Imperial College London

How can we frame antimicrobial resistance in the best way to inspire behaviour change? An online randomised controlled trial.

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Study Management Group

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Sponsor

Imperial College London is the main research Sponsor for this study. For further information regarding the sponsorship conditions, please contact the Head of Research Governance and Integrity.

This protocol describes the “How best to frame antimicrobial resistance” study and provides information about procedures for entering participants. Every care was taken in its drafting, but corrections or amendments may be necessary. These will be

circulated to investigators in the study. Problems relating to this study should be referred, in the first instance, to the Principal Investigator.

This study will adhere to the principles outlined in the UK Policy Frame Work for Health and Social Care Research It will be conducted in compliance with the protocol, Data Protection Act 2018 and General Data Protection Regulations (Europe) and other regulatory requirements as appropriate.

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1. INTRODUCTION

1.1 Background

Antimicrobial resistance (AMR) is often referred to as “the silent pandemic”. Antibiotics, vital for treating all manner of bacterial infections, are becoming increasingly ineffective as bacteria develop sophisticated mechanisms of AMR. This can lead to prolonged and severe infections, illness and even death – it has been predicted that there will be up to 10 million deaths by 2050 if we do not mitigate this crisis (1, 2).

Human behaviour is a significant contributor to the aetiology of the AMR crisis (3). Poor compliance with antibiotic prescriptions, requesting / providing antibiotics for illnesses where they are not indicated and the use of antibiotics in food production are all significant contributors. It is very likely that the public are not aware of the significance of their actions in contributing to the AMR crisis – in fact, we anticipate that many individuals would not know what AMR is, and certainly not be aware of its significance. Achieving widespread behaviour change within the public, both as individuals and global citizens is crucial in the mitigation of this silent pandemic – we cannot rely on new drug discovery and scientific advances alone.

The design of behavioural science informed nudges and interventions have been shown to effectively change behaviours that are associated with the aetiology of antimicrobial resistance. A study by the Behavioural Insights Team (BIT) provided General Practitioners (GP’s) with feedback information about their prescribing rates if they were prescribing antibiotics at a rate higher than 80% of those in the local area, and substantially reduced the rate of antibiotic prescribing in the intervention group (4). This feedback incorporated the behavioural science construct of using social norms (invoking a sense of shared standards of acceptable behaviour)– highlighting that they were prescribing above the typical rates of their peers. It also utilised the messenger effect (*who* sends the message has an impact on its effectiveness), by ensuring the letters were sent from a high-profile source – England’s Chief Medical Officer. A similar cluster randomised controlled trial in Australia also prompted high prescribing GP’s with feedback that again used social norms – the most effective intervention incorporated a graph comparing their prescribing to that of their peers (5). Social norms have been repeatedly shown to be an effective way of changing prescribers behaviour and reducing antibiotic prescribing, as evidenced in a systematic review of 23 studies (6).

Behavioural science has also been used to change the public’s behaviours, particularly around inappropriately requesting antibiotics, or the misuse of antibiotics. A recent study tested two interventions – one that increased the saliency of the cost of antibiotic overuse, and another that focused on reducing diagnostic uncertainty (7). Both reduced the participants expectations and intentions to request antibiotics compared to a control group. A study by the same research group ground that knowledge and beliefs about antibiotics was predictive of an individual’s antibiotic expectations. It also found that information about antibiotic efficacy reduced expectations, but information about viral aetiology did not (8).

We are a team of behavioural scientists who are working to explore some of the behaviours that surround antibiotic use, aiming to co-design behavioural science informed interventions with public members that would encourage behaviour change. We are part of a larger body of work at Imperial looking to make a step change in AMR from several perspectives – public engagement, behavioural science, advising policy and clinical research. The novel idea is the creation of “The Fleming Centre” – a purpose built space due to open in 2028 (in the same location where Alexander Fleming discovered penicillin 100 years ago) where these themes can come together under one roof and influence each

other. The building will be developed with local community groups and museum curators to ensure visitors represent different backgrounds and can learn and feed into our research. This unique set up has the opportunity to change public behaviour and to have the public meaningfully improve research for global influence. However, in order to inspire behaviour change and mitigate the crisis of antimicrobial resistance, the public must understand what AMR is as a term and its significance.

