Debunking highly prevalent health misinformation using audio dramas delivered by WhatsApp: evidence from a randomised controlled trial in Sierra Leone

Maike Winters 1, Ben Oppenheim 2,3, Paul Sengh 4, Mohammad B Jalloh 4, Nance Webber 4, Samuel Abu Pratt 4, Bailah Leigh 5, Helle Molsted-Alvesson 1, Zangin Zeebary 6, Carl Johan Sundberg 7, Mohamed F Jalloh 1, Helena Nordenstedt 1

ABSTRACT

Introduction Infectious disease misinformation is widespread and poses challenges to disease control. There is limited evidence on how to effectively counter health misinformation in a community setting, particularly in low-income regions, and unsettled scientific debate about whether misinformation should be directly discussed and debunked, or implicitly countered by providing scientifically correct information.

Methods The Contagious Misinformation Trial developed and tested interventions designed to counter highly prevalent infectious disease misinformation in Sierra Leone, namely the beliefs that (1) mosquitoes cause typhoid and (2) typhoid co-occurs with malaria. The information intervention for group A (n=246) explicitly discussed misinformation and explained why it was incorrect and then provided the scientifically correct information. The intervention for group B (n=245) only focused on providing correct information, without directly discussing related misinformation. Both interventions were delivered via audio dramas on WhatsApp that incorporated local cultural understandings of typhoid. Participants were randomised 1:1:1 to the intervention groups or the control group (n=245), who received two episodes about breast feeding.

Results At baseline 51% believed that typhoid is caused by mosquitoes and 59% believed that typhoid and malaria always co-occur. The endline survey was completed by 91% of participants. Results from the intention-to-treat, per-protocol and as-treated analyses show that both interventions substantially reduced belief in misinformation compared with the control group. Estimates from these analyses, as well as an exploratory dose–response analysis, suggest that direct debunking may be more effective at countering misinformation. Both interventions improved people’s knowledge and self-reported behaviour around typhoid risk reduction, and yielded self-reported increases in an important preventive method, drinking treated water.

Key questions

What is already known?
► Health-related misinformation is highly prevalent and highly damaging.
► Randomised trials to counter real-world misinformation remain rare, with most evidence to date being limited to high-income settings.

What are the new findings?
► Two narrative audio dramas were tested via WhatsApp in Freetown, Sierra Leone; the first explicitly mentioned and debunked typhoid-related misinformation, the second focused only on providing scientifically correct information.
► Both interventions effectively reduced belief in misinformation as well as improved knowledge and self-reported protective behaviours, but stronger effects were achieved by explicitly citing and debunking misinformation.

What do the new findings imply?
► Explicitly addressing why misinformation is wrong via narrative public health messaging may prove effective in countering infodemics.

Conclusion These results from a field experiment in a community setting show that highly prevalent health misinformation can be countered, and that direct, detailed debunking may be most effective.

Trial registration number NCT04112680.

INTRODUCTION

Misinformation can be as contagious as a virus—sometimes more. And like a virus, misinformation can be fatal. There is strong evidence that misinformation can reduce protective actions, encourage risky behaviours...
and promote the spread of infectious disease.12 The WHO has described the current COVID-19 pandemic as an ‘infodemic’, pointing to the overabundance of (mis)information.3,4 Widespread misinformation has posed significant challenges to the control of the pandemic, introducing (and amplifying) uncertainty about the importance and efficacy of non-pharmaceutical interventions such as masking and social distancing, as well as safety and efficacy of vaccines for SARS-CoV-2.23,25 The public health challenges posed by misinformation go far beyond COVID-19. Vaccine hesitancy, driven by online misinformation, has played a role in the recurrence of preventable diseases, notably measles.6–8

The rapid rise in the use of social media has increased the volume and velocity of misinformation, giving the especially virulent narratives a wider reach.9,10 Despite the urgent need for tools to counter health-related misinformation, there is limited evidence on which strategies are efficacious. Meta-analyses studying different strategies for countering misinformation found that detailed counterarguments could be effective, especially when they are delivered by a trusted source and in line with recipients’ worldviews and social norms.11,12 However, this approach does not always yield reductions in belief in misinformation.11,12 This might be explained by the continued influence effect, whereby despite credible alternatives, people still rely on the initial misinformation,13–17 or via a number of cognitive biases through which repeated exposure to information can strengthen its cognitive availability or appeal, raising the risk that corrective messaging inadvertently strengthens belief in misinformation.18–20 Fortunately, evidence thus far shows that these types of unwanted side effects of debunking do not always occur.21,22 However, many studies have methodological limitations and few use a pre-post randomised controlled design.21 An alternative approach to debunking misinformation emphasises providing correct information rather than directly countering misinformation, to avoid spreading the narrative further to people who would otherwise not have come in contact with it and thus increasing their familiarity with the misinformation.23–27

To date, there have been very few experimental studies of interventions to reduce misinformation in non-laboratory settings.13,15,28 Most studies aiming to test debunking strategies against health and non-health-related misinformation have been carried out using survey experiments, or in laboratory experiments on university campuses, with relatively small sample sizes and subjects including young, mostly female college students.11,29 Furthermore, many studies have not been anchored in a real-world context, as the effectiveness of debunking strategies was evaluated by experimentally introducing a piece of misinformation and subsequently countering its content.23,30 In summary, there is limited evidence to date to counter already existing misinformation that is prevalent among the public. In addition, as most studies have been carried out in high-income settings, little is known about debunking strategies in low-income settings that are especially vulnerable to infectious disease outbreaks. Studies that have been performed in low-income settings have mainly looked at various forms of health education to increase knowledge and uptake of protective behaviours, as opposed to specifically testing debunking strategies to target health misinformation.31–34

In Sierra Leone, there is widespread misinformation regarding typhoid, and in particular, widespread belief that typhoid and malaria are closely related.25 Interestingly, people commonly conceptualise typhoid and malaria as a single disease, ‘typhoid-malaria’. The belief structure linking these diseases is complex and varied. Some narratives indicate that malaria weakens the immune system, which in turn leads to typhoid infection; another narrative suggests that ‘typhoid and malaria walk on the same road’ or ‘are friends’, which implies that the diseases have some causal relationship. Finally, some conceptualise typhoid-malaria as a more severe case of malaria, requiring distinct treatment approaches. The notion that typhoid and malaria occur in conjunction is the common denominator across all explanations. The perceived similarity of the two diseases also makes many people believe that typhoid is caused by mosquitoes.

Although typhoid and malaria share symptoms (eg, fever), they are very different diseases: typhoid is caused by bacterial infection, usually transmitted through contaminated food, water and the faecal-oral route. The incidence of typhoid in Sierra Leone is estimated to be low (around 15,000 cases in 2019).35 Malaria is a disease spread by parasite-infected mosquitoes and is much more common than typhoid in Sierra Leone, with more than 3.7 million cases estimated in 2019.35

Typhoid can be diagnosed through blood culture. However, in Sierra Leone only one hospital currently has the necessary equipment, and resource constraints limit the availability of blood culture for clinical diagnosis.37 Instead, the Widal test is commonly used to diagnose typhoid. The Widal test reportedly has low sensitivity, specificity and positive predictive value for typhoid diagnosis,38,39 and may cross-react with malaria antigens, raising the risk of a false-positive result for patients with malaria infections.40 Confirmed coinfection of malaria and typhoid is rarely observed.41–43 However, in Sierra Leone patients are frequently diagnosed in health centres with ‘typhoid-malaria’, often without using a diagnostic test,44 which in addition to antimalarials often is treated with antibiotics.45 While there are limited data on typhoid diagnosis and related antibiotic usage in Sierra Leone,44 the overdiagnosis of typhoid has likely contributed to the unnecessary use of antibiotics, as well as ensuing antibiotic resistance.46,47 Countering typhoid misinformation could therefore inform and empower citizens to question a typhoid-malaria diagnosis and potentially avoid unnecessary usage of antibiotics.
Table 1 Core messages of audio dramas by intervention group

<table>
<thead>
<tr>
<th>Episode</th>
<th>Group A: Plausible Alternative</th>
<th>Group B: Avoiding Misinformation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Disease</td>
<td>People think there is a disease called typhoid-malaria, but these are two different diseases.</td>
<td>You can get typhoid by itself, without having other diseases.</td>
</tr>
<tr>
<td>2. Cause</td>
<td>Typhoid is not caused by mosquitoes, but by contaminated water and food.</td>
<td>Typhoid is caused by contaminated water and food.</td>
</tr>
<tr>
<td>3. Prevention</td>
<td>Sleeping under a bednet helps prevent malaria but does not help prevent typhoid. Good hygiene, drinking treated water and cooking food properly help prevent typhoid.</td>
<td>Prevent yourself from getting typhoid by cooking your food properly and drinking only treated water.</td>
</tr>
</tbody>
</table>

**METHODS**

The Contagious Misinformation Trial (CMT) was a prospective, three-arm, superiority randomised controlled trial that took place within the community in Freetown, the capital of Sierra Leone, in 2019. The CMT investigated the efficacy of two debunking strategies to counter misinformation about typhoid in Freetown, Sierra Leone, by incorporating scientific and risk communication information into four-episode audio dramas (see table 1) delivered via WhatsApp, a widely used instant messaging platform.

The audio dramas targeting intervention group A (the Plausible Alternative group) explicitly mentioned the misinformation and provided a detailed counter-argument. The audio dramas applied to intervention group B (the Avoiding Misinformation group) did not directly discuss the misinformation, and instead only focused on providing scientifically correct information. The control group received audio messages on breast feeding, unrelated to typhoid-malaria. We tested the efficacy of the two interventions using a randomised controlled trial of 736 participants that took place in the community. Comparing the two interventions allows us to examine whether explicitly invoking and discussing misinformation yields superior results in terms of reducing belief in misinformation. We tested two main outcomes:

- The belief that typhoid is caused by mosquitoes.
- The belief that typhoid can only co-occur with malaria.

The study was designed to detect a relative reduction of 15% in belief in misinformation between one of the intervention groups and the control group. Based on pilot testing, we assumed a 50% prevalence of belief in misinformation. A sample size of 170 per group was required to provide power of 0.80 for a one-sided Wald test. Because of the clustered sampling strategy, the intracluster correlation (ICC) can potentially reduce the effective sample size compared with the calculated sample size. Based on a previous study, we assumed an ICC of 0.01 and a design effect of 1.2. The sample size was expanded to 250 per group in order to address ICC and potential attrition. The postattrition sample size of 668 gives a statistical power of approximately 0.97.

**Recruitment of participants**

We selected 21 of the 64 administrative sections in Freetown as trial sites using weighted random sampling without replacement. As these sections vary widely in size (between roughly 600 and 6000 households), each section had a weighted probability of selection proportional to its size. The weighted random selection was done by a macro written in Visual Basic for Application for Microsoft Excel. During the recruitment phase, three teams consisting of four enumerators and one supervisor visited one section per day for 7 days (7–13 October 2019). Each enumerator recruited nine new participants in each section. Eligible participants were adults (18 years and older), living in Freetown, fluent in Krio, in possession of a phone with WhatsApp and with no hearing impairments (more details about the recruitment can be found in the online supplemental material).

Participants received 10,000 leones (about US$1) worth of data credit (around 220 MB) per audio message they received, to ensure that the audio messages could be downloaded. All enumerators and supervisors followed the 3-day training both before the recruitment and baseline survey and before the endline survey was conducted. The aim of the training was for the enumerators to understand the purpose of the study, the recruitment, and to practise the translation of the survey to Krio. The survey was constructed and pilot tested in English, and translated both in written and spoken Krio by a certified translator in Freetown.

The data collection for the endline survey was structured in a similar fashion as the baseline survey, with each team of four enumerators and one supervisor visiting one section per day. Enumerators called participants at least 1 day in advance to make appointments. Five extra data collection days were used to visit participants that could not be reached directly (2–13 December 2019).

