance with GRIPP2 long-form guidelines for public involvement.

Results

Coproduction activities informed factsheet modifications incorporating simplified language, visual cues, and content relevant to PEH and PWID. Coproducers described the factsheet as eye-catching, easy to read, and person-centred whereas the original version was viewed as having limited relevance to their needs. In the evaluation survey, 32/39 responders preferred the coproduced factsheet, which was rated higher for readability and clarity of guidance. Symptoms of invasive group A streptococcal infection were correctly identified and responders stated that they would follow the advice.

Conclusions

Our findings show the potential of rapid, participatory approaches to improve and evaluate the design of public health advice for underserved groups. By applying the ACE framework, we showed that coproduced materials were clearer, more actionable, and better aligned with the needs of PEH and PWID. The process also identified practical steps for health protection teams and highlighted ways to optimise the ACE framework for future use in emergency settings.

INTRODUCTION

Invasive group A streptococcal (iGAS) disease is a rare but serious condition following infection by *Streptococcus pyogenes* bacteria, associated with significant morbidity and case fatality [1]. Close contacts of people with iGAS infection are at elevated risk of secondary infection and are routinely provided with public health advice by health protection teams to prompt early healthcare presentation should symptoms develop [2]. This advice typically includes information on recognition of signs and symptoms of group A streptococcal infection, hygiene measures, and the recommendation of prophylactic antibiotics for high-risk individuals. Standardised communication tools, such as factsheets and posters, are used to reinforce key messages.

People experiencing homelessness (PEH) and people who inject drugs (PWID) face elevated risk of iGAS disease due to factors such as comorbidities, limited access to hygiene facilities, compromised skin integrity, and barriers to timely healthcare engagement [2]. These factors may also contribute to onward transmission, particularly in congregate settings such as homeless hostels, increasing the risk of outbreaks. In recognition of these risks, tailored public health advice (i.e. a specific factsheet and posters) is available for PWID, addressing risks associated with injecting drug practices and iGAS infection [3]. However, these materials were not developed in collaboration with PWID. There are currently no equivalent materials designed specifically for PEH, despite their heightened risk. Standard public health advice may not always be feasible or practical for people without secure accommodation, creating a gap in accessible, targeted messaging for a group at high risk of infection and transmission.

The health protection management of iGAS contacts among PEH or PWID presents additional complexities. Due to previous negative experiences, people in these groups may be reluctant to engage with health protection teams. They may also face challenges understanding or following standard public health advice, particularly when such advice is not adapted to their circumstances. Whilst health protection teams will attempt to provide information directly to contacts, this may be constrained by practical limitations and barriers to engagement, including the reluctance to disclose the identities of contacts due to stigma or fear of legal repercussions. As a result, health protection teams may rely on intermediaries, such as hostel staff or outreach services, to disseminate advice for potential contacts. It is therefore essential that iGAS-related messaging is accessible, understandable, non-stigmatising, and actionable, even if it is relayed through an intermediary.

Coproduction centres people with lived experience in the development of public health information, aiming to ensure that it is accessible, relevant, and appropriate to their specific contexts [4]. By incorporating the experiences and insights of those affected, coproduced materials may be more acceptable, understandable, and actionable, and less likely to be stigmatising. This approach is particularly important for improving services for inclusion health target populations, defined as socially excluded groups who experience extreme health inequalities [5]. Coproduction has been used effectively with PWID and service providers, for example, to develop harm reduction messaging and guidance on safe injecting equipment [6, 7], demonstrating its value in tailoring public health information to the realities of marginalised groups.

We used the Agile Co-production and Evaluation (ACE) framework [8], to support the timely and inclusive development of public health communication in this context. This framework combines coproduction with rapid evaluation and iterative adaptation, enabling the development of communication materials that are both evidence-informed and responsive to the lived realities of inclusion health groups. Its emphasis on feasibility, acceptability, and behavioural impact makes it particularly well suited for working with marginalised populations who experience disproportionate rates of iGAS disease.

METHODS

Study design and aims

The objectives of the project were to:

1. Understand the experiences and communication needs of PEH and PWID who have been in close contact with an iGAS case.
2. Adapt existing iGAS factsheets (i.e. accessibility and formatting; we will not review the clinical content of the guidance) in collaboration with PEH and PWID.
3. Evaluate whether coproduced information is accessible, understandable, non-stigmatising, and actionable.

We used the Agile Co-production and Evaluation (ACE) framework [8]. The study design was developed with input from a multidisciplinary steering group, which included public health expertise in iGAS infection, including PEH and PWID case and contact management; a representative from a homelessness service provider; and researchers with expertise in ACE with inclusion health groups. Progress was reviewed fortnightly.

In line with principles of equitable collaboration in community-engaged research, a lived experience contributors (NW) was involved in all aspects of the study including design, interpretation, and review of materials [9, 10]. The study protocol was registered at OSF Registries (z4268; [11]). All deviations are reported in Additional file 1, Table A1. The main deviation concerned the timing of the evaluation, which was originally scheduled to occur immediately after the coproduction phase. Due to a delay in the production of the final factsheet, the evaluation was carried out three months later. The study is reported in accordance with the Guidance for Reporting Involvement of Patients and the Public long form (GRIPP2-LF) check-list [12], reported in Additional file 2, Table A2.