From our initial literature review and work to understand the AMR crisis, we know that this term/acronym, and the way the crisis is framed is not reaching the public adequately. A 2015 World Health Organisation survey across 12 countries found only half had heard of Antimicrobial Resistance, and 1/5 of AMR (9, 10). These findings were supported by a similar study in the UK (11).

Previous research has evaluated the term “Antimicrobial Resistance” – finding that it doesn’t possess three key criteria of a successful communication strategy – pronounceability, meaningfulness and specificity (12). As such, it is perceived that the term “antimicrobial resistance” is “inconsistently used, difficult to pronounce and lacks meaning for lay audiences”.
The Wellcome Trust undertook a large body of work in 2019, involving in-depth interviews with experts and message testing in 7 countries worldwide. The developed five key principles for how to frame AMR in a way that is best received by the public (13). These included:

1. Framing drug resistant infections as undermining modern medicine
2. Explain the fundamentals succinctly
3. Emphasise that this is a universal issue; it affects everyone, including you
4. Focus on the here and now
5. Encourage immediate action

This report also recommends **drug-resistant infections** as the term most easily understood by the public. However, in the four years since the publication of this report, drug-resistant infections has not become a commonly used term.

Further work has also postulated that the framing of AMR needs to be more inclusive of the wider determinants of AMR – including environmental and animal factors (such as the use of antibiotics in the food chain); and to develop AMR related communications that are specific to local contexts (14).
A 2023 online study, designed to test both memorability and risk association for the most frequent AMR-related health terms (15). These were “AMR”, “Antimicrobial Resistance”, “Drug-Resistant Infections”, “Antibiotic Resistance”, “Bacterial Resistance” and “Superbugs”.
The study found that both “AMR” and “Antimicrobial Resistance” scored consistently low on these two parameters. “Antibiotic resistance” performed best, with “Drug-Resistant Infections” second. However, the authors conclude that none of the current options sufficiently motivate a change in antibiotic use.
Consequently, much of the current academic literature calls for a new name or way to present AMR, with standardised terminology that is accessible to the public (16).

As part of the work to develop the Fleming Centre within the Institute of Global Health Innovation (IGHI) at Imperial we have already conducted some public engagement activities to explore current knowledge about antibiotics, and the potential implications of the crisis. This work involved a spot test at Paddington station and three workshops with people from under-represented groups that had different lived experiences (young people, those with young children and older age individuals). The insights gained from this work highlighted that there was good public interest in an initiative such as the Fleming Centre, and motivation to tackle the AMR crisis. Crucially, this work demonstrated a lack of understanding / awareness of AMR, and how antibiotics should best be utilised - illustrated by this participant quote: *“When I go to Spain I bring back a few packets of antibiotics, because the ones there come in two pills I can take over two days, which means I can get better quicker”*

1.2 Study Rationale

It has been established that behavioural science can be applied to the problem of antimicrobial resistance, and therefore that behaviours that contribute to its aetiology can be addressed. However, it is not clear that the current phrasing and terminology used to describe this looming crisis – "Antimicrobial Resistance" is reaching or resonating with the public. This has been described in the literature but not explored adequately. Studies to date have engaged with experts and world leaders on how best to present the crisis to the public – but there has been limited public engagement and co-production when it comes to determining what the best way of doing so might be. This study aims to test new ways of naming / framing AMR that have been co-designed with the public.

As such, this study has been conceived in order to help answer the following research question:
"Can we co-design a new way of framing the AMR crisis with the public, that is memorable, conveys meaning and inspires behaviour change?"

We hypothesise that a co-designed behaviourally informed way of framing AMR will resonate better with the public, improving understanding of AMR, attitudes towards AMR and will influence future AMR related behaviours (such as requesting antibiotics).
The null hypothesis for this study is that no alternative naming strategy is more impactful than Antimicrobial Resistance / AMR itself.

Intervention Design
These names and posters were designed through a series of co-design workshops, focus groups and public engagement activities, funded by Imperial Societal Engagement Seed Fund (these can be viewed in slides 7 and 8 in Appendix 1). Our research team worked closely with members of the public in a steering group to guide our engagement activities and development of the three intervention arms. Several community workshops were held, along with stalls at community events to capture the publics' feelings around AMR, what antibiotics mean to them, and challenging them to come up with a new name for AMR. The Imperial team were invited to attend the White City Community Fun Day (hosted by the local community) and held a stall with some AMR related games and activities to gain insights. The Imperial team also hosted two events for World Antimicrobial Awareness week, one in Paddington and one at White City, with stalls where members of the public were invited to suggest new names for AMR and provide their thoughts on what AMR meant to them. These insights were distilled in conjunction with our public steering group to create the three intervention arms being tested in this study.