In Western Area Urban (the district in which Freetown is situated), an estimated 65% of the population has access to the internet, compared with around 38% elsewhere in the country. This means that the sample in our study is likely wealthier and more highly educated than the general population in Sierra Leone. To strengthen the external validity and understand whether the intervention would work with another mode of administration, we...
conducted an ancillary analysis with 60 additional participants who did not have WhatsApp but were in possession of a mobile phone (see online supplemental file 2).

Data collection teams were instructed not to say words like ‘misinformation’ when recruiting participants. Instead, they would explain that the study would aim to understand people’s knowledge about diseases, as knowledge is power. The Krio name for the study was ‘Info Na Pawa’, or ‘Information is power’. After obtaining written informed consent, the baseline survey was administered in Krio.

Randomisation and masking
After the recruitment and baseline survey, the participants were randomised 1:1:1 across two intervention groups (A (n=246) and B (n=245)) and one control group (n=245). The random allocation sequence was generated by an Excel Macro (created by ZZ), in which the whole sample was treated as one block.

After randomisation, the study team and the participants were blinded to the allocation of the participants. Enumerators were not aware of participants’ intervention condition during the endline survey. Questions about the audio messages (which would have potentially revealed whether the participant was in the intervention or control group) were asked at the end of the survey, so that enumerators would not be biased. After completion of the endline survey, data were anonymised so that the analysis team was blinded to the allocation of the participants as well.

Intervention
The two intervention groups in the CMT received audio messages that were based on evidence around countering misinformation. The first intervention (group A) was called ‘Plausible Alternative’, and was informed by research showing that offering a plausible alternative to the misinformation has a higher success rate than simply rejecting the misinformation as false. The second intervention (group B) was called ‘Avoiding Misinformation’, and was motivated by a less explored debunking method, which is to provide correct information without invoking or mentioning misinformation to limit the risk of further spreading misinformation. We drew on these theories to produce two sets of audio dramas, with four episodes each.

The audio dramas were produced in Krio with the Freetong Players, a well-known actors group in Sierra Leone. The episodes in the Plausible Alternative drama explicitly cited and discussed misinformation around typhoid and malaria, which was subsequently debunked in the episodes. The episodes in the Avoiding Misinformation drama on the other hand did not mention the misinformation at all and instead focused on the correct information regarding typhoid. The audio dramas incorporated local cultural understandings and language regarding typhoid and malaria. The Freetong Players identified themselves at the start of each episode, and the scientific and risk communication messaging in the dramas was delivered by credible characters: physicians and nurses. By sending out four episodes in each intervention group, we ensured repeated exposure to debunking efforts.

Every episode had one core message (see table 1) and lasted between 2 and 5 min. (See the English transcripts in the online supplemental information. To listen to the dramas (in Krio) and access the full dataset see: https://data.mendeley.com/datasets/c758p4dtwz/3). Participants in the control group received two episodes promoting breast feeding in Krio, which were approximately 1 min long.

Outcomes
The two main outcomes (ie, to reduce the belief that (1) typhoid is caused by mosquitoes and (2) can only co-occur with malaria) were captured in the baseline and endline survey with yes/no questions and were analysed with intention-to-treat (ITT) and per-protocol analyses. We conducted a dose–response analysis for each primary outcome. As a robustness check we conducted an as-treated analysis of the two primary outcomes.

The study included several secondary outcomes. First, whether either the intervention unintentionally seeded misinformation among participants who held the correct beliefs as baseline. Second, we tested whether the interventions improved knowledge about preventive methods and self-reported practices for typhoid.

Statistical analysis
Demographic descriptive statistics were tabulated and differences between the intervention and control groups analysed using χ2 tests. We carried out an ITT analysis, excluding the participants who were lost to follow-up. The per-protocol analyses only included participants who reported listening to 100% of the episodes (four episodes for the intervention groups, two episodes for the control group). We also conducted sensitivity analyses to ensure that the per-protocol estimates were not confounded by sample selection (see online supplemental material). For the as-treated analysis, the groups were determined based on the endline survey question ‘Was the audio about typhoid or about breastfeeding?’

Crude logistic regression models were specified for the ITT, per-protocol and as-treated analyses. Adjusted logistic regression models incorporated sociodemographic covariates, including sex, education, religion, monthly income and age. As a robustness check, we also estimated Ordinary Least Squares (OLS) regression models with robust SEs for the ITT, per-protocol and as-treated analyses; the results were consistent with the analyses presented in the main text and can be found in the online supplemental information. We applied a Bonferroni adjustment to account for multiple hypothesis tests, setting our alpha at 0.025.

We tested whether the interventions unintentionally seeded misinformation by limiting the analysis to respondents who held scientifically correct beliefs at baseline.
and modelling whether the treatments lead to an increase in belief in misinformation at endline. We used logistic regression models, comparing the intervention groups to each other, as well as to the control group.

We conducted an exploratory dose–response analysis by building a treatment index based on the number of episodes each respondent reported listened to; indexing these values allows us to compare the dose–response relationship for the intervention groups (who listened to a maximum of four episodes) to the control group (who listened to a maximum of two episodes). We conducted this analysis for the two primary outcomes using crude and covariate-adjusted logistic regression models.

Knowledge about preventive methods was assessed through an index constructed from an open-ended question on preventive methods that was administered in both the baseline and endline survey (‘Can you name up to 3 ways how you can prevent yourself from getting typhoid?’). Correct answers such as drinking treated water were awarded one point, incorrect answers such as taking anti-malarials received one minus point (see online supplemental material). The total score per participant varied between −3 and +3. The difference between the intervention groups and the control group in preventive knowledge was analysed through crude and adjusted ordinal logistic regression models.

Lastly, we conducted an exploratory analysis of two behavioural outcomes to estimate whether the intervention increased the use of scientifically grounded approaches to reduce the risk of typhoid infection. In the baseline survey, participants were asked whether they currently take actions to avoid getting infected by typhoid. Those answering yes were asked about the type of actions taken through an open-ended question. Similarly, in the endline survey, participants were asked whether they had taken actions in the last 2 months (ie, the time between the baseline and endline survey) to avoid a typhoid infection. Those answering yes received the open-ended question regarding the specific actions they had taken. Crude and adjusted logistic regression models were fitted for two behavioural outcomes: sleeping under a bednet and drinking treated water (with only the latter a scientifically correct approach to reduce typhoid risk). It should be noted that episode 3 in intervention group A mentioned that while sleeping under a bednet does not prevent a typhoid infection, it does help prevent malaria; we therefore expect intervention group A to be less likely to report sleeping under a bednet to prevent typhoid at endline (though no less likely to use a bednet to avoid malaria infection).

Stata MP V.15 was used for the analysis. The online supplemental tables S10–S15 describe sensitivity analyses. The full study protocol and statistical analysis plan can be accessed at ClinicalTrials.gov and the online supplemental file 2. The study was reported in accordance with Consolidated Standards of Reporting Trials.53

RESULTS

In total, 736 participants in Freetown were enrolled in the CMT. A total of 44 (6%) participants were lost during the intervention period and 24 (3%) participants could not be recontacted for endline data collection, yielding a completion rate of 91% (see figure 1).

Participants who had completed primary education had a slightly higher attrition rate than those who had

Figure 1 Flow chart of the Contagious Misinformation Trial.
no formal education, as well as those who had completed secondary and postsecondary education (see online supplemental table S1). The majority of the participants had received secondary education (54%) (see table 2).

Islam was the most common religion among the participants (60%). Two-thirds of the participants earned up to US$30 (300,000 leones) per month. Almost two-thirds of the participants (66%) indicated that they had had typhoid at some point in life. In total, 94% of study participants reported in the baseline survey that they had heard of typhoid-malaria. Belief in misinformation was highly prevalent: at baseline, 51% believed that typhoid is caused by mosquitoes, and 59% believed that typhoid and malaria co-occur (see table 2, online supplemental table S2). There was no statistical difference between the three randomised groups on the demographic variables. At baseline, there was also no statistical difference in belief in misinformation between the intervention and control groups.

**ITT analysis**

The belief that typhoid is caused by mosquitoes was significantly reduced in intervention group A compared with the control group in the ITT analysis (group A: adjusted OR (AOR) 0.29, 95% CI 0.18 to 0.47, see table 3 and online supplemental figure S1). In intervention group B, the reduction was not significant (AOR 0.61, 95% CI 0.39 to 0.95, p=0.029).

The Plausible Alternative intervention (group A) yielded a larger reduction than the Averting

| Table 2: Baseline characteristics of the intervention and control groups |
|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|                            | Group A (n=246) | Group B (n=245) | Control (n=245) |
| Age (years)                |                |                |                |
| 18–30                      | 169 (69%)      | 163 (67%)      | 151 (62%)      | 0.147 |
| 31–49                      | 59 (24%)       | 74 (29%)       | 73 (30%)       |        |
| 50+                        | 18 (7%)        | 10 (4%)        | 21 (9%)        |        |
| Sex                        |                |                |                |
| Female                     | 118 (48%)      | 127 (52%)      | 130 (53%)      | 0.499 |
| Male                       | 128 (52%)      | 118 (48%)      | 115 (47%)      |        |
| Education                  |                |                |                |
| No formal                  | 17 (7%)        | 9 (4%)         | 18 (7%)        | 0.226 |
| Primary                    | 14 (6%)        | 12 (5%)        | 12 (5%)        |        |
| Secondary                  | 133 (54%)      | 126 (51%)      | 142 (58%)      |        |
| Postsecondary              | 82 (33%)       | 98 (40%)       | 72 (29%)       |        |
| Religion                   |                |                |                |
| Islam                      | 155 (63%)      | 141 (58%)      | 149 (61%)      | 0.461 |
| Christianity               | 91 (37%)       | 104 (42%)      | 96 (39%)       |        |
| Income (leones)†           |                |                |                |
| 0–300,000                  | 175 (71%)      | 158 (64%)      | 160 (65%)      | 0.418 |
| 300,000–1,000,000          | 60 (24%)       | 68 (28%)       | 69 (28%)       |        |
| >1,000,000                 | 11 (4%)        | 19 (8%)        | 16 (7%)        |        |
| Typhoid from mosquitoes?   |                |                |                |
| No                         | 94 (38%)       | 100 (41%)      | 93 (38%)       | 0.648 |
| Yes                        | 123 (50%)      | 122 (50%)      | 128 (52%)      |        |
| I don’t know               | 26 (11%)       | 23 (9%)        | 23 (9%)        |        |
| No response                | 3 (1%)         | 0 (0%)         | 1 (0%)         |        |
| Typhoid without malaria?   |                |                |                |
| No                         | 145 (59%)      | 146 (60%)      | 142 (58%)      | 0.827 |
| Yes                        | 83 (34%)       | 86 (35%)       | 89 (36%)       |        |
| I don’t know               | 17 (7%)        | 13 (5%)        | 14 (6%)        |        |
| No response                | 1 (0%)         | 0 (0%)         | 0 (0%)         |        |

Data are n (%).
*Based on χ² test.
†At the time of the baseline survey 10,000 leones was worth approximately US$1.
Misinformation intervention (group B) (AOR 0.46, 95% CI 0.28 to 0.76), though this result does not reach significance in the crude model (table 4). The belief that typhoid co-occurs with malaria was significantly reduced in both intervention groups in the ITT analysis (group A: AOR 0.29, 95% CI 0.19 to 0.45; group B: AOR 0.55, 95% CI 0.36 to 0.83) (table 3 and online supplemental figure S2). Group A showed a greater reduction than group B (AOR 0.51, 95% CI 0.33 to 0.81, see table 4), but was not significant in the crude model (AOR 0.65, 95% CI 0.43 to 0.98). As a robustness check, we ran the ITT analysis using OLS regression, which yielded similar results (see online supplemental table S3).