Setting and community engagement

Setting

The need for coproduced iGAS public health materials was identified by the South East Health Protection Team of the UK Health Security Agency (UKHSA). After notification of an iGAS case, local health protection teams conduct contact tracing and provide public health advice to cases and contacts. The South East Region includes Kent, Surrey and Sussex, Thames Valley, and Hampshire and Isle of Wight. Consultants and practitioners in this region, as per other regions in England, routinely manage iGAS case notification (several hundred cases per year) and have direct experience of the challenges involved in effectively engaging PEH and PWID and providing them with public health advice.

Engagement-informed coproduction

The methodological approach was informed by the UKHSA Community Engagement Checklist, developed with people with lived experience of social exclusion to promote inclusive, ethical practice. It guides consideration of accessibility, power sharing, and the role of voluntary and community sector partners. The completed checklist was reviewed by the UKHSA Community Engagement Assurance Group, a cross-agency panel with expertise in inclusion health, who provided additional input. Aligned with the PPCIE framework and ACE methodology, this helped ensure that the engagement and coproduction design was transparent, context-sensitive, and shaped by lived experience.

Sample specification and coproducer draft personas

Recruitment was supported by local government public health officials involved in commissioning drug and alcohol services, engaged via their professional regional network. Based on iGAS case data from the South East Health Protection Team (unpublished), we wanted to identify a coastal urban centre with areas of deprivation and recent iGAS outbreaks, including in hostel settings, as a suitable site for the project. Potential collaborating sites were prioritised based on these socio-geographical criteria, as well as established relationships between commissioners and service providers, a history of supporting public health research, and access to both hostel and outreach services.

Through this process, we partnered with the Society of St James, a homelessness charity in Hampshire (hereafter referred to as ‘the service provider’), which provides specialist accommodation and outreach support across Southampton, Portsmouth, and the surrounding areas.

Given the central role of service providers in disseminating iGAS information to our target inclusion health groups, we recruited both service provider staff and individuals supported by the service provider with lived experience of homelessness and/or injecting drug use (PEH/PWID). We aimed for a 1:2 ratio of staff to PEH/PWID coproducers. Recruitment of PEH/PWID followed a persona-led approach, developed through previous fieldwork and guidance from the steering group. Personas reflected key factors influencing engagement with public health advice, including levels of prior awareness of GAS/iGAS; experience of homelessness, injecting drug use, or both; levels of engagement with health services; and asylum seekers or UK residents. We also sought demographic diversity in age, gender, and ethnicity. The sampling approach remained flexible to accommodate the circumstances of coproducers.

Coproduction

Coproduction of factsheets

Coproduction of the iGAS factsheet involved a series of in-person group conversations with service users and service provider staff. These were held in separate sessions to enable open discussion within each group and were facilitated by AFM and SD. Sessions were held in a communal area of the service provider's main hostel in the early afternoon to maximise engagement and coincide with the service user voice feedback group. The format was designed to be as welcoming and accessible as possible for coproducers, and we aimed to reduce power imbalances by creating a peer-supported environment in which to reflect on materials with facilitators affiliated with statutory services. A coproduction topic guide was developed to cover key discussion points but used flexibly during sessions (Additional file 3). In the first session, coproducers were asked about their experiences of infections and reviewed the existing iGAS factsheets – one for the general population and one tailored for PWID.

Feedback from this initial session informed the design and facilitation of subsequent sessions. For example, coproducers requested that future sessions be structured as a single group discussion with the factsheets displayed on the wall, replacing the 'breakout room' format used initially. Feedback from this session also revealed that information should be presented in one consolidated factsheet for both PEH and PWID. Therefore, in subsequent sessions, service users discussed a consolidated, coproduced draft for both PWID *and* PEH.

We used a modified "think aloud" technique to understand how people engage with materials [13, 14]. In contrast to standard think aloud interviews, these were group-based sessions and less structured in that we did not use a topic guide and co-producers were encouraged to lead the conversation as much as possible. In particular, co-producers were encouraged to reflect on how they would engage (or not) with factsheets as they were read and discussed in real-time. Each section of the materials was discussed in turn. Coproducers voiced their suggestions, concerns, and reactions as they engaged with the materials. They identified barriers to understanding and carrying out the recommended protective behaviours and discussed preferred formats and delivery methods. Sessions were audio-recorded, and summaries of discussions were used to inform the development of Guiding Principles and entered into a table of changes (ToC) from the Person-Based Approach [15]. This process involves documenting and prioritising suggested modifications using the MoSCoW method, which categorises input as 'must', 'should', 'could', or 'would like' depending on its priority. Iterative refinement included review of the ToC by the steering group to determine the most appropriate way to implement proposed changes. Decisions were based on the change's likely impact on understanding and behaviour, repetition across coproducers, and practical feasibility. In the rare occasions when changes could not be made in the way the coproducers intended, this was discussed with coproduces in a subsequent session. We also used a Custom GPT, a personalised version of ChatGPT based on GPT-4, tailored to specific tasks and domains, to review the final materials for accessibility and readability. The design team integrated the changes according to UKHSA easy-read guidance [16], and clinical experts reviewed the final factsheet to ensure that all changes retained fidelity to the public health guidance.