2. STUDY OBJECTIVES

This study aims to achieve a greater understanding of how different ways of presenting AMR to the public can influence their attitudes towards AMR, their comprehension and recall of the topic, and whether this can affect their intended future behaviour.

Primary objective:
Identify the best way of framing "Antimicrobial Resistance" to the public, in a way that resonates maximally and consequently shifts their attitudes towards AMR and its implications.

Secondary objectives:

- Identify which method of framing AMR is most likely to improve comprehension of antimicrobial resistance

Exploratory objectives

- Explore which method of framing AMR has the best recall from participants
- Identify which method of framing AMR most influences intent – particularly with respect to future antibiotic use
- Explore the differing impact of different ways to present AMR on population sub-characteristics, including age, ethnicity and previous antibiotic use.

3. STUDY DESIGN

This research study is being conducted as a collaboration between the Institute of Global Health Innovation at Imperial College London and the Behavioural Insights Team. Imperial College will own all data generated by the study.

This study has been designed as a four-armed online randomised control trial (RCT). This will be conducted using Predictiv, an online platform for running behavioural experiments built by the Behavioural Insights Team (17). There is a contract in place between BIT and ICL for this work to be conducted on BIT's Predictiv platform.
The detailed user journey through the study can be viewed in Appendix 1, and will take the following steps. Figure 1 demonstrates the flow of participants through the online study.