Per-protocol analysis
Similarly, both intervention groups had reduced levels of belief in misinformation under the per-protocol analyses (see tables 3 and 4, online supplemental figures S1 and S2 and online supplemental table S3 for OLS models). The belief that typhoid is caused by mosquitoes was lower in both intervention groups compared with the control group (group A: AOR 0.06, 95% CI 0.02 to 0.20; group B: AOR 0.35, 95% CI 0.15 to 0.84); group A showed sharper declines in the odds than group B (AOR 0.15, 95% CI 0.04 to 0.58). Similarly, the belief that typhoid and malaria co-occur was reduced at endline in the intervention groups compared with the control group (group

Table 3  Primary outcomes for intervention group A and group B versus control group

<table>
<thead>
<tr>
<th></th>
<th>Crude OR (95% CI)</th>
<th>P value</th>
<th>Adjusted* OR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
</table>
### Typhoid comes from mosquitoes

<table>
<thead>
<tr>
<th></th>
<th>Crude OR (95% CI)</th>
<th>P value</th>
<th>Adjusted* OR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intention-to-treat</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n=583)†</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.31 (0.20 to 0.48)</td>
<td>0.000</td>
<td>0.29 (0.18 to 0.47)</td>
<td>0.000</td>
</tr>
<tr>
<td>Group B</td>
<td>0.50 (0.33 to 0.77)</td>
<td>0.002</td>
<td>0.61 (0.39 to 0.95)</td>
<td>0.029</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>–</td>
<td>Reference</td>
<td>–</td>
</tr>
</tbody>
</table>

| **Per-protocol**       |                   |         |                       |         |
| (n=210)                |                   |         |                       |         |
| Group A                | 0.07 (0.02 to 0.19) | 0.000   | 0.06 (0.02 to 0.20) | 0.000   |
| Group B                | 0.31 (0.14 to 0.70) | 0.005   | 0.35 (0.15 to 0.84) | 0.019   |
| Control                | Reference         | –       | Reference             | –       |

| **As-treated**         |                   |         |                       |         |
| (n=419)                |                   |         |                       |         |
| Group A                | 0.15 (0.08 to 0.27) | 0.000   | 0.13 (0.07 to 0.25) | 0.000   |
| Group B                | 0.33 (0.19 to 0.57) | 0.000   | 0.38 (0.21 to 0.68) | 0.001   |
| Control                | Reference         | –       | Reference             | –       |

### Typhoid and malaria co-occur

<table>
<thead>
<tr>
<th></th>
<th>Crude OR (95% CI)</th>
<th>P value</th>
<th>Adjusted* OR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intention-to-treat</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n=618)†</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.32 (0.21 to 0.48)</td>
<td>0.000</td>
<td>0.29 (0.19 to 0.45)</td>
<td>0.000</td>
</tr>
<tr>
<td>Group B</td>
<td>0.49 (0.33 to 0.73)</td>
<td>0.000</td>
<td>0.55 (0.36 to 0.83)</td>
<td>0.004</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>–</td>
<td>Reference</td>
<td>–</td>
</tr>
</tbody>
</table>

| **Per-protocol**       |                   |         |                       |         |
| (n=220)                |                   |         |                       |         |
| Group A                | 0.07 (0.03 to 0.18) | 0.000   | 0.06 (0.02 to 0.15) | 0.000   |
| Group B                | 0.16 (0.07 to 0.36) | 0.000   | 0.15 (0.06 to 0.36) | 0.000   |
| Control                | Reference         | –       | Reference             | –       |

| **As-treated**         |                   |         |                       |         |
| (n=434)                |                   |         |                       |         |
| Group A                | 0.13 (0.08 to 0.23) | 0.000   | 0.12 (0.07 to 0.21) | 0.000   |
| Group B                | 0.25 (0.15 to 0.42) | 0.000   | 0.27 (0.16 to 0.47) | 0.000   |
| Control                | Reference         | –       | Reference             | –       |

*Adjusted for sex, education, religion, income and age.
†Complete case analysis. Participants who responded ‘Don’t Know’ or ‘No Response’ in either baseline or endline were excluded. We analysed the impact of intervention assignment on endline non-response (see online supplemental table S9).
A: AOR 0.06, 95% CI 0.02 to 0.15; group B: AOR 0.15, 95% CI 0.06 to 0.36). There was no statistical difference between group A and group B (AOR 0.32, 95% CI 0.09 to 1.09).

As-treated analysis
For the as-treated analysis, 30 participants (13%) were reclassified from control to intervention group A, and 10 participants (3%) in group A and 7 (3%) in group B) from intervention to control. Results are robust to different reclassification techniques (see online supplemental table S4). The as-treated analysis confirmed that participants in both intervention groups were significantly less likely to believe in misinformation. The belief that typhoid is caused by mosquitoes had significantly lower odds in both groups compared with the control group (AOR 0.13, 95% CI 0.07 to 0.25; group B: AOR 0.58, 95% CI 0.21 to 0.68). The belief that typhoid and malaria co-occur had even stronger associations (group A: AOR 0.12, 95% CI 0.07 to 0.21; group B: AOR 0.27, 95% CI 0.16 to 0.47) (see table 3 and online supplemental table S3 for OLS models).

Seeding misinformation
It is possible that an informational intervention to mitigate misinformation can instead have the undesired effect of ‘seeding’ it, for example, by exposing people who previously held scientifically correct beliefs to factually incorrect beliefs, which then take hold. We analysed whether the intervention unintentionally seeded misinformation among the participants who held the correct beliefs at baseline. Participants in group A were less likely to believe the misinformation at endline compared with the control group, for both the belief that mosquitoes cause typhoid (AOR 0.35, 95% CI 0.15 to 0.81) and the belief that typhoid and malaria co-occur (AOR 0.39, 95% CI 0.18 to 0.82) (see online supplemental table S5). There was no significant difference between group B and the control group for the mosquito belief (AOR 0.70, 95% CI 0.33 to 1.51) and the belief that typhoid and malaria co-occur (AOR 0.58, 95% CI 0.29 to 1.16). There

<table>
<thead>
<tr>
<th>Table 4</th>
<th>Primary outcomes for intervention group A versus group B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Crude OR (95% CI)</td>
</tr>
<tr>
<td>Typhoid comes from mosquitoes</td>
<td></td>
</tr>
<tr>
<td>Intention-to-treat (n=385)†</td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.61 (0.39 to 0.96)</td>
</tr>
<tr>
<td>Group B</td>
<td>Reference</td>
</tr>
<tr>
<td>Per-protocol (n=130)</td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.23 (0.08 to 0.73)</td>
</tr>
<tr>
<td>Group B</td>
<td>Reference</td>
</tr>
<tr>
<td>As-treated (n=306)</td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.47 (0.27 to 0.82)</td>
</tr>
<tr>
<td>Group B</td>
<td>Reference</td>
</tr>
<tr>
<td>Typhoid and malaria co-occur</td>
<td></td>
</tr>
<tr>
<td>Intention-to-treat (n=404)†</td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.65 (0.43 to 0.98)</td>
</tr>
<tr>
<td>Group B</td>
<td>Reference</td>
</tr>
<tr>
<td>Per-protocol (n=133)</td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.43 (0.15 to 1.25)</td>
</tr>
<tr>
<td>Group B</td>
<td>Reference</td>
</tr>
<tr>
<td>As-treated (n=311)</td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.55 (0.32 to 0.96)</td>
</tr>
<tr>
<td>Group B</td>
<td>Reference</td>
</tr>
</tbody>
</table>

*Adjusted for sex, education, religion, income and age.
†Complete case analysis. Participants who responded ‘Don’t Know’ or ‘No Response’ in either baseline or endline were excluded.
was no difference between group A and group B on both outcomes (mosquito outcome: AOR 0.41, 95% CI 0.15 to 1.05; malaria co-occurrence outcome: AOR 0.72, 95% CI 0.33 to 1.58).

Dose–response analysis
The dose–response analysis suggests that the group A ‘Plausible Alternative’ intervention was more effective. Both intervention groups significantly reduced their beliefs in the misinformation after having listened to at least two episodes, compared with the control group (see online supplemental table S6). Limiting the analysis to only the two intervention groups, we found a significant interaction between intervention group and dose for the belief that typhoid is caused by mosquitoes (AOR 0.62, 95% CI 0.43 to 0.89), showing that with increased number of episodes, group A performed better than group B (online supplemental table S7). This effect was not observed for the belief that typhoid and malaria co-occur (AOR 0.80, 95% CI 0.58 to 1.11). Furthermore, three episodes of the drama in group A were significantly better at reducing the typhoid-mosquito belief than the four episodes in the group B drama (online supplemental table S8).

Knowledge about preventive methods
We scored participants’ knowledge about preventive methods on a scale ranging from −3 to +3. The data suggest that both interventions improved study participants’ knowledge: at endline, 67% of the participants in group A scored 1 or higher versus 66% in group B and 51% in the control group. Ordinal logistic regression showed that the two intervention groups scored significantly higher than the control group (group A: AOR 2.19, 95% CI 1.57 to 3.06; group B: AOR 1.79, 95% CI 1.27 to 2.50), but there was no statistically distinguishable effect between the two intervention groups (online supplemental table S9).

Behavioural outcomes
Exploratory analyses around behavioural outcomes showed that participants in group A were significantly less likely than the control group to report that they were sleeping under a bednet to prevent typhoid infection (AOR 0.43, 95% CI 0.24 to 0.78). There was no statistically significant association for group B (AOR 0.64, 95% CI 0.36 to 1.12) (online supplemental table S9). Both intervention groups had significantly higher odds to report that they were drinking treated water to prevent typhoid infection (group A: AOR 2.78, 95% CI 1.67 to 4.64; group B: AOR 1.77, 95% CI 1.08 to 2.91). There were no statistically differences between intervention groups for either behavioural outcome.

DISCUSSION
Effectively correcting prevalent public health misinformation is an urgent challenge. The CMT tested two ways of countering prevalent misinformation about typhoid using audio dramas delivered via WhatsApp. Results show that both intervention groups reduced belief in two types of misinformation compared with the control: the belief that typhoid is caused by mosquitoes and the belief that typhoid and malaria co-occur.

Apart from changing the participants’ beliefs in prevalent misinformation, both interventions also positively influenced people’s knowledge and yielded increases in an important protective practice (drinking treated water). It should be noted that this measure was self-reported and might have suffered from social desirability bias. Further studies could gather longitudinal observational data on behavioural risk reduction following (mis)information interventions.

While both interventions reduced belief in misinformation relative to the control group, the Plausible Alternative intervention group, which mentioned misinformation before debunking it, generally experienced stronger improvements in misinformation belief reduction than the Avoiding Misinformation intervention (group B). This is consistent with evidence from laboratory-based studies. While both interventions contained basic elements of storytelling, the debunking strategy of the Plausible Alternative group incorporated the dramatic element of conflict and debate, which might have made the content ‘stick’ better. Both interventions contained the same volume of scientifically correct, educational content, but intervention group A ‘invested’ additional story time in debunking misinformation; it is possible that increasing the length and scientific detail of the Avoiding Misinformation intervention could increase its effectiveness. Further research on these topics is warranted. However, the Plausible Alternative intervention did not yield statistically significant improvements relative to the Avoiding Misinformation intervention in knowledge of prevention measures or behavioural outcomes.

Contrary to other trials with health communication interventions, we found no evidence that the interventions created negative side effects. Despite concerns that specifically mentioning and debunking misinformation might inadvertently spread scientifically incorrect narratives, we found that the Plausible Alternative intervention did not seed misinformation among those who had previously held correct beliefs. This could be because the risk of spreading misinformation is higher when those audiences are new to the misinformation. However, in our study a large majority of participants (94%) had heard of typhoid-malaria, which may have lowered the risk of seeding the misinformation among those who held the correct beliefs.

A major strength of this study is the study design. As a randomised field experiment, the CMT contributes to a small but growing body of research that tests strategies to counter misinformation in a community rather than laboratory setting or survey experiment. The intervention was designed to approximate a real-world public health communication effort, and therefore may have
stronger external validity than survey experiments and other commonly used tools to assess the efficacy of informational interventions.