Co-production activities continued until no further substantial changes were proposed and when coproducers felt that their input had been reflected and were satisfied with the materials.

Coproduction of evaluation and dissemination

In parallel, group sessions were used to co-develop the evaluation and dissemination plans. Coproducers discussed how to assess whether the new materials worked better than the originals, how the project and factsheets should be shared, and how to ensure that final outcomes were communicated back to coproducers. Through these discussions, coproducers engaged in collaborative sense-making, reflecting on emerging findings and whether the materials and approach aligned with their needs and perspectives.

At the end of each session, coproducers were invited to complete a short, anonymous demographic survey (provided at the end of each topic guide in Additional file 3). We also recorded written reflections after each session to document key observations, emerging insights, and contextual factors.

Evaluation

Survey

We evaluated whether the coproduced factsheets were accessible, understandable, non-stigmatising, and actionable, and compared intentions in response to the revised materials versus the original factsheet. Coproducers requested that the evaluation involve comparing the original and coproduced factsheets one at a time and providing real time feedback. Most preferred to complete this via an online survey, while a minority favoured in-person group sessions. However, due to delays between the coproduction phase and the production of the final factsheet, a pragmatic decision was made to proceed with survey-based evaluation. This approach was discussed with coproducers during the final briefing session.

The evaluation survey was developed by the steering team. Participants were asked about their likelihood of reading the material, understanding of how to protect themselves, intentions to follow the advice, emotional response, and preferences for branding and delivery. Comparative and knowledge-check items were included, alongside optional open-ended questions. For efficiency and accuracy, we used ChatGPT-4 to edit the language of the questions, ensuring they were appropriate for an age 8 comprehension level. The survey is provided in Additional file 4.

The target sample size was 40 participants, which was sufficient to provide proof of concept rather than statistical power, with numbers limited by available budget. Recruitment used a convenience sampling approach. The service provider shared a recruitment poster, and people could choose to opt in by reading an information sheet and agreeing to take part. The survey was administered via Qualtrics. Service users completed the survey using a tablet provided at the hostel, while seated in a quiet office with a member of staff. Participants could complete the survey anonymously or request support in navigating the online platform or understanding the survey items if needed. Staff participants completed the survey independently on a device of their choosing. At the start of the survey, either the original or coproduced factsheet was presented on-screen at random, followed by the survey questions. The alternate factsheet was then shown, followed by the same questions. Participation in the evaluation was not limited to individuals involved in the coproduction process.

Statistical approach

Quantitative survey responses were analysed using base R and the packages dplyr, tidyr, purr, and pwr [17–21]. We used repeated measures Wilcoxon signed-rank tests to compare paired Likert-scale responses to the original and coproduced factsheets, as the data were ordinal and did not meet assumptions for parametric testing. Chi-square tests were used to compare multi-response questions (i.e. who should provide the factsheet), as all expected cell counts were above five. A binomial test was used to evaluate overall preference between the two factsheets, comparing the observed proportions against the null hypothesis of no preference. Post hoc power analyses were conducted with effect sizes expressed as Cohen's d for paired comparisons and Cohen's h for proportions, applying conventional thresholds (small > 0.2, medium > 0.5, large > 0.8)[22].

Qualitative survey data were analysed using a ToC in which data were coded as positive or negative in relation to each intervention feature. The analysis was conducted by SD, in discussion with AFM, to ensure continuity with the coproduction process and alignment with the context of the sessions they facilitated.

Ethical Considerations

This project involved service improvement rather than research, and UKHSA Research Ethics and Governance Group confirmed that formal research ethics approval was not required. No behavioural data were collected or recorded. However, recognition of the potentially vulnerable characteristics of the inclusion health groups were addressed through the team's extensive experience working with these populations. A safeguarding protocol was developed for this project, drawing on existing protocols from both UKHSA and the service provider. This included procedures for escalating clinical concerns raised during the coproduction sessions and a route for support if requested by coproducers. The protocol was approved by the UKHSA Safeguarding Team.

Before taking part in any aspect of the study, coproducers were provided with an information sheet and asked to sign an agreement form. Support was offered by the facilitators to ensure the information sheet and agreement form were understood, when needed. The approach to agreement was informed by experts in coproduction with PEH and PWID at the University of Bristol, and followed a light-touch, easy-read format tailored to the needs of participants.

Coproducers were compensated for their time at a rate of £25 per hour, according to guidance from the National Institute for Health and Care Research [23]. Based on feedback from the steering group, payment was in the form of physical shopping vouchers that could be used across a wide range of shops and services. A voucher worth £12.50 was given to those who completed the survey. We also donated £475 to the service provider that supported the project.

RESULTS

Two coproduction sessions were held with each group before saturation was reached. In session one, 14 service users and eight staff participated. In session two, eight service users attended (five had attended previously and three were new coproducers), and four staff took part (all of whom had attended the first session).