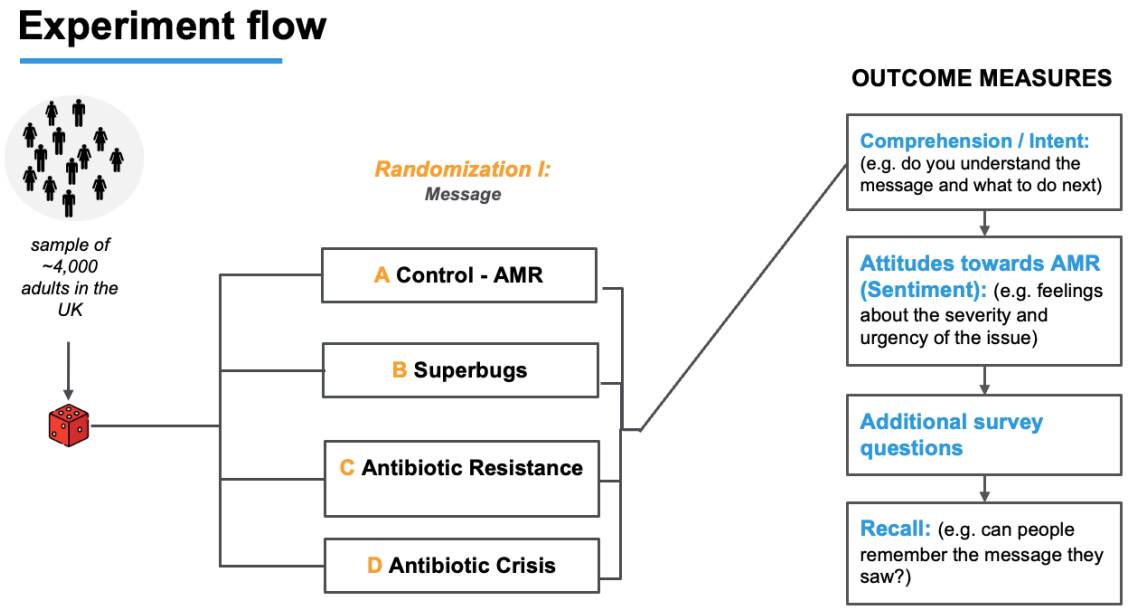

Figure 1: Participant randomisation and experiment flow

1. **Access.** Participants access the Predictiv online platform through an online link. This will be provided by their own market research panel company. Market research panels will be provided the survey by CINT, a panel aggregator. Since a panel aggregator is used, the study team do not work directly with specific market research panels. In similar previous survey studies, around 30-40 market research panels are typically contacted. The panel provider we use has access to over 500,000 participants who having completed an online survey in the last year. Participants must be at least 18 years old and live in the UK in order to participate in this survey. We will also set recruitment quotas across demographic criteria such as age, gender, region in the UK, and ethnicity, to ensure a nationally representative sample.
2. **Introduction slide.** This will orientate the user on the upcoming task (being shown information about antibiotics and that they will then be asked to answer some questions). They will be informed that completing the survey should take around five minutes, and that they are free to withdraw at any point by closing the survey window in their online browser. Participants will also be provided with a link to a summary Participant Information Sheet (Appendix 2).
3. **Attention check.** Participants will be asked a simple question to ensure they are reading the questions and can answer appropriately. If they do not answer the first attention check correctly they will be provided with a second simple question. If a participant answers both questions incorrectly they will be excluded from the study at this point.
4. **Randomisation.** The 4,000 participants will be randomised in a 1:1:1:1 ratio to one of four trial arms. This will be done within the platform at the individual level and will be computer generated. Participants will be blinded to the study arm that they have been assigned to.
5. **Intervention.** As demonstrated in Figures 2 and 3 below, participants will be shown one of four images. Each image will be of a poster at a bus stop – and will contain information about antimicrobial resistance. Each of the four posters will have a different name for AMR displayed on them. The participant will be free to look at the image for as long as they wish to.
6. **Survey Questions.** Once participants have looked at the image, they will click through a series of survey questions. The full survey can be viewed in Appendix 1. The survey questions have been designed to evaluate the following:
    a. **Recall.** Participants will be asked questions to see if they can remember the name for AMR they were presented with, what the poster was about, and what the term means
    b. **Comprehension.** Participants will be asked questions to evaluate their understanding of AMR and what the solution might be
    c. **Intent.** Participants will be asked to predict their likely behaviours if they had symptoms of a viral infection (visit their doctor, pharmacist, or ask for antibiotics). They will be asked their opinion on what a friend or relative might do in the same situation. Finally they will be asked about finishing the course of antibiotics.
    d. **Attitudes towards AMR (Sentiment).** Participants will be asked to state their agreement on several statements relating to AMR.
    e. **Understanding of AMR and existing terms.** Participants' familiarity with the various terms for AMR being tested, and their understanding of AMR

    The survey incorporates some free text responses to further understand participants understanding of AMR, and what this term means to them. It is possible that some anonymised quotes may be published in any resulting study publications. This is made clear in the summary PIS and on the introduction slide that the participant will see before engaging with the survey.

7. **Demographics.** Participants will be asked to provide non-identifying demographic data, including their previous antibiotic use and whether they work in the healthcare sector.

All questions within the survey will be compulsory. Once a participant has completed the online survey they will close the window. This will signify the end of their involvement in the study. No further contact or questions will be asked of the participants after this point.

Imagine that you are waiting for a bus, and you see a poster on the bus stop. Please read the poster - you will be asked questions about the content on the following pages.