Like other social media, WhatsApp, a widely used messaging platform with global reach, is a platform that can enable the spread of misinformation.\textsuperscript{37, 38} At the same time, WhatsApp’s wide reach could be used to deliver effective public health communication campaigns at scale,\textsuperscript{58} while avoiding some of the challenges inherent to radio and television as information channels (eg, information must be ‘consumed’ at time of broadcast, rather than when convenient for the receiver). Further studies are warranted to test corrective messages at scale. These studies might explore the potential for spillover effects, in particular the extent to which health information and educational messaging is shared with others, whether on or off the specific technology platform used to disseminate the intervention. In the case of the CMT, study participants were explicitly instructed not to share the audio dramas. However, real-world information interventions could be much more impactful on a population level if recipients were encouraged to share them, and future studies could explore whether specific types of content, delivery or instructions can encourage ‘productive’ spillover effects of health promotion messaging.

This study also had several limitations. First, despite our ability to monitor message reception and follow-up with study participants, 30\% of our participants did not receive or listen to any of the audio episodes. If interventions of this type would be implemented on a larger scale and with less intensive oversight, non-adherence could be higher. Further research could explore the effect of additional reminders and ‘nudges’ on listenership. The endline survey was conducted 8 weeks after the baseline. Future studies should assess the long-term ‘stickiness’ of improvements to knowledge and practices via these and other debunking methods. Furthermore, the misinformation we aimed to counter concerned a specific health-related myth that was not subject to politicised debates. Polarised misinformation might be harder to counter, although the evidence on this is inconclusive thus far.\textsuperscript{59, 60} Further experimental work is needed to examine whether the CMT intervention elements would yield similar improvements on polarising misinformation. Similarly, while the misinformation in our study was explicitly debunked in the Plausible Alternative group, it would be of interest to study similar corrective efforts when misinformation consists of implied rather than explicit falsehoods, for instance, through the omission of relevant information.\textsuperscript{61}

CONCLUSION

These limitations notwithstanding, we have shown that it is possible to reduce belief in misinformation rapidly, even where such beliefs are widely held and reinforced via the health system. A communications strategy that gives room to explain why misinformation is wrong and then provides scientifically correct information, is in line with existing worldviews, delivered by credible sources and gets repeated exposure has the potential to yield desired results without unintentionally seeding misinformation. This list of attributes may sound demanding. However, the results of this field experiment provide some grounds for optimism that even as misinformation becomes more prevalent, there are effective tools at hand to counter its impact and its spread.

Author affiliations
1Department of Global Public Health, Karolinska Institutet, Stockholm, Sweden
2Center on International Cooperation, New York University, New York, New York, USA
3Metabiota, San Francisco, California, USA
4FOCUS1000, Freetown, Sierra Leone
5College of Medicine and Allied Health Sciences, Freetown, Sierra Leone
6Department of Economics, Finance and Statistics, Jönköping International Business School, Jönköping, Sweden
7Department of Physiology and Pharmacology, Karolinska Institutet, Stockholm, Sweden

Twitter Ben Oppenheim @benoppenheim

Acknowledgements We would like to thank the participants of the Info Na Pawa study for their time and the enumerators for their hard work recruiting participants and administering the surveys. A big thanks to the entire staff of FOCUS1000 in Freetown for making this study possible. We would also like to thank Grant Gordon and Sarah Oh for their feedback on the manuscript.

Contributors MW, BO, PS, MBJ, NW, SAP, BL, HM-A, ZZ, CJS, MFJ and HN contributed to the study design. MW, BO, PS, MBJ, NW, SAP, MFJ and HN contributed to the creation of the intervention. MW, BO, MFJ and HN contributed to the overall management of the study. MW, PS, MBJ, NW, HM-A, ZZ, CJS and SAP contributed to the training of enumerators and overseeing the data collection in Freetown. MW, BO, PS, MBJ, NW, SAP, MFJ and HN contributed to overseeing the administration of the intervention. MW, BO and ZZ contributed to data management and statistical analysis. MW, BO, ZZ and HN contributed to writing the manuscript. MW is responsible for the overall content as guarantor. All authors read and approved the final manuscript.

Funding Swedish Research Council (2017-05581).

Competing interests None declared.

Patient consent for publication Not required.

Ethics approval Ethical permission for this study was granted by the Sierra Leone Ethics and Scientific Review Committee on 30 May 2019 and the Swedish Ethical Review Authority in Stockholm (dnr 2019-04433).

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available in a public, open access repository.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any decision, action or inaction by anyone in response to or as a result of the content. The content is therefore provided on the understanding that BMJ has made every attempt to ensure accurate, complete and up-to-date information but shall not be liable for any errors or omissions which have been made.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution 4.0 Unported (CC BY 4.0) license, which permits others to copy, redistribute, remix, transform and build upon this work for any purpose, provided the original work is properly cited, a link to the licence is given, and indication of whether changes were made. See: https://creativecommons.org/licenses/by/4.0/.

ORCID iDs
Maike Winters http://orcid.org/0000-0003-0915-6506
Ben Oppenheim http://orcid.org/0000-0003-1487-3534

BMJ Global Health: first published as 10.1136/bmjgh-2021-006954 on 10 November 2021. Downloaded from http://gh.bmj.com/ on February 5, 2022 by guest.

Protected by copyright.
REFERENCES


Supplementary Material

Debunking highly prevalent health misinformation using audio dramas delivered by WhatsApp: evidence from a randomised controlled trial in Sierra Leone

This file includes:
Supplementary description of Methods:
- Recruitment of Participants
- Intervention
- Procedures
- Sensitivity Analyses
- Non-WhatsApp Trial Arms

Supplementary Tables:
- Table S1: Lost to follow-up: demographics
- Table S2: Frequencies of the primary outcomes by group
- Table S3: Primary outcomes using OLS regression with robust SEs
- Table S4: As-treated analysis robustness check
- Table S5: Seeding misinformation
- Table S6: Dose response analysis all groups
- Table S7: Dose response analysis intervention groups
- Table S8: Dose response post-hoc analysis between Group A and Group B
- Table S9: Knowledge and practices
- Table S10: Robustness check: contact with other participants
- Table S11: Per-protocol analysis robustness check
- Table S12: Don’t Know analysis
- Table S13: Lost to follow-up analysis
- Table S14: Non-WhatsApp baseline characteristics
- Table S15: Non-WhatsApp intention-to-treat and per-protocol analysis

Supplementary Figures:
- Figure S1: Intention-to-treat, per-protocol and as-treated analysis for the belief that typhoid comes from mosquitoes, compared to control group
- Figure S2: Intention-to-treat, per-protocol and as-treated analysis for the belief that typhoid and malaria co-occur, compared to control group

Surveys:
- Baseline Survey Contagious Misinformation Trial
- Endline Survey Contagious Misinformation Trial

Transcripts of interventions:
- Transcripts audio dramas intervention group A
- Transcripts audio dramas intervention group B

Registered Study Protocol & Statistical Analysis Plan (ClinicalTrials.gov NCT04112680)
Methods
Recruitment of participants
Every day during the recruitment phase, a data collection team started at the approximate middle of the section (which was determined using printed A3 maps of the sections), where the supervisor threw a pen in the air. The first enumerator walked in the direction of the tip of the pen, the second enumerator in a direction 90 degrees from the first enumerator. The third and fourth enumerator walked in 180 degrees and 270 degrees angle, respectively, from the first enumerator. All enumerators used a skip interval of 15 houses before approaching a household to determine if an eligible adult would be present. Real time review of the GPS points during the recruitment phase was done to ascertain that the geographic spread was indicative of a random selection. Data collection started early in the morning so that people could be encountered at home, before heading to work; it resumed in the late afternoon when most people returned from their day jobs.

Enumerators were instructed to keep a gender balance, recruiting 5 women and 4 men on one day and 4 women and 5 men the next day or vice versa.

Despite the relatively large skip interval, participants might have known each other, and thus posed a risk of contamination within the study. Participants were explicitly asked not to share the audio dramas until after the endline survey was conducted. The endline survey contained a question asking whether they talked to people who had also received audio dramas – 25 participants (3.7%) indicated they did. 3 participants (0.5%) reported receiving audio dramas from someone else. While the risk of contamination is negligible, we fit additional statistical models, omitting the potentially contaminated respondents from the analysis, and find no difference in results (see table S10).

Intervention
We took steps to ensure that the storyline of the two interventions were equally engaging and memorable, to ensure that any observed differences did not result from the narrative “packaging” which contained the health information of interest. Because the Plausible Alternative episodes had elements of conflict and discussion regarding two competing explanations for the illness, we introduced an extra storyline to the Avoiding Misinformation narrative, in which the sister of the main character was about to get married and attendance was unsure due to the typhoid infection. The narratives are thus similar but non-identical, and designed to be equally interesting from a dramatic point of view.

Procedures
WhatsApp Broadcast was used to deliver the audio dramas. This feature allows one message to be sent to a maximum of 256 recipients, without recipients seeing who else received that message. Episode 1 was sent on Monday the 21st of October 2019 with an accompanying message making it clear that it came from the Info Na Pawa study, that these messages should not be forwarded, and providing the number for our helpline. Participants with no WhatsApp were called on Monday and Tuesday the same week and listened to the audio dramas over the phone. This procedure was repeated every week for four weeks for the primary intervention groups and the Non-WhatsApp groups (see S14 and S15 for more info on the Non-WhatsApp group). The control group received the breastfeeding episodes in week 1 and week 3. In week 5 a message was sent to all participants to inform them that they had received all episodes and that enumerators would come back in early December to conduct the endline survey (Dec 2-13, 2019).

By checking and counting blue ticks on WhatsApp the day after (a sign that the recipient has received and has seen the message), we could see to which participants we needed to resend the episode. Through this method, we could also determine that around 70% of the participants had received and seen the 4 episodes in the intervention groups. In the control group, 82% of the participants had received and seen the 2 episodes.

Sensitivity analyses
We conducted a less stringent per-protocol analysis as a robustness check, whereby we included participants who have listened to at least 2 episodes in the intervention groups and at least 1 episode in the control group. Results are in line with the strict per-protocol analysis (see table S11).
It is possible that study participants who followed protocol and listened to the audio dramas differ from those who did not (for example, they could be more receptive to newly introduced information, or more willing to change behaviour). This could cause an upward bias in our estimates of treatment effects. We address this issue via additional analyses: average treatment effects on the treated, and the average potential outcome on the treated by inverse-probability-weighted regression-adjustment (IPWRA). These analyses serve as the sensitivity analyses for the unbiasedness of the per-protocol treatment analysis. The results of these analyses are consistent with the main per-protocol analysis reported above, indicating that our per-protocol results are not confounded by sample selection (data available on request.)

Many participants mentioned not eating chicken to avoid typhoid infection. This response most likely related to a typhoid-scare in 2016, when a large amount of expired imported chicken was dumped on landfills in Freetown and reportedly consumed by some of Freetown’s poorest residents - resulting in typhoid (1). This response was coded as 0 for the knowledge score, as it correctly identifies a historical risk factor but not the more general preventive behaviour needed to reduce typhoid infection risk.

Lastly, we conducted a number of exploratory sensitivity analyses. We assessed patterns of item non-response and “don’t know” responses on dependent variables across the two survey waves, and found no indication that the two interventions increased “don’t know” responses (for example by shifting people from belief in misinformation from indicating uncertainty). On the contrary, we found that for the belief that typhoid co-occurs with malaria, group A had a statistically significant reduction in “don’t know” responses, compared to the control group, see table S12. We also analysed whether the results were robust to the exclusion of the small number of respondents who had potentially been contaminated by discussing the intervention messages with others, and found that their exclusion did not impact the results we present here, see table S10. Lastly, we analysed whether the exclusion of the respondents who answered “don’t know” or “no response” on either the baseline or the endline survey influenced the intention-to-treat analyses. Results were consistent with the primary intention-to-treat analyses, data are available upon request.

Non-WhatsApp Trial Arms

A smaller-scale parallel study which delivered the audio dramas by phone, rather than WhatsApp, achieved similar results, suggesting that the impacts we observe may be achieved through a range of potential information channels.

The Non-WhatsApp participants were similarly randomised to two intervention groups: Non-WhatsApp group A (n=30) and Non-WhatsApp group B (n=30), which were compared to the main control group. For the Non-WhatsApp comparator study, we analysed the two primary outcomes using the intention-to-treat and per-protocol analyses, comparing the intervention groups to the control group of the WhatsApp participants.