Coproducer demographics

Eleven service user coproducers were men aged between 25 and 54 years (although most were between 35–54 years) who identified as British and White. Two were women aged between 30 and 35 years and identified as British and White. Four were from Eastern Europe or identified as British from a non-White ethnic background. Most had been supported by the service provider for between one and four months, although this ranged from one week to over 20 years. None were in paid employment at the time of the study and several reported recent imprisonment in His Majesty's Prison (HMP) system. While only four disclosed current injecting drug use in the survey, others described such use during the sessions. A large minority had experienced or knew someone who had experienced a serious bacterial infection requiring hospital care, particularly among those who reported drug use. Although all service users were routinely supported to register with a GP, most reported difficulties accessing primary healthcare.

Service user coproducers broadly reflected the provider's client base, although one notable gap was the absence of Polish residents, who make up a significant proportion of the hostel users. This was due to insufficient time and resources to provide translation support, which made it impractical to facilitate participation for this group.

Staff coproducers included five men and three women, all with substantial experience in their roles. Their positions included a support worker project manager, team leaders, housing management staff, an integrated offender management recovery worker, and assistant support workers. They represented a range of services, including rough sleeper outreach, supported housing across Hampshire, assessment centres, and intensive hostels.

Guiding principles

People told us about their experiences of infection and help seeking, and based on this, we developed guiding principles (reported in Additional file 5, Table A5) to help inform decisions about intervention content to promote and support engagement. These specify user characteristics that are specific to the target population and likely to reduce engagement in content, key design objectives and intervention features. For example, despite significant negative experiences of infections, coproducers often have low motivation to engage in infection control behaviours. In particular, the participants reported being unlikely to engage with lengthy factsheets or information-heavy resources about iGAS and were often unable to follow advice regarding handwashing and cleaning practices. People reported previous negative experiences of healthcare, stigma, and a sense that healthcare providers are unable to help, leading some to delay seeking help until the last minute. Coproducers who do not use drugs immediately disengaged from materials that referenced drug use due to the misconception that iGAS only affects those who inject. Material content was therefore developed to address these barriers to engagement.

Coproduced factsheets

The modifications made to the iGAS factsheet are summarised in the ToC (Tables 1–3). The original and final coproduced versions of the iGAS factsheet are provided in Additional file 6.

Table 1

Summary of changes from the original iGAS guidance for the general population

Materials section	Barrier/ negative comments	Facilitator/positive comments	Proposed change	Agreed change (reason for change)
General comments	Knowledge of iGAS is low, but motivation to read is even lower. The factsheet is too long; this group is unlikely to read it in its current form. Although a poster was displayed on the notice board, only one person reported having seen it.	Keep to short, clear key messages. Use images to improve engagement.	Reduce the length of the factsheet by focusing on personally relevant information. Add pictures, use cartoons, and adopt a light, accessible tone.	Reduce the factsheet to one side of A4 (maximum two sides). Add pictures and cartoons. Maintain a light, tone to increase engagement. (IMP, EAS, REP)
Group A streptococcus	This section is not needed or relevant. The sentence about PWID GAS having no symptoms is confusing.	-	Remove this section or move further down.	Use adapted text from the PWID version and include on first page. (EAS, IMP)
How iGAS is spread	Despite significant experience of infections, motivation to engage in infection control behaviour is low. Infection control is a low priority.	Many of the group were interested in this information and, after reading the sheet, had questions about how it was spread.	Simplify the section using bullet points and move it further down the sheet.	Use adapted text from the PWID version. (EAS, IMP)
Kinds of illnesses caused by iGAS; Why iGAS disease occurs; Do contacts require treatment	Not read in detail. Not seen as personally relevant.	-	Remove this section or move further down.	Use adapted text from the PWID version and order by importance to promote required behaviour. (EAS, IMP)
How common is iGAS	Avoid scaremongering. Highlighting that the risk is low may lead to disengagement.	-	Remove this section.	Include a statement such as: “There have been cases close to you, and you may have been in contact with someone who has iGAS”. (EAS, IMP)
Risk of getting iGAS disease	Emphasising low risk may result in disengagement.	-	Remove this section or move it further down.	Replace with the section above. This is information for contacts of cases, not for general awareness-raising. (EAS)
Early signs and symptoms	Perceived as generic; hard to distinguish from other conditions or infections.	This is key information people need to recognise.	Make the section more prominent in the factsheet. Use images and highlight personal relevance.	Move to front page to highlight importance and generate personal relevance by adding “Do you or someone you know have these symptoms?” (EAS, IMP)
What to do if I develop any of these symptoms	Due to previous negative experiences with healthcare providers, motivation to seek care is low. Help-seeking behaviour tends to be	-	Highlight local relevance (e.g., “someone in your area has iGAS”) and the importance of	Add a statement to say that only a doctor can tell the difference between IGAS and other infections. If you develop any symptoms

Note. Capital letters in brackets are standard codes used in the Table of Changes: IMP = important change; EAS = easy change; REP = repeated feedback from coproducers