Figure 2: Control arm intervention as shown to participants

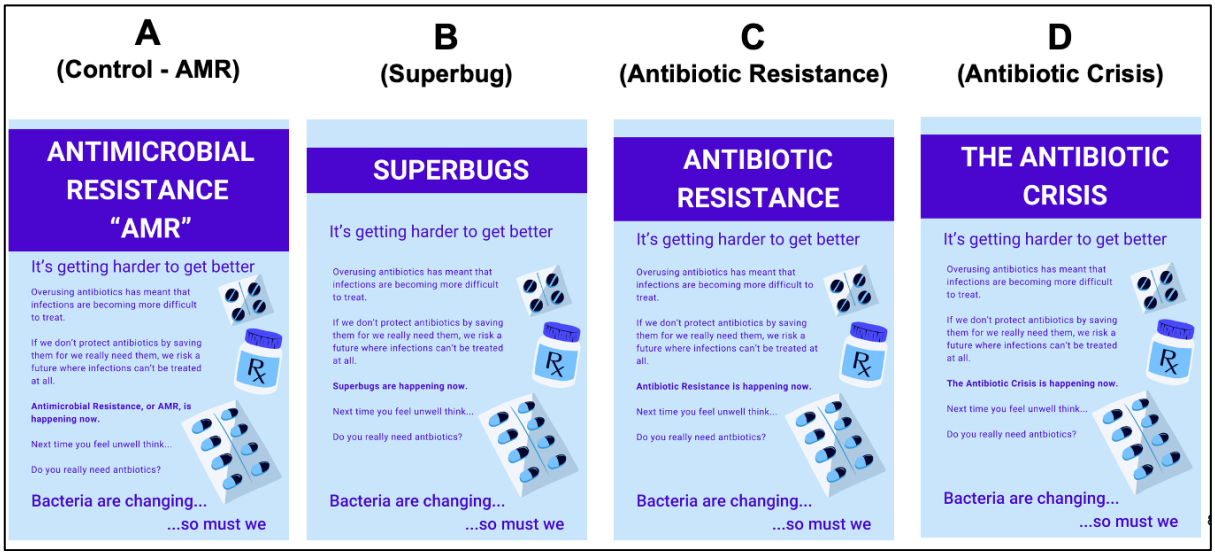

Figure 3: The four intervention arms, as co-designed with public members

Participant Recruitment

The Predictiv Online platform already has access to a participant pool of 500,000 individuals, roughly representative of the general UK population (in terms of gender, age, location and income). Participants are recruited via market research panel companies. The online survey will be uploaded to a panel aggregator who will subsequently distribute this to a range of market research panels. Examples of such panels include QMee and Prime Insights. The link to the survey will be provided by the individual market research panel, and will not be advertised directly by the research team.
Each individual market research panel will hold any personally identifying data and would have previously obtained consent to contact individuals in this way. If a participant responds to the advert, they will be invited to join the Predictiv Online platform via a link provided by their market research panel and take part in the study. No personal identifying data will be transferred to Predictiv, the Behavioural Insights Team or ICL, and it is impossible for these teams to access these data from the original market research panels. As such, for the purposes of this study, participants will be fully anonymous. Participants will be incentivised to participate in this study through a small financial incentive. This will be in the region of £0.70 per participant, although the amount may vary dynamically within a small margin depending upon recruitment. Payment will be made upon completion of the survey. This payment will be managed by the individual market research panel, and not BIT or ICL. Funding for this payment will be provided by ICL, as part of the overall agreement for the work done by BIT. A contract is in place for this work between ICL and BIT, and BIT will invoice ICL for the work done as per this agreement. This invoice will include funds for participant payment. Payment to the panel aggregator company will be managed by BIT. BIT have a contract with the panel aggregator company, but not with the individual panel providers. The panel aggregator will invoice us for the number of completed surveys based on a preset charge per completed survey. The aggregator will then distribute the relevant payments to the relevant panels who will in turn reimburse the participants.

Recruitment will be open for specified covariates until the representative quotas are recruited, demonstrated in Table 1. Once the survey is advertised, survey completion and ongoing participant recruitment will continue in parallel. The recruitment window for the study will remain open until all participant groups are recruited at the defined size. If one participant sub-group is more difficult to recruit, the financial incentive for this sub-group will be raised as part of the pre-defined dynamic process.
Recruitment rates will determine the length of the recruitment and study period, however from previous experience we anticipate the total duration of the study to be 3 weeks.

The target for recruitment has been set at 4,000 participants based on power calculations for the primary outcome. Accepting a two-sided p-value of <0.05 as statistically significant, the study has been designed with 80% power to detect a minimal detectable effect size 6% between trial arms. This is based upon a likely outcome baseline of 60% for sentiment (attitudes to AMR) as referenced in previous similar studies by Wellcome (13), and a likely difference between trial arms as seen in other online trials (15).

Table 1: Participant recruitment targets to ensure representation of the U.K. population

Covariate	Proportion to be recruited

Gender	
Women	50%
Men	50%
Age	
18-24	12%
25-54	53%
55+	35%
Region	
South & East	32%
North	23%
Midlands	16%
Scot/NI/Wales	16% (each country represented proportionately)
London	13%
Ethnicity	
White	82%
Asian (or Asian British)	9%
Black (or Black British)	4%
Mixed / Other	5%

Consent to participate.

Participants will receive the link for study via their own market research panel, who will hold any personally identifying data. This will not be available to the research team at BIT or ICL. The research team will only access anonymous data provided within the survey itself and anonymised demographic data provided by the market research panel.

Accessing the link to the online experiment and continuing with the online survey will be taken as implied participant consent for this study. Participants will be informed that they are free to leave the survey at any point during the process, and given instructions as to how to do so.