Reference:

Table S1. Lost to follow-up: demographics

<table>
<thead>
<tr>
<th></th>
<th>Included No (%)</th>
<th>Lost to follow-up No (%)</th>
<th>P-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>346 (52%)</td>
<td>29 (43%)</td>
<td>0.150</td>
</tr>
<tr>
<td>Female</td>
<td>322 (48%)</td>
<td>39 (57%)</td>
<td></td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No formal</td>
<td>39 (6%)</td>
<td>5 (7%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Primary</td>
<td>30 (4%)</td>
<td>8 (12%)</td>
<td></td>
</tr>
<tr>
<td>Secondary</td>
<td>371 (56%)</td>
<td>30 (44%)</td>
<td></td>
</tr>
<tr>
<td>Post-secondary</td>
<td>228 (34%)</td>
<td>24 (35%)</td>
<td></td>
</tr>
<tr>
<td><strong>Religion</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Islam</td>
<td>400 (60%)</td>
<td>45 (66%)</td>
<td>0.312</td>
</tr>
<tr>
<td>Christianity</td>
<td>268 (40%)</td>
<td>23 (34%)</td>
<td></td>
</tr>
<tr>
<td><strong>Income (in Leones)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-300.000</td>
<td>448 (67%)</td>
<td>45 (66%)</td>
<td>0.738</td>
</tr>
<tr>
<td>300.000-1,000.000</td>
<td>177 (27%)</td>
<td>20 (29%)</td>
<td></td>
</tr>
<tr>
<td>&gt;1,000.000</td>
<td>43 (6%)</td>
<td>3 (4%)</td>
<td></td>
</tr>
</tbody>
</table>

*Based on Chi2 test

There was a significant difference in educational level between the participants included in this study and the participants that were lost to follow-up, whereby those lost to follow-up were more likely to have lower educational attainment.
Table S2. Frequencies of the primary outcomes by group

<table>
<thead>
<tr>
<th>Can you get typhoid from mosquitoes?</th>
<th>Baseline</th>
<th>Endline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group A</td>
<td>Group B</td>
</tr>
<tr>
<td></td>
<td>No (%)</td>
<td>No (%)</td>
</tr>
<tr>
<td>Yes</td>
<td>123 (50)</td>
<td>122 (50)</td>
</tr>
<tr>
<td>No</td>
<td>94 (38)</td>
<td>100 (41)</td>
</tr>
<tr>
<td>I don’t know</td>
<td>26 (11)</td>
<td>23 (9)</td>
</tr>
<tr>
<td>No response</td>
<td>1 (1)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Can you get typhoid without getting malaria?</th>
<th>Baseline</th>
<th>Endline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group A</td>
<td>Group B</td>
</tr>
<tr>
<td></td>
<td>No (%)</td>
<td>No (%)</td>
</tr>
<tr>
<td>Yes</td>
<td>83 (34)</td>
<td>86 (35)</td>
</tr>
<tr>
<td>No</td>
<td>145 (59)</td>
<td>146 (60)</td>
</tr>
<tr>
<td>I don’t know</td>
<td>17 (7)</td>
<td>13 (5)</td>
</tr>
<tr>
<td>No response</td>
<td>1 (0)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>
Table S3. Primary outcomes using OLS regression with robust SEs

<table>
<thead>
<tr>
<th>Typhoid comes from mosquitoes</th>
<th>Coef (SEs)</th>
<th>P-value</th>
<th>Adjusted* Coef (SEs)</th>
<th>P-value</th>
<th>Adjusted* Coef (SEs)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intention-to-treat</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>-0.25 (0.05)</td>
<td>0.000</td>
<td>-0.24 (0.04)</td>
<td>0.000</td>
<td>-0.14 (0.04)</td>
<td>0.002</td>
</tr>
<tr>
<td>Group B</td>
<td>-0.15 (0.05)</td>
<td>0.001</td>
<td>-0.10 (0.05)</td>
<td>0.023</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Per-protocol</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>-0.40 (0.06)</td>
<td>0.000</td>
<td>-0.38 (0.07)</td>
<td>0.000</td>
<td>-0.16 (0.06)</td>
<td>0.007</td>
</tr>
<tr>
<td>Group B</td>
<td>-0.23 (0.07)</td>
<td>0.001</td>
<td>-0.20 (0.07)</td>
<td>0.004</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>As-treated</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>-0.36 (0.05)</td>
<td>0.000</td>
<td>-0.36 (0.05)</td>
<td>0.000</td>
<td>-0.14 (0.04)</td>
<td>0.002</td>
</tr>
<tr>
<td>Group B</td>
<td>-0.23 (0.05)</td>
<td>0.000</td>
<td>-0.20 (0.05)</td>
<td>0.000</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Typhoid and malaria co-occur</th>
<th>Coef (SEs)</th>
<th>P-value</th>
<th>Adjusted* Coef (SEs)</th>
<th>P-value</th>
<th>Adjusted* Coef (SEs)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intention-to-treat</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>-0.27 (0.05)</td>
<td>0.000</td>
<td>-0.27 (0.05)</td>
<td>0.000</td>
<td>-0.13 (0.05)</td>
<td>0.005</td>
</tr>
<tr>
<td>Group B</td>
<td>-0.17 (0.05)</td>
<td>0.000</td>
<td>-0.14 (0.05)</td>
<td>0.003</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Per-protocol</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>-0.46 (0.06)</td>
<td>0.000</td>
<td>-0.47 (0.07)</td>
<td>0.000</td>
<td>-0.10 (0.06)</td>
<td>0.087</td>
</tr>
<tr>
<td>Group B</td>
<td>-0.37 (0.07)</td>
<td>0.000</td>
<td>-0.36 (0.07)</td>
<td>0.000</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>As-treated</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>-0.42 (0.05)</td>
<td>0.000</td>
<td>-0.42 (0.05)</td>
<td>0.000</td>
<td>-0.13 (0.05)</td>
<td>0.005</td>
</tr>
<tr>
<td>Group B</td>
<td>-0.32 (0.05)</td>
<td>0.000</td>
<td>-0.29 (0.05)</td>
<td>0.000</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Adjusted for: sex, education, religion, income, age

OLS = Ordinary Least Squares, Coef = Coefficient, SE = Standard error
Table S4. As-treated analysis robustness check
In this scenario the participants who were assigned to the control group but said they received messages about typhoid (n=30), were added to intervention Group B (Avoiding Misinformation)

<table>
<thead>
<tr>
<th></th>
<th>Crude OR (95% CI)</th>
<th>P-value</th>
<th>Adjusted* OR (95% CI)</th>
<th>P-value</th>
<th>Adjusted* OR (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Typhoid comes from mosquitoes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.12 (0.06-0.23)</td>
<td>0.000</td>
<td>0.11 (0.06-0.22)</td>
<td>0.000</td>
<td>0.46 (0.28-0.76)</td>
<td>0.002</td>
</tr>
<tr>
<td>Group B</td>
<td>0.33 (0.19-0.56)</td>
<td>0.000</td>
<td>0.35 (0.20-0.62)</td>
<td>0.000</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td><strong>Typhoid and malaria co-occur</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.11 (0.06-0.19)</td>
<td>0.000</td>
<td>0.09 (0.05-0.18)</td>
<td>0.000</td>
<td>0.51 (0.33-0.81)</td>
<td>0.004</td>
</tr>
<tr>
<td>Group B</td>
<td>0.26 (0.16-0.43)</td>
<td>0.000</td>
<td>0.27 (0.16-0.45)</td>
<td>0.000</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
</tr>
</tbody>
</table>

*Adjusted for: sex, education, religion, income, age

OR = Odds Ratio, CI = Confidence Interval

Supplemental material
BMJ Publishing Group Limited (BMJ) disclaims all liability and responsibility arising from any reliance placed on this supplemental material which has been supplied by the author(s)
Table S5. Seeding misinformation

<table>
<thead>
<tr>
<th>Typhoid comes from mosquitoes</th>
<th>Crude OR (95% CI)</th>
<th>P-value</th>
<th>Adjusted* OR (95% CI)</th>
<th>P-value</th>
<th>Adjusted* OR (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>0.35 (0.16-0.77)</td>
<td>0.008</td>
<td>0.35 (0.15-0.81)</td>
<td>0.014</td>
<td>0.41 (0.16-1.05)</td>
<td>0.064</td>
</tr>
<tr>
<td>Group B</td>
<td>0.57 (0.29-1.14)</td>
<td>0.111</td>
<td>0.70 (0.33-1.51)</td>
<td>0.369</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Typhoid and malaria co-occur</th>
<th>Crude OR (95% CI)</th>
<th>P-value</th>
<th>Adjusted* OR (95% CI)</th>
<th>P-value</th>
<th>Adjusted* OR (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>0.41 (0.21-0.82)</td>
<td>0.012</td>
<td>0.39 (0.18-0.82)</td>
<td>0.014</td>
<td>0.72 (0.33-1.58)</td>
<td>0.413</td>
</tr>
<tr>
<td>Group B</td>
<td>0.57 (0.30-1.10)</td>
<td>0.093</td>
<td>0.58 (0.29-1.16)</td>
<td>0.123</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
</tr>
</tbody>
</table>

*Adjusted for: sex, education, religion, income, age
Table S6. Dose response analysis all groups

<table>
<thead>
<tr>
<th>Typhoid comes from mosquitoes</th>
<th>Crude OR (95% CI)</th>
<th>P-value</th>
<th>Adjusted* OR (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of episodes listened to:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>1</td>
<td>0.58 (0.25-1.32)</td>
<td>0.195</td>
<td>0.50 (0.21-1.19)</td>
<td>0.116</td>
</tr>
<tr>
<td>2</td>
<td>0.30 (0.18-0.52)</td>
<td>0.000</td>
<td>0.31 (0.18-0.55)</td>
<td>0.000</td>
</tr>
<tr>
<td>3</td>
<td>0.11 (0.06-0.21)</td>
<td>0.000</td>
<td>0.13 (0.07-0.25)</td>
<td>0.000</td>
</tr>
<tr>
<td>4</td>
<td>0.12 (0.07-0.19)</td>
<td>0.000</td>
<td>0.14 (0.08-0.22)</td>
<td>0.000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Typhoid and malaria co-occur</th>
<th>Crude OR (95% CI)</th>
<th>P-value</th>
<th>Adjusted* OR (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of episodes listened to:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>1</td>
<td>0.73 (0.33-1.63)</td>
<td>0.446</td>
<td>0.65 (0.29-1.48)</td>
<td>0.307</td>
</tr>
<tr>
<td>2</td>
<td>0.33 (0.20-0.58)</td>
<td>0.000</td>
<td>0.36 (0.21-0.61)</td>
<td>0.000</td>
</tr>
<tr>
<td>3</td>
<td>0.13 (0.07-0.25)</td>
<td>0.000</td>
<td>0.15 (0.08-0.29)</td>
<td>0.000</td>
</tr>
<tr>
<td>4</td>
<td>0.15 (0.10-0.24)</td>
<td>0.000</td>
<td>0.17 (0.11-0.27)</td>
<td>0.000</td>
</tr>
</tbody>
</table>

* Adjusted for: sex, education, religion, income, age
OR = Odds Ratio, CI = Confidence Interval
Table S7. Dose response analysis intervention groups

<table>
<thead>
<tr>
<th>Typhoid comes from mosquitoes</th>
<th>Crude OR (95% CI)</th>
<th>P-value</th>
<th>Adjusted* OR (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dose (0-4) Intervention group</td>
<td>0.57 (0.47-0.69)</td>
<td>0.000</td>
<td>0.65 (0.52-0.82)</td>
<td>0.000</td>
</tr>
<tr>
<td>Group A</td>
<td>1.30 (0.64-2.66)</td>
<td>0.470</td>
<td>1.06 (0.45-2.52)</td>
<td>0.888</td>
</tr>
<tr>
<td>Group B Reference</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Interaction (Dose x Group AB)</td>
<td>0.71 (0.53-0.96)</td>
<td>0.028</td>
<td>0.62 (0.43-0.89)</td>
<td>0.009</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Typhoid and malaria co-occur</th>
<th>Crude OR (95% CI)</th>
<th>P-value</th>
<th>Adjusted* OR (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dose (0-4) Intervention group</td>
<td>0.52 (0.43-0.64)</td>
<td>0.000</td>
<td>0.54 (0.43-0.67)</td>
<td>0.000</td>
</tr>
<tr>
<td>Group A</td>
<td>0.79 (0.39-1.60)</td>
<td>0.510</td>
<td>0.71 (0.32-1.55)</td>
<td>0.386</td>
</tr>
<tr>
<td>Group B Reference</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Interaction (Dose x Group AB)</td>
<td>0.83 (0.61-1.13)</td>
<td>0.235</td>
<td>0.80 (0.58-1.11)</td>
<td>0.187</td>
</tr>
</tbody>
</table>