Materials section	Barrier/ negative comments	Facilitator/positive comments	Proposed change	Agreed change (reason for change)
	reactive rather than preventative.		telling a doctor so the symptoms are taken seriously.	seek healthcare, you cannot wait. Tell your doctor you have been in contact with someone who has iGAS. You may find it helpful to show your GP this information. (IMP, REP)

Note. Capital letters in brackets are standard codes used in the Table of Changes: IMP = important change; EAS = easy change; REP = repeated feedback from coproducers

Table 2
Summary of changes from the original guidance for people who inject drugs

Materials section	Barrier/ negative comments	Facilitator/positive comments	Proposed change	Agreed change (reason for change)
General comments	Knowledge of bacterial infection is high, but understanding of iGAS is low, and motivation to read is mixed. Many felt it was not important, despite personal experience of serious infections.	Some recognised the need for the information and found the content clear and relevant. Non-drug users were willing to share the factsheet with peers.	Focus on personally relevant information ("you or someone you know"). Add pictures and cartoons. Use a light, non-clinical tone.	Focus on personally relevant information ("you or someone you know"). Add pictures and cartoons. Use a light, non-clinical tone. (IMP, REP)
Why iGAS happens	Participants who did not inject drugs felt the PWID-specific factsheet was irrelevant and perceived iGAS as an issue only for drug users.	-	Combine content into one factsheet applicable to all, clearly stating iGAS can affect anyone. Include an additional section for people who inject drugs.	Use one factsheet for PEH/PWID. Make clear that iGAS can affect everyone. Include an extra section for those who inject drugs at the end of page two, detailing tailored protective advice. (IMP, REP)
Risk of getting iGAS disease from close contact with a relative our household contact	Emphasising low risk led to disengagement.	-	Make content more locally relevant, emphasising risks in hostels. Frame information as being shared due to a recent local case.	As above: one factsheet with tailored section for PWID. Clarify relevance through localised examples. General population factsheet also requires revision. (IMP, REP)
iGAS symptoms	Descriptions were generic and difficult to distinguish from withdrawal or other infections.	-	Be more specific (e.g. "high fever" rather than "fever"). Include images of symptoms.	Improve specificity, include images to support recognition. We also added text emphasising that symptoms of iGAS may reflect a *change* from usual health status, recognising that chronic wounds, pain, and other ongoing symptoms are common in this population. (IMP, EAS, REP)
What to do if I develop any of these symptoms	Low motivation to seek care, particularly among those with negative healthcare experiences or history of incarceration.	-	Increase urgency and relevance. Emphasise that iGAS is rare but serious. Encourage showing the factsheet to healthcare providers.	Stress urgency and seriousness of iGAS. Include guidance on how to communicate symptoms to healthcare staff. Add visuals where possible. (IMP, EAS, REP)
Keeping safe when injecting	Content was familiar and easy to understand. However, confusion existed around the risk of needle reuse or sharing despite using clean needles.	-	Clarify risks associated with reusing one's own needles or sharing, explaining the potential for self-transmission.	Clarify that using a needle more than once can spread iGAS between different body areas. Do not share needles. Add external resource link (e.g. We Are With You).

Note. This table captures feedback that was different to that given in response to the general guidance, reported in Table 1. Capital letters in brackets are standard codes used in the Table of Changes: IMP = important change; EAS = easy change; REP = repeated feedback from coproducers

Materials section	Barrier/ negative comments	Facilitator/positive comments	Proposed change	Agreed change (reason for change)
				Include not to share pipes. (IMP, EAS)
Stigma	-	The factsheet was viewed as relevant and useful; no concerns about stigma were raised.	-	No change required.

Note. This table captures feedback that was different to that given in response to the general guidance, reported in Table 1. Capital letters in brackets are standard codes used in the Table of Changes: IMP = important change; EAS = easy change; REP = repeated feedback from coproducers

Table 3

Table of Changes: Summary of changes from the drafts of the coproduced factsheet

Materials section	Barrier/ negative comments	Facilitator/positive comments	Proposed change	Agreed change (reason for change)
Overall impression	-	Great, straight to the point, bite size… addressed all comments from last meeting… clear, serious tone without panic. Better than other drug warning posters which can be too overwhelming and alarming.	Highlight key phrases by putting them in bold: “Do not wait”, “Serious infection”, “Not only people who use drugs get iGAS”.	Bolded/emphasised DO NOT WAIT and SERIOUS INFECTION to improve clarity and urgency. (EAS, IMP)
Title	Title is lost in background image. ‘People in your area’ not prominent enough. Image unclear.	Current image is good. A severe case image would deter engagement. Worry is good, but fear drives people away	Remove shadow from text; darken background to increase contrast.	Adjusted image/text contrast: removed shadow and darkened background to improve legibility and emphasis. (EAS, IMP, REP)
Images	Hard to tell if sores shown are iGAS or something else.	Pictures attract attention and provoke curiosity. Images of diverse skin tones appreciated.	-	Images retained with diverse representation; selected for visual impact and clarity. Reinforces salience. (IMP, REP)
Anyone can get iGAS/symptoms	Symptoms are too generic.	Highlights universality and removes potential stigma. Good visual representation.	Add NHS 111 contact detail.	Added ring 111 instruction for urgent clarity. (EAS, IMP)
What should I do if I have these symptoms	Placing this below the ‘anyone can get iGAS’ section reduces urgency.	-	Swap this section with section above.	Reordered for urgency. (IMP, REP)
How likely am I to get iGAS	Actual numbers would be calming. Typo – extra ‘is'.		Remove unnecessary "is".	Corrected and clarified sentence: “The risk of getting iGAS is low.” (EAS)
If you use drugs	People may assume this doesn’t apply to them. Assumption in hostel context may not apply elsewhere.	Harm minimisation well handled, realistic and practical.	Make clear that anyone can get iGAS or not only drug users are at risk.	Inserted: “Anyone can get iGAS” before “If you use drugs…” to clarify applicability. (EAS, IMP)
QR code	Some don’t have smartphones or know how to scan QR codes.	A free text option would be better	Add web address, phone support, and instructions on how to use QR codes.	Added website URL, repeated NHS 111 and 999 info. (EAS, IMP, REP)