Study Duration

The study will be launched on the 20th March 2024 and will stay open until participant recruitment has been fulfilled. Based on previous experience we anticipate the study duration to be 3 weeks. The participant will be involved in the study for approximately 5 minutes (the anticipated time taken to view the image and answer related questions), after which no further involvement will be required.

Data Analysis

Statistical analysis of anonymous survey data will be conducted by the named study team members at BIT, obtained directly from their Predictiv platform. This will be conducted at the individual participant level. The detailed analysis plan can be found in Appendix 1, and will cover the following key components:

1. Primary Outcome – Attitudes towards AMR (Sentiment). This will be conducted using a quasibinominal regression model

2. Secondary Outcome - Comprehension of AMR. This will be conducted using a quasibinominal regression model
3. Exploratory Outcomes – Each exploratory outcome will be analysed using a separate logistic regression for each outcome.

Regression will be adjusted for the following covariates: age, gender, income, region, ethnicity, education, employment status, prescribe antibiotics in job, first language, taken antibiotics in last year For the primary and secondary outcomes, the Benjamini-Hochberg procedure will be used to adjust for 3 comparisons (all treatment arms to control) within each outcome. There will be no multiple comparison correction for the exploratory outcomes.

Aggregate anonymised data will be transferred to researchers at ICL via secure email for further analysis and write up of the findings. These data will be stored securely in a password protected folder within Imperial College London's Sharepoint.

Data Storage

Aggregate anonymised data will be stored securely on ICL servers, only accessible by the ICL research team. This will be stored for 10 years in line with ICL policy on data storage.

4. PARTICIPANT RECRUITMENT

4.1 Pre-recruitment evaluations

In order to access our online survey, participants must be signed up to a market research panel that will receive the survey via a panel aggregator.

4.2 Inclusion Criteria

Adults aged over 18
Resident in the United Kingdom
Have passed the attention check at the start of the online survey.

4.3 Exclusion Criteria

Individuals not signed up a market research panel, and will therefore not have access to the online survey
Those resident outside the UK
Those who fail the attention check at the start of the online survey.
Individuals aged under 18.

4.4 Withdrawal Criteria

Participants can leave the study at any point by closing the online window. They will be informed of this within the information at the start of the survey. If a participant withdraws from the study their data will not be included in the analysis and will be deleted.

5. ASSESMENT AND FOLLOW UP

There will be no routine follow up of participants once they have accessed and completed the online survey in Predictiv's online platform. Participants are not asked any personal questions during this study or asked to relay any personal experiences, as such there is no requirement for follow up once the study has been completed.

6. REGULATORY ISSUES

7.1 Ethics approval

The Principal Investigator has obtained approval from the Head of Department and favourable opinion from RGIT. The study will be conducted in accordance with the recommendations for physicians involved in research on human subjects adopted by the 18th World Medical Assembly, Helsinki 1964 and later revisions.

7.2 Consent

Participants registered with market research panels will have historically consented to be contacted for use in future online studies at the point of signing up. If a participant decides to join this study following receipt of an advert by their own market research panel, them joining the online survey and participating in the questions will be taken as implied consent. No personal or identifying data will be asked or recorded by BIT or ICL as part of the Predictiv online survey. The right of the participant to refuse to participate without giving reasons will be respected. All participants are free to withdraw at any time whilst the survey is being conducted.

7.3 Confidentiality

The Principal Investigator will preserve the confidentiality of participants taking part in the study and fulfil transparency requirements under the General Data Protection Regulation for health and care research. Data and all appropriate documentation will be stored for a minimum of 10 years after the completion of the study, including the follow-up period.

7.4 Indemnity

Imperial College London holds negligent harm insurance policies which apply to this study.

7.5 Sponsor

Imperial College London will act as the main sponsor for this study.

7.6 Funding

There is no external funding for this study. IGHI and BIT are working in collaboration to conduct behavioural science studies related to AMR, and researcher time is provided in kind. IGHI are funding the use of the Predictiv Online Platform at BIT through internal funds, which includes small financial incentives for participants as outlined above.

7.7 Audits

The study may be subject to inspection and audit by Imperial College London under their remit as sponsor.

7. PUBLICATION POLICY

The findings of this study will be written up and published in peer-reviewed journals. We will also create a report detailing the process of intervention design (our public engagement and involvement (PPIE) work) which will be published as a report on the Imperial College IGHI blog. The study findings to be distributed to public members involved in this PPIE work as a written report.

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