*Adjusted for: sex, education, religion, income, age
### Table S8. Dose response post-hoc analysis between Group A and Group B

Number of episodes listened to, Odds Ratios with 95% Confidence Intervals

<table>
<thead>
<tr>
<th></th>
<th>Group B</th>
<th>Group A</th>
<th>Group A</th>
<th>Group A</th>
<th>Group A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Typhoid comes from mosquitoes</td>
<td>0.06 (0.45-2.52)</td>
<td>1.63 (0.76-3.46)</td>
<td>2.48 (1.22-5.05)*</td>
<td>3.79 (1.81-7.95)*</td>
<td>5.79 (2.51-13.37)*</td>
</tr>
<tr>
<td></td>
<td>0.43 (0.02-0.92)</td>
<td>0.66 (0.35-1.24)</td>
<td>1.00 (0.56-1.80)</td>
<td>1.53 (0.83-2.84)</td>
<td>2.34 (1.13-4.85)*</td>
</tr>
<tr>
<td></td>
<td>0.17 (0.08-0.37)*</td>
<td>0.27 (0.14-0.50)*</td>
<td>0.41 (0.23-0.72)*</td>
<td>0.62 (0.34-1.14)</td>
<td>0.95 (0.46-1.95)</td>
</tr>
<tr>
<td></td>
<td>0.07 (0.03-0.17)*</td>
<td>0.11 (0.05-0.23)*</td>
<td>0.16 (0.08-0.33)*</td>
<td>0.25 (0.12-0.52)*</td>
<td>0.38 (0.17-0.87)*</td>
</tr>
<tr>
<td></td>
<td>0.03 (0.01-0.08)*</td>
<td>0.04 (0.02-0.11)*</td>
<td>0.07 (0.03-0.16)*</td>
<td>0.10 (0.04-0.25)*</td>
<td>0.16 (0.06-0.42)*</td>
</tr>
<tr>
<td>Typhoid and malaria co-occur</td>
<td>0.71 (0.32-1.55)</td>
<td>1.32 (0.67-2.62)</td>
<td>2.47 (1.29-4.73)*</td>
<td>4.61 (2.30-9.22)*</td>
<td>8.60 (3.86-19.14)*</td>
</tr>
<tr>
<td></td>
<td>0.30 (0.15-0.61)*</td>
<td>0.57 (0.32-1.01)</td>
<td>1.06 (0.62-1.81)</td>
<td>1.98 (1.10-3.54)*</td>
<td>3.69 (1.83-7.44)*</td>
</tr>
<tr>
<td></td>
<td>0.13 (0.06-0.26)*</td>
<td>0.24 (0.14-0.43)*</td>
<td>0.45 (0.27-0.77)*</td>
<td>0.85 (0.48-1.50)</td>
<td>1.58 (0.80-3.15)</td>
</tr>
<tr>
<td></td>
<td>0.06 (0.03-0.12)*</td>
<td>0.10 (0.05-0.21)*</td>
<td>0.20 (0.10-0.37)*</td>
<td>0.36 (0.19-0.71)*</td>
<td>0.68 (0.32-1.46)</td>
</tr>
<tr>
<td></td>
<td>0.02 (0.01-0.06)*</td>
<td>0.04 (0.02-0.10)*</td>
<td>0.08 (0.04-0.19)*</td>
<td>0.16 (0.07-0.36)*</td>
<td>0.29 (0.12-0.72)*</td>
</tr>
</tbody>
</table>

*p-value < 0.025
Table S9. Knowledge and practices

<table>
<thead>
<tr>
<th></th>
<th>Crude OR (95% CI)</th>
<th>P-value</th>
<th>Adjusted* OR (95% CI)</th>
<th>P-value</th>
<th>Adjusted* OR (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>2.19 (1.57-3.04)</td>
<td>0.000</td>
<td>2.19 (1.57-3.06)</td>
<td>0.000</td>
<td>1.24 (0.88-1.75)</td>
<td>0.226</td>
</tr>
<tr>
<td>Group B</td>
<td>2.11 (1.51-2.94)</td>
<td>0.000</td>
<td>1.79 (1.27-2.50)</td>
<td>0.001</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Sleeping under a bednet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.43 (0.24-0.77)</td>
<td>0.004</td>
<td>0.43 (0.24-0.78)</td>
<td>0.005</td>
<td>0.66 (0.35-1.27)</td>
<td>0.213</td>
</tr>
<tr>
<td>Group B</td>
<td>0.56 (0.32-0.96)</td>
<td>0.035</td>
<td>0.64 (0.36-1.12)</td>
<td>0.118</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Drinking treated water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>2.74 (1.68-4.48)</td>
<td>0.000</td>
<td>2.78 (1.67-4.64)</td>
<td>0.000</td>
<td>1.57 (0.92-2.68)</td>
<td>0.100</td>
</tr>
<tr>
<td>Group B</td>
<td>1.97 (1.23-3.16)</td>
<td>0.005</td>
<td>1.77 (1.08-2.91)</td>
<td>0.023</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
</tr>
</tbody>
</table>

*Adjusted for: sex, education, religion, income, age
Table S10. Robustness check: contact with other participants
In this robustness check, we excluded the participants who indicated to have contact with other participants of the Info Na Pawa study (n=25, 3.7%) and those who received the audio dramas from someone else (n=3, 0.5%).

<table>
<thead>
<tr>
<th></th>
<th>Crude OR (95% CI)</th>
<th>P-value</th>
<th>Adjusted* OR (95% CI)</th>
<th>P-value</th>
<th>Adjusted* OR (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Typhoid comes from mosquitoes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Intention-to-treat</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.29 (0.19-0.46)</td>
<td>0.000</td>
<td>0.28 (0.17-0.46)</td>
<td>0.000</td>
<td>0.47 (0.28-0.79)</td>
<td>0.004</td>
</tr>
<tr>
<td>Group B</td>
<td>0.47 (0.30-0.72)</td>
<td>0.001</td>
<td>0.57 (0.36-0.90)</td>
<td>0.015</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td><strong>Per-protocol</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.06 (0.02-0.18)</td>
<td>0.000</td>
<td>0.05 (0.02-0.18)</td>
<td>0.000</td>
<td>0.12 (0.03-0.58)</td>
<td>0.008</td>
</tr>
<tr>
<td>Group B</td>
<td>0.26 (0.11-0.61)</td>
<td>0.002</td>
<td>0.29 (0.12-0.74)</td>
<td>0.009</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td><strong>As-treated</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.14 (0.08-0.26)</td>
<td>0.000</td>
<td>0.12 (0.06-0.24)</td>
<td>0.000</td>
<td>0.47 (0.28-0.79)</td>
<td>0.004</td>
</tr>
<tr>
<td>Group B</td>
<td>0.30 (0.17-0.53)</td>
<td>0.000</td>
<td>0.35 (0.19-0.64)</td>
<td>0.001</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td><strong>Typhoid and malaria co-occur</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Intention-to-treat</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.32 (0.21-0.49)</td>
<td>0.000</td>
<td>0.29 (0.19-0.46)</td>
<td>0.000</td>
<td>0.53 (0.33-0.84)</td>
<td>0.007</td>
</tr>
<tr>
<td>Group B</td>
<td>0.48 (0.32-0.71)</td>
<td>0.000</td>
<td>0.54 (0.36-0.82)</td>
<td>0.004</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td><strong>Per-protocol</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.08 (0.03-0.20)</td>
<td>0.000</td>
<td>0.06 (0.02-0.17)</td>
<td>0.000</td>
<td>0.36 (0.10-1.26)</td>
<td>0.109</td>
</tr>
<tr>
<td>Group B</td>
<td>0.15 (0.07-0.35)</td>
<td>0.000</td>
<td>0.14 (0.06-0.36)</td>
<td>0.000</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td><strong>As-treated</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.12 (0.07-0.22)</td>
<td>0.000</td>
<td>0.11 (0.06-0.20)</td>
<td>0.000</td>
<td>0.53 (0.33-0.84)</td>
<td>0.007</td>
</tr>
<tr>
<td>Group B</td>
<td>0.23 (0.13-0.39)</td>
<td>0.000</td>
<td>0.25 (0.14-0.45)</td>
<td>0.000</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
</tr>
</tbody>
</table>

*Adjusted for: sex, education, religion, income, age
OR = Odds Ratio, CI = Confidence Interval
Table S11. Per-protocol analysis robustness check

Scenario 2: considering all participants who have listened to at least 2 episodes in the intervention groups to be per-protocol, or at least 1 episode in the control group

<table>
<thead>
<tr>
<th></th>
<th>Crude OR (95% CI)</th>
<th>P-value</th>
<th>Adjusted* OR (95% CI)</th>
<th>P-value</th>
<th>Adjusted* OR (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typhoid comes from mosquitoes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.12 (0.06-0.23)</td>
<td>0.000</td>
<td>0.12 (0.06-0.24)</td>
<td>0.000</td>
<td>0.23 (0.11-0.49)</td>
<td>0.000</td>
</tr>
<tr>
<td>Group B</td>
<td>0.38 (0.22-0.66)</td>
<td>0.001</td>
<td>0.50 (0.28-0.88)</td>
<td>0.016</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Typhoid and malaria co-occur</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.14 (0.07-0.25)</td>
<td>0.000</td>
<td>0.13 (0.07-0.24)</td>
<td>0.000</td>
<td>0.39 (0.20-0.76)</td>
<td>0.006</td>
</tr>
<tr>
<td>Group B</td>
<td>0.29 (0.17-0.48)</td>
<td>0.000</td>
<td>0.33 (0.20-0.57)</td>
<td>0.000</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
</tr>
</tbody>
</table>

*Adjusted for: sex, education, religion, income, age

OR = Odds Ratio, CI = Confidence Interval

*BMJ Publishing Group Limited (BMJ) disclaims all liability and responsibility arising from any reliance placed on this supplemental material which has been supplied by the author(s)*

BMJ Global Health
Table S12. Don’t know analysis
In this analysis, we tested whether the interventions had any impact on the proportion of respondents who indicated uncertainty regarding the endline measures of interest: whether typhoid comes from mosquitoes, and whether it only co-occurs with malaria. Specifically, we were interested in whether the interventions shifted more respondents from initial uncertainty (e.g. answering “don’t know” at baseline) to having a clear viewpoint at endline (e.g. answering either yes or no), and additionally the converse (e.g. whether either intervention shifted people from yes/no at baseline to “don’t know” at endline). We generated a variable taking a value of +1 if a respondent shifted from don’t know to a certain answer at endline, and -1 if they shifted from certainty to uncertainty, and 0 if no change. A positive statistically significant value shows that participants who said ‘Don’t Know’ at baseline were more likely to have a certain answer (Yes/No) at endline. A negative statistically significant value would indicate that participants who had a certain answer (Yes/No) at baseline were more likely to answer ‘Don’t Know’ at endline. We found that Intervention Group A led to an increase in certain answers from baseline to endline from the question regarding whether typhoid is caused by mosquitoes; neither intervention had an impact on the question regarding the co-occurrence of typhoid and malaria.