Note. Capital letters in brackets are standard codes used in the Table of Changes: IMP = important change; EAS = easy change; REP = repeated feedback from coproducers

The steering group and clinical team made several recommendations for integrating the coproduction modifications to improve clarity, accuracy, and accessibility. They advised clearer messaging that iGAS can look like a common infection but requires urgent action, with simplified language aimed at a reading age of eight years. Visual content was carefully selected to avoid misleading impressions about symptoms, using cartoon images to show a wider range of signs like breathing difficulties and fever. The photos were also chosen to reflect that the most common clinical presentation of iGAS in these groups is associated with skin and soft tissue infection. References to support organisations were updated to better match

the needs of the audience, and contact advice was clarified (i.e. NHS 111 or 999). A QR code for safer injecting advice was repositioned for clarity. Clinical feedback also highlighted the need to clarify transmission routes, prioritising contact sharing over respiratory spread to avoid confusion with flu or COVID-19. Practical issues were raised, including the need for colour printing, the value of physical copies, and the possibility of making materials available on national government website.

Evaluation

Quantitative survey evaluation

Thirty-nine people completed the survey, comprising 29 service users and ten staff. Of these, 15 (38.5%) completed it in under three minutes suggesting potential satisficing, which may reflect more superficial engagement with the survey content. Responses from both service users and staff were included in the analysis. There were no missing data.

When asked which version of the factsheet they preferred, 32 out of 39 respondents (82%) selected the coproduced version (Sheet B), while 7 (18%) selected the original version (Sheet A). A binomial test indicated that this difference was statistically significant ($p < .001$) when tested against the null hypothesis of no preference (50%). Results of the comparison tests are reported in full in Table 4. A post hoc power analysis showed that the study had approximately 87% power to detect this difference at $\alpha = 0.05$, suggesting it was well powered to identify a true preference.

Table 4
Summary of preference and Likert-scale comparisons between Sheet A (original factsheet) and Sheet B (coproduced factsheet)

	Sheet A			Sheet B			
Item	Agree	Neutral	Disagree	Agree	Neutral	Disagree	p-value
Factsheet Preference (Sheet B)	7	–	–	32	–	–	< .001
Would read the factsheet	23	4	12	36	2	1	.001
Know what to do to stay safe	34	4	1	37	1	1	.075
Know what to do if I have signs of iGAS	37	2	0	39	0	0	.013
Believe the advice given	36	3	0	37	2	0	.140
Would follow the advice	37	2	0	39	0	0	.078
Felt upset or judged	1	15	23	4	12	23	.578

Note. Counts of the number of respondents selecting each response category; strongly agree and agree were collapsed into 'Agree' and disagree and strongly disagree were collapsed into 'Disagree'. P-values are from Wilcoxon signed-rank tests for paired Likert items and a binomial test for overall preference.

Respondents were significantly more likely to agree that they would read the coproduced factsheet, with 92% selecting 'agree' or 'strongly agree' for Sheet B compared to 59% for Sheet A ($p = .001$). Understanding of what to do if they had signs of iGAS was also higher for Sheet B (100% vs 95%, $p = .013$). There was no statistically significant difference observed in understanding of how to stay safe (95% vs 87%, $p = .075$), though this may reflect limited power to detect small effects.

Responses to 'I believe the advice given in the factsheet' were similarly high for both versions (95% for Sheet B vs 92% for Sheet A, $p = .140$), as were responses to 'I would follow the advice given' (95% for both, $p = .078$). Feelings of upset or judgement were low for both versions, with 10% of respondents agreeing with the statement 'The factsheet made me feel upset or like I was being judged' for Sheet B, compared to 7% for Sheet A ($p = .578$). Five respondents gave this response overall, but although a free-text box was provided to explain their response choice, none chose to leave a comment, so the reasons remain unknown.

However, the study had only 45% power to detect a small effect size (Cohen's d = 0.3) using a two-sided paired test at α = 0.05, suggesting it was underpowered to reliably detect small effects and therefore the non-significant comparisons may be false negatives and should be interpreted with caution.

For the coproduced factsheet, participants expressed a clear preference for receiving information from either a public health worker (34 out of 39) or a support worker (35 out of 39). There was a strong preference for including the NHS logo, with 74% selecting strongly agree and 13% agree. For the UKHSA logo, 67% selected strongly agree and 15% agree. No respondents selected disagree or strongly disagree for either logo. There were no differences observed between the original and coproduced factsheets.

All respondents answered the first understanding question correctly, recognising the signs of iGAS. For the second question, which asked what to do if experiencing these symptoms, just over half answered correctly (i.e. selected "go to a hospital"), while the remainder selected 'not sure' and no one answered incorrectly. As the comprehension questions were presented at the very end of the survey, these responses relate to the general guidance rather than either specific version of the factsheet.

Qualitative survey evaluation

Overall, participants liked the appearance and content of the revised factsheet. It was described as eye-catching, bright and bold. Participants reported that "it draws you in, and you would find it hard to walk by it." Pictures were considered to be useful for "show(ing) what to look for" and "mak(ing) the fact sheet clearer." In terms of content, participants thought that the factsheet was "clear and direct," and appreciated that it was "shorter" "easy to read, bite-sized and factual with loads of colour." It was considered to be tailored and "person centred," with one participant saying it looks like "it has been created for the residents rather than the professionals." Suggestions to improve the factsheet included adding in more bullet points and removing the abbreviation iGAS.

In comparison, the original factsheet was viewed as "more professional and serious", with one participant appreciating "the officiality of it".

DISCUSSION

In this paper, we presented the use of the Agile Co-production and Evaluation (ACE) framework to support the rapid development and evaluation of public health materials for contacts of a confirmed case of iGAS infection, for people experiencing homelessness (PEH) and people who inject drugs (PWID). This participatory approach is especially important for inclusion health groups, who may face higher risks of infection and have needs that are not met by standard public health materials and their delivery. Through iterative feedback, the revised materials reflect what mattered to participants: clear and direct language, a non-judgemental tone, visual cues, and practical guidance relevant to their daily lives. Coproduced factsheets were preferred to the original versions, with participants much more likely to read them and rating them as accessible, actionable, and non-stigmatising. The revised materials supported understanding and intended behaviours. These findings show how participatory methods can improve the relevance and acceptability of public health communication tools.

The results of the project reflect wider evidence that awareness and harm reduction are only likely to improve if people meaningfully engage with the material and if the guidance is pragmatic, reflecting the realities of the risk behaviours and environments of the target population [24]. Coproducers offered several important insights that shaped how the advice was presented. For example, many described barriers to seeking help for their health, so the revised factsheet encouraged people to bring it with them and explain that they had been advised to seek assessment by public health teams. This is particularly important given evidence that symptoms of infection are common among PWID but often go untreated for extended periods [25]. On the other hand, those experiencing homelessness who did not use drugs disengaged from the original factsheet as soon as it mentioned injecting behaviours. The revised factsheet flipped the approach and stressed that anyone can get iGAS, with advice for safer drug use provided separately at the end, in addition to the general guidance. These changes helped ensure that the factsheet was inclusive and avoided reinforcing assumptions about risk or behaviour.

Awareness and harm reduction are more likely to improve when information is not only accessible but also discussed with someone trusted [24, 26–28]. During our coproduction and evaluation, service users expressed a strong preference for receiving information from either a public health worker or a support worker, reflecting the importance of trusted service provider-client relationships highlighted through coproduction among PWID in other public health contexts [7]. However, PWID and PEH often face barriers to accessing information directly from health protection teams, even when urgent advice is needed following an iGAS case, highlighting the key role of service providers in disseminating urgent information to these groups. At the same time, service provider staff told us they had not received training on how to explain public health guidance to clients or information on how to keep themselves safe during an outbreak. This gap was identified repeatedly during the project and should be a priority for health protection teams seeking to strengthen infection mitigation in the community.

A recent scoping review of behavioural science frameworks for public health emergencies found that no existing approaches fully integrated rapid implementation, coproduction with underserved groups, and evaluation, key components of the ACE framework [29]. Although this project was delivered in a routine setting, our experience suggests that core elements of ACE, such as early collaboration, iterative development, and community-led input, can also support response. These align with recognised enablers of engagement in public health emergencies, including cultural competence, trust building, and early engagement [30]. Our findings also support previous reviews highlighting the importance of involving front-line providers in designing public health communication during epidemics and pandemics [31]. However, while these are encouraging signs, applying ACE in an emergency timeline may require careful negotiation of structural barriers, including early consideration of institutional processes and other constraints that could affect delivery.

Limitations

While this project shows the value of using a structured coproduction and evaluation approach to developing public health messaging for PEH and PWID, several limitations should be considered. Although a highly experienced and senior representative of the service provider was part of the steering group, no service users were formally involved in governance. Broader involvement at this level could have strengthened oversight and improved key decisions. Polish speakers and people without recourse to public funds were under-represented in the coproduction process due to the lack of translation services, despite comprising a substantial proportion of the service provider's client base and likely facing heightened risk due to language barriers. This represents an important gap, and there is a case for translating the factsheet into commonly spoken languages in similar settings, although this approach remains untested in these groups. The intended audience was diverse, and some participants disengaged when the content did not feel directly relevant to their circumstances. This highlights the need for tailored communication within inclusion health populations rather than a single solution for all. Finally, the evaluation was pragmatic and not powered to detect small effects, but the results are promising and provide proof of concept for this type of rapid, codesigned evaluation.