<table>
<thead>
<tr>
<th></th>
<th>Coefficient (SE*)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Typhoid comes from mosquitoes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.456 (0.059-0.853)</td>
<td>0.025</td>
</tr>
<tr>
<td>Group B</td>
<td>0.253 (-0.152-0.657)</td>
<td>0.218</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td><strong>Typhoid and malaria co-occur</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.119 (-0.361-0.599)</td>
<td>0.621</td>
</tr>
<tr>
<td>Group B</td>
<td>0.346 (-0.198-0.891)</td>
<td>0.207</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
</tr>
</tbody>
</table>

OLS regression
*SE = Standard Error
Table S13. Lost to follow-up analysis

In this analysis, the answers of those lost to follow-up were regarded as unchanged at endline (i.e. they were regarded to be the same as the baseline answers)

<table>
<thead>
<tr>
<th>Typhoid comes from mosquitoes</th>
<th>Crude OR (95% CI)</th>
<th>P-value</th>
<th>Adjusted* OR (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>0.34 (0.22-0.52)</td>
<td>0.000</td>
<td>0.32 (0.20-0.51)</td>
<td>0.000</td>
</tr>
<tr>
<td>Group B</td>
<td>0.57 (0.37-0.86)</td>
<td>0.008</td>
<td>0.64 (0.41-0.99)</td>
<td>0.047</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td></td>
<td>Reference</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Typhoid and malaria co-occur</th>
<th>Crude OR (95% CI)</th>
<th>P-value</th>
<th>Adjusted* OR (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>0.34 (0.23-0.51)</td>
<td>0.000</td>
<td>0.32 (0.21-0.49)</td>
<td>0.000</td>
</tr>
<tr>
<td>Group B</td>
<td>0.54 (0.37-0.79)</td>
<td>0.001</td>
<td>0.59 (0.40-0.87)</td>
<td>0.008</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td></td>
<td>Reference</td>
<td></td>
</tr>
</tbody>
</table>

* Adjusted for: sex, education, religion, income, age

OR = Odds Ratio, CI = Confidence Interval
Table S14. Non-WhatsApp baseline characteristics

<table>
<thead>
<tr>
<th></th>
<th>Group A (n=30)</th>
<th>Group B (n=30)</th>
<th>Control (n=245)</th>
<th>Total</th>
<th>P-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-30 years</td>
<td>17 (57%)</td>
<td>10 (33%)</td>
<td>151 (62%)</td>
<td>178 (58%)</td>
<td>0.031</td>
</tr>
<tr>
<td>31-49 years</td>
<td>11 (37%)</td>
<td>14 (47%)</td>
<td>73 (30%)</td>
<td>98 (32%)</td>
<td></td>
</tr>
<tr>
<td>50+ years</td>
<td>2 (7%)</td>
<td>6 (20%)</td>
<td>21 (9%)</td>
<td>29 (10%)</td>
<td></td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>17 (57%)</td>
<td>12 (40%)</td>
<td>130 (53%)</td>
<td>159 (52%)</td>
<td>0.365</td>
</tr>
<tr>
<td>Male</td>
<td>13 (43%)</td>
<td>18 (60%)</td>
<td>115 (47%)</td>
<td>146 (48%)</td>
<td></td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No formal</td>
<td>3 (10%)</td>
<td>3 (10%)</td>
<td>18 (7%)</td>
<td>24 (8%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Primary</td>
<td>6 (20%)</td>
<td>8 (27%)</td>
<td>12 (5%)</td>
<td>26 (9%)</td>
<td></td>
</tr>
<tr>
<td>Secondary</td>
<td>18 (60%)</td>
<td>14 (47%)</td>
<td>142 (58%)</td>
<td>174 (57%)</td>
<td></td>
</tr>
<tr>
<td>Post-secondary</td>
<td>3 (10%)</td>
<td>5 (17%)</td>
<td>72 (29%)</td>
<td>80 (26%)</td>
<td></td>
</tr>
<tr>
<td><strong>Religion</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Islam</td>
<td>18 (60%)</td>
<td>17 (57%)</td>
<td>149 (61%)</td>
<td>149 (61%)</td>
<td>0.930</td>
</tr>
<tr>
<td>Christianity</td>
<td>12 (40%)</td>
<td>13 (43%)</td>
<td>96 (39%)</td>
<td>96 (39%)</td>
<td></td>
</tr>
<tr>
<td><strong>Income (Leones)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-300,000</td>
<td>20 (67%)</td>
<td>16 (53%)</td>
<td>160 (65%)</td>
<td>196 (64%)</td>
<td>0.519</td>
</tr>
<tr>
<td>300,000-1,000,000</td>
<td>9 (30%)</td>
<td>10 (33%)</td>
<td>69 (28%)</td>
<td>88 (29%)</td>
<td></td>
</tr>
<tr>
<td>&gt;1,000,000</td>
<td>1 (3%)</td>
<td>4 (13%)</td>
<td>16 (7%)</td>
<td>21 (7%)</td>
<td></td>
</tr>
<tr>
<td><strong>Typhoid from</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mosquitoes?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>9 (30%)</td>
<td>10 (33%)</td>
<td>93 (38%)</td>
<td>112 (37%)</td>
<td>0.916</td>
</tr>
<tr>
<td>Yes</td>
<td>19 (63%)</td>
<td>18 (60%)</td>
<td>128 (52%)</td>
<td>165 (54%)</td>
<td></td>
</tr>
<tr>
<td>I don’t know</td>
<td>2 (7%)</td>
<td>2 (7%)</td>
<td>23 (9%)</td>
<td>27 (9%)</td>
<td></td>
</tr>
<tr>
<td>No response</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>1 (0.4%)</td>
<td>1 (0.3%)</td>
<td></td>
</tr>
<tr>
<td><strong>Typhoid without</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>malaria?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>25 (83%)</td>
<td>20 (67%)</td>
<td>142 (58%)</td>
<td>187 (61%)</td>
<td>0.098</td>
</tr>
<tr>
<td>Yes</td>
<td>4 (13%)</td>
<td>9 (30%)</td>
<td>89 (36%)</td>
<td>102 (33%)</td>
<td></td>
</tr>
<tr>
<td>I don’t know</td>
<td>1 (3%)</td>
<td>1 (3%)</td>
<td>14 (6%)</td>
<td>16 (5%)</td>
<td></td>
</tr>
<tr>
<td>No response</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
</tbody>
</table>

*Fisher’s exact test

There was a significant difference between groups for Age (whereby the WhatsApp control group was older than the Non WhatsApp Intervention groups) and Education (the Non WhatsApp intervention groups were less highly educated than the WhatsApp control group)
Table S15. Non-WhatsApp intention-to-treat and per-protocol† analysis

<table>
<thead>
<tr>
<th>Typhoid comes from mosquitoes</th>
<th>Crude OR (95% CI)</th>
<th>P-value</th>
<th>Adjusted* OR (95% CI)</th>
<th>P-value</th>
<th>Adjusted* OR (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention-to-treat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.24 (0.10-0.60)</td>
<td>0.002</td>
<td>0.20 (0.07-0.52)</td>
<td>0.001</td>
<td>1.57 (0.33-7.36)</td>
<td>0.569</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Group B</td>
<td>0.19 (0.07-0.52)</td>
<td>0.001</td>
<td>0.21 (0.07-0.64)</td>
<td>0.006</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Per-protocol</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.23 (0.08-0.64)</td>
<td>0.005</td>
<td>0.16 (0.05-0.49)</td>
<td>0.001</td>
<td>0.77 (0.14-4.32)</td>
<td>0.766</td>
</tr>
<tr>
<td>Group B</td>
<td>0.21 (0.07-0.62)</td>
<td>0.005</td>
<td>0.20 (0.06-0.67)</td>
<td>0.009</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Typhoid and malaria co-occur</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intention-to-treat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.16 (0.06-0.42)</td>
<td>0.000</td>
<td>0.13 (0.05-0.35)</td>
<td>0.000</td>
<td>0.55 (0.10-2.90)</td>
<td>0.480</td>
</tr>
<tr>
<td>Group B</td>
<td>0.25 (0.10-0.62)</td>
<td>0.003</td>
<td>0.26 (0.10-0.70)</td>
<td>0.008</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Per-protocol</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>0.13 (0.04-0.42)</td>
<td>0.001</td>
<td>0.08 (0.02-0.28)</td>
<td>0.000</td>
<td>0.26 (0.03-2.07)</td>
<td>0.205</td>
</tr>
<tr>
<td>Group B</td>
<td>0.25 (0.09-0.67)</td>
<td>0.006</td>
<td>0.21 (0.07-0.66)</td>
<td>0.007</td>
<td>Reference</td>
<td>-</td>
</tr>
<tr>
<td>Control</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
<td>-</td>
</tr>
</tbody>
</table>

*Adjusted for: sex, education, religion, income, age
OR = Odds Ratio, CI = Confidence Interval
†The per-protocol analysis includes respondents from Groups A and B who reported that they listened to at least 2 episodes, and in the Control Group, at least 1 message

Among the Non-WhatsApp participants, belief in misinformation was higher at baseline, with 63% of group A and 60% in group B reporting the belief that typhoid is caused by mosquitoes. In group A 83% and in group B 67%, respectively believed that typhoid and malaria co-occur. The intention-to-treat analyses showed that the belief that typhoid is caused by mosquitoes was reduced in both intervention groups, compared to the control group (group A: AOR 0.20, 95% CI 0.07-0.52, group B: AOR 0.21, 95% CI 0.07-0.64). Similarly, the two intervention groups were less likely to believe that typhoid and malaria co-occur, compared to the control group (group A: AOR 0.13, 95% CI 0.05-0.35, group B: AOR 0.26, 95% CI 0.10-0.70). Per-protocol analyses yielded similar results.
Supplementary Figures

Figure S1. Intention-to-treat, per-protocol and as-treated analysis for the belief that typhoid comes from mosquitoes, compared to control group

Figure S2. Intention-to-treat, per-protocol and as-treated analysis for the belief that typhoid and malaria co-occur, compared to control group
<table>
<thead>
<tr>
<th>No</th>
<th>Question</th>
<th>Answer alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Name of enumerator</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Does the participant have WhatsApp?</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No → end</td>
</tr>
<tr>
<td>3</td>
<td>Does the participant want to be part of the study?</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No → end</td>
</tr>
<tr>
<td>4</td>
<td>Is the study phone number programmed in the participant’s phone?</td>
<td>Yes → Q6</td>
</tr>
<tr>
<td>5</td>
<td>If not, why not?</td>
<td>No → Q5</td>
</tr>
<tr>
<td>6</td>
<td>Did the participant sign the informed consent form?</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No → end</td>
</tr>
<tr>
<td>7</td>
<td>First name</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Last name</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Address</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Describe house / address / landmark</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>WhatsApp phone number</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Is your WhatsApp number from Orange, Africell, or Qcell?</td>
<td>Orange</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Africell</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q cell</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I don’t know</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No answer</td>
</tr>
<tr>
<td>13</td>
<td>Other phone number participant can be reached on</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Gender</td>
<td>Male</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female</td>
</tr>
<tr>
<td>15</td>
<td>Age in years</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>What is your highest level of education?</td>
<td>No formal education</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Primary education</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Secondary education</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post-secondary education</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I don’t know/not sure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No response</td>
</tr>
<tr>
<td>17</td>
<td>Average monthly household income from paid job in Leones</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>What is your religion?</td>
<td>Islam</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Christianity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I don’t know/not sure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No response</td>
</tr>
<tr>
<td>19</td>
<td>How often do you discuss health issues with family or friends?</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Weekly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monthly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When necessary</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Never</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I don’t know/not sure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No response</td>
</tr>
<tr>
<td>20</td>
<td>Do you know of any diseases that can be spread by being in contact with another person? Do not read the alternatives, select all that apply</td>
<td>Malaria</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HIV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ebola</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Typhoid</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measles</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lassa Fever</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cholera</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Zika</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tuberculosis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leprosy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scabies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sexually transmitted diseases</td>
</tr>
<tr>
<td>Question</td>
<td>Answer</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td>Have you ever had typhoid?</td>
<td>Yes → Q22&lt;br&gt;No → Q25&lt;br&gt;I don’t know/not sure → Q25</td>
<td></td>
</tr>
<tr>
<td>How did you know you had typhoid? Do not read the alternatives, select all that apply</td>
<td>Diagnosed in a hospital&lt;br&gt;Diagnosed in a health facility other than a hospital&lt;br&gt;Diagnosed in a private clinic&lt;br&gt;From a pharmacy&lt;br&gt;From a health center&lt;br&gt;From a health-worker&lt;br&gt;From a lab&lt;br&gt;Sombody told me&lt;br&gt;From the symptoms&lt;br&gt;I don’t know/not sure&lt;br&gt;No response</td>
<td></td>
</tr>
<tr>
<td>How many times have you had typhoid?</td>
<td>In the last 3 months&lt;br&gt;In the last 6 months&lt;br&gt;In the last year&lt;br&gt;Longer ago&lt;br&gt;I can’t remember&lt;br&gt;No response</td>
<td></td>
</tr>
<tr>
<td>For data collectors only: Did the respondent mention 'typhoid-malaria' so far?</td>
<td>Yes&lt;br&gt;No</td>
<td></td>
</tr>
<tr>
<td>How does a person get typhoid? Do not read the alternatives, select all that apply</td>
<td>Mosquitoes&lt;br&gt;After getting malaria&lt;br&gt;Bacteria&lt;br&gt;Virus&lt;br&gt;Witchcraft/evildoing/sin&lt;br&gt;God or higher power&lt;br&gt;By eating contaminated food&lt;br&gt;By drinking contaminated water&lt;br&gt;Eating with dirty hands&lt;br&gt;Contact between houseflies and food&lt;br&gt;Contact with vomit or stool&lt;br&gt;Drinking too much beer&lt;br&gt;Eating too many oranges&lt;br&gt;Eating peanuts&lt;br&gt;Eating oily foods&lt;br&gt;Not washing off sweat&lt;br&gt;Other&lt;br&gt;I don’t know/not sure&lt;br&gt;No response</td>
<td></td>
</tr>
<tr>
<td>Can a person get typhoid from mosquitoes?</td>
<td>Yes&lt;br&gt;No&lt;br&gt;I don’t know/not sure&lt;br&gt;No response</td>
<td></td>
</tr>
<tr>
<td>How would you know that someone is infected with typhoid (signs and symptoms)? Do not read the alternative, select all that apply</td>
<td>Weakness&lt;br&gt;Fever&lt;br&gt;Chills&lt;br&gt;Headache&lt;br&gt; Muscle pain&lt;br&gt;Diarrhea&lt;br&gt;Vomiting&lt;br&gt;Abdominal (stomach) pain&lt;br&gt;Constipation&lt;br&gt;Lack of appetite&lt;br&gt;Sore throat&lt;br&gt;Cough</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Can you name up to three ways how you can prevent yourself from getting typhoid? <em>Do not read the alternative, select all that apply (max three!)</em></td>
<td></td>
</tr>
</tbody>
</table>
|   | Sleep under a bednet  
|   | Drink treated water  
|   | Wash hands with soap before eating  
|   | Wash hands before cooking food  
|   | Wash hands after leaving the toilet  
|   | Wash food before eating  
|   | Cook foods thoroughly  
|   | Eat foods while hot  
|   | Take anti-malarials  
|   | Don’t eat too many oranges  
|   | Don’t eat oily foods  
|   | Don’t drink too much beer  
|   | Keep environment clean  
|   | Other:  
|   | I don’t know/not sure  
|   | No response |
| 30 | If you think that you or someone in your family has typhoid, what would you do? *Do not read the alternative, select all that apply* |
|   | Go to a health facility/hospital  
|   | Go to -a traditional healer/traditional birth attendant  
|   | Get medication from a pharmacy  
|   | Get antibiotics from a pharmacy  
|   | Get anti-malarials from a pharmacy  
|   | Self-medicate  
|   | Other:  
|   | I don’t know/not sure  
|   | No response |
| 31 | Let’s say you keep doing what you already do to avoid typhoid, do you think it is likely or unlikely for you to get typhoid in the next year? |
|   | Likely  
|   | Unlikely  
|   | I don’t know  
|   | No response |
| 32 | Do you currently take actions to avoid getting typhoid? |
|   | Yes  
|   | No  
|   | I don’t know  
|   | No response |
| 33 | What kind of actions do you currently take to avoid getting typhoid? *Do not read the alternatives, select all that apply* |
|   | Sleep under a bednet  
|   | Drink treated water  
|   | Wash hands with soap before eating  
|   | Wash hands before cooking food  
|   | Wash hands after leaving the toilet  
|   | Wash food before eating  
|   | Cook foods thoroughly  
|   | Eat foods while hot  
|   | Take anti-malarials  
|   | Don’t eat too many oranges  
|   | Don’t eat oily food  
|   | Don’t drink too much beer  
|   | Keep environment clean  
|   | Other:  
|   | I don’t know/not sure  
|   | No response |
| 34 | Would you take actions in the next year to avoid getting typhoid? |
|   | Yes  
|   | No  
|   | I don’t know/not sure  
|   | No response |
### 35. What kind of actions would you take in the next year to avoid getting typhoid? Do not read the alternatives, select all that apply

- Sleep under a bednet
- Drink treated water
- Wash hands with soap before eating
- Wash hands before cooking food
- Wash hands after leaving the toilet
- Wash food before eating
- Cook foods thoroughly
- Eat foods while hot
- Take anti-malarials
- Don’t eat too many oranges
- Don’t eat oily food
- Don’t drink too much beer
- Keep environment clean
- Other:
- I don’t know/not sure
- No response

### 36. How does a person get malaria? Do not read the alternatives, select all that apply

- Mosquitoes
- Bacteria
- Virus
- Parasite
- Witchcraft/evil doing/sin
- God or higher power
- By eating contaminated food
- By drinking contaminated water
- Eating with dirty hands
- Contact between houseflies and food
- Contact with vomit or stool
- Drinking too much beer
- Eating too many oranges
- Eating peanuts
- Eating oily foods
- Not washing off sweat
- Other:
- I don’t know/not sure
- No response

### 37. Can you get typhoid without getting malaria?

- Yes → Q40
- No → Q38
- I don’t know
- No response

### 38. Why do you think that? Do not read the alternative, select all that apply

- Typhoid and malaria go together
- First you get malaria, then typhoid
- Typhoid is a bad form of malaria
- Both are caused by mosquitoes
- Signs and symptoms are the same
- Other:

### 39. Where did you get this information? Do not read the alternatives, select all that apply

- Health facility/hospital
- Radio
- Television
- Church/mosque/other religious venues
- Community meetings
- Newspapers/text messages
- Traditional leaders
- Traditional healers
- Government/Ministry of Health/Well Bodi Ministry
- Family/friends
- Doctors
- Nurses
- Other health workers
- Other community workers
- Other:
- I don’t know/not sure

---

<table>
<thead>
<tr>
<th></th>
<th>No response</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>Record geo location</td>
</tr>
<tr>
<td>No</td>
<td>Question</td>
</tr>
<tr>
<td>----</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Name enumerator</td>
</tr>
<tr>
<td>2</td>
<td>Trial ID of participant</td>
</tr>
<tr>
<td>3</td>
<td>First name</td>
</tr>
<tr>
<td>4</td>
<td>Last name</td>
</tr>
<tr>
<td>5</td>
<td>WhatsApp phone number (in case of non WhatsApp participant: phone 1)</td>
</tr>
<tr>
<td>6</td>
<td>Trial ID again of participant</td>
</tr>
<tr>
<td>7</td>
<td>What kind of work do you currently do?</td>
</tr>
<tr>
<td>8</td>
<td>How often do you discuss health issues with family or friends?</td>
</tr>
<tr>
<td>9</td>
<td>Have you had typhoid in the last 2 months?</td>
</tr>
<tr>
<td>10</td>
<td>How did you know you had typhoid? Do not read the alternatives, select all that apply</td>
</tr>
<tr>
<td>11</td>
<td>How does a person get typhoid? Do not read the alternatives, select all that apply</td>
</tr>
<tr>
<td>Question</td>
<td>Options</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Eating too many oranges</td>
<td>Eating peanuts</td>
</tr>
<tr>
<td>Eating peanuts</td>
<td>Eating oily foods</td>
</tr>
<tr>
<td>Bad hygiene</td>
<td>Other: I don’t know/not sure</td>
</tr>
<tr>
<td>No response</td>
<td></td>
</tr>
<tr>
<td>Can a person get typhoid from mosquitoes?</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>I don’t know/not sure</td>
</tr>
<tr>
<td></td>
<td>No response</td>
</tr>
<tr>
<td>How would you know that someone is infected with typhoid (signs and symptoms)?</td>
<td>Weakness</td>
</tr>
<tr>
<td></td>
<td>Fever</td>
</tr>
<tr>
<td></td>
<td>Chills</td>
</tr>
<tr>
<td></td>
<td>Headache</td>
</tr>
<tr>
<td></td>
<td>Muscle pain</td>
</tr>
<tr>
<td></td>
<td>Vomiting</td>
</tr>
<tr>
<td></td>
<td>Abdominal (stomach) pain</td>
</tr>
<tr>
<td></td>
<td>Constipation</td>
</tr>
<tr>
<td></td>
<td>Lack of appetite</td>
</tr>
<tr>
<td></td>
<td>Sore throat</td>
</tr>
<tr>
<td></td>
<td>Cough</td>
</tr>
<tr>
<td></td>
<td>Rash</td>
</tr>
<tr>
<td></td>
<td>Difficulty breathing</td>
</tr>
<tr>
<td></td>
<td>Confusion</td>
</tr>
<tr>
<td></td>
<td>Dizziness</td>
</tr>
<tr>
<td></td>
<td>Yellow eyes/yellow urine</td>
</tr>
<tr>
<td></td>
<td>Other: I don’t know/not sure</td>
</tr>
<tr>
<td></td>
<td>No response</td>
</tr>
<tr>
<td>Can you name up to three ways how you can prevent yourself from getting typhoid?</td>
<td>Sleep under a bednet</td>
</tr>
<tr>
<td></td>
<td>Drink treated water</td>
</tr>
<tr>
<td></td>
<td>Wash hands with soap before eating</td>
</tr>
<tr>
<td></td>
<td>Wash hands before cooking food</td>
</tr>
<tr>
<td></td>
<td>Wash hands after leaving the toilet</td>
</tr>
<tr>
<td></td>
<td>Wash food before eating</td>
</tr>
<tr>
<td></td>
<td>Cook foods thoroughly</td>
</tr>
<tr>
<td></td>
<td>Eat foods while hot</td>
</tr>
<tr>
<td></td>
<td>Take antimalarials</td>
</tr>
<tr>
<td></td>
<td>Don’t eat too many oranges</td>
</tr>
<tr>
<td></td>
<td>Don’t eat oily foods</td>
</tr>
<tr>
<td></td>
<td>Don’t drink too much beer</td>
</tr>
<tr>
<td></td>
<td>Clean environment</td>
</tr>
<tr>
<td></td>
<td>Other: I don’t know/not sure</td>
</tr>
<tr>
<td></td>
<td>No response</td>
</tr>
<tr>
<td>If you think that you or someone in your family has typhoid, what would you do?</td>
<td>Go to a health facility/hospital</td>
</tr>
<tr>
<td></td>
<td>Go to a traditional healer/traditional birth attendant</td>
</tr>
<tr>
<td></td>
<td>Get medication from a pharmacy</td>
</tr>
<tr>
<td></td>
<td>Get antibiotics from a pharmacy</td>
</tr>
<tr>
<td></td>
<td>Get anti-malarials from a pharmacy</td>
</tr>
<tr>
<td></td>
<td>Self-medicate</td>
</tr>
<tr>
<td></td>
<td>Other: I don’t know/not sure</td>
</tr>
<tr>
<td></td>
<td>No response</td>
</tr>
<tr>
<td>Do you think it is likely or unlikely for you to get typhoid in the next year?</td>
<td>Likely</td>
</tr>
<tr>
<td></td>
<td>Unlikely</td>
</tr>
<tr>
<td></td>
<td>I don’t know/not sure</td>
</tr>
<tr>
<td></td>
<td>No response</td>
</tr>