Implications for practitioners

Our coproduction results have important implications for public health practice, which go beyond only ensuring use of the materials in place of existing versions. Whilst their use is strongly supported by the evaluation, coproduction allowed the development of this new communication tool within a context of honest reflection on the barriers and facilitators to recipients understanding and being empowered to act on urgent public health advice, described in our guiding principles and comments on barriers and facilitators. Reports of low engagement and motivation, uncertainty about relevance, and stigma, emphasise the need for public health practitioners to be approachable and non-judgemental, consider health literacy, and focus communication on the key messages of susceptibility and personal risk, symptom recognition, and recommended actions.

Previous negative experiences of healthcare providers and practical barriers to accessing information mean that engagement by public health services alone may not be successful without messages being reinforced by other trusted persons (such as support workers). This will be more effective if, at the same time, services continue to offer practical support to follow advice on presentation to healthcare, hygiene, and risk reduction. Local health protection systems should also consider the service specifications, and communication and training needs for practitioners, services, and healthcare providers to support action,

both during an acute incident or outbreak, and over the longer term, particularly in high incidence areas. Finally, the wider learning from our work should be used to improve other risk communication materials produced by UKHSA.

Implications for coproduction

Projects involving inclusion health populations in the development of public health messaging and evaluation must account for both practical and structural barriers to participation. For PEH or PWID, barriers such as housing instability and stigma can make ongoing involvement difficult. These experiences are often shaped by mistrust of organisations due to previous discrimination and exclusion. Similar barriers to inclusion have been reported in other underserved groups. For example, researchers found that young people from underserved communities faced barriers to taking part in rapid public health research such as rigid processes and unfamiliar research practices [32].

In both cases, adapting how coproduction is planned and run can make participation more accessible. In our project, we partnered with an organisation with established community relationships and experience of supporting research. As seen in other public health interventions, this type of partnerships helped enable more rapid delivery [33]. Coproducers shaped how sessions ran from the outset and throughout, helping to build a sense of ownership and made it easier for people to take part in a way that felt comfortable and useful.

Even with a flexible and responsive approach, teams still need to manage institutional processes such protocol approval, clinical sign-off, and requirements for producing branded materials. Time constraints for researchers and the steering team inevitably affect timelines. These challenges can delay progress when using rapid frameworks such as ACE but may be reduced by involving a steering group familiar with internal systems, engaging clinical teams early, and allowing time upfront to develop the protocol with careful attention to common risks.

Conclusions

Rapid, structured coproduction can lead to public health materials that are more acceptable and relevant to inclusion health groups. We applied the Agile Co-production and Evaluation (ACE) framework not only to coproduce materials but also to evaluate them, using an iterative approach to capture improvements in accessibility, clarity, and actionability. The findings also informed practical recommendations for health protection teams working with inclusion health groups. The coproduction process identified further opportunities to strengthen the ACE model, including how to maximise its benefits during emergencies and to support researchers using this approach.

Abbreviations

ACE
Agile Co-production and Evaluation
iGAS
Invasive group A streptococcal disease
PWID
People who inject drugs
PPCIE
patient, public, community involvement, engagement, and coproduction

Declarations

Ethical Considerations

This project involved service improvement rather than research, and UKHSA Research Ethics and Governance Group confirmed that formal research ethics approval was not required. No behavioural data were collected or recorded. However, recognition of the potentially vulnerable characteristics of the inclusion health groups were addressed through the team's

extensive experience working with these populations. A safeguarding protocol was developed for this project, drawing on existing protocols from both UKHSA and the service provider. This included procedures for escalating clinical concerns raised during the coproduction sessions and a route for support if requested by coproducers. The protocol was approved by the UKHSA Safeguarding Team.

Before taking part in any aspect of the study, coproducers were provided with an information sheet and asked to sign an agreement form. Support was offered by the facilitators to ensure the information sheet and agreement form were understood, when needed. The approach to agreement was informed by experts in coproduction with PEH and PWID at the University of Bristol, and followed a light-touch, easy-read format tailored to the needs of participants.

Coproducers were compensated for their time at a rate of £25 per hour, according to guidance from the National Institute for Health and Care Research [23]. Based on feedback from the steering group, payment was in the form of physical shopping vouchers that could be used across a wide range of shops and services. A voucher worth £12.50 was given to those who completed the survey. We also donated £475 to the service provider that supported the project.

Consent for publication

Consent for publication is not required as individual person's data are reported.

Availability of data and materials

This project used coproduction as part of a service evaluation, therefore was not a research study that generated data that were stored or available for sharing. All coproduction materials including the information sheet and agreement form, session topic guides, survey items, guiding principles, and coproduced iGAS factsheets for close contacts who are PEH or PWID are publicly available in the appendices to this paper as well as the OSF project repository: https://osf.io/ut92p/.

Competing interests

All authors have declared that they have no competing or potential conflicts of interest.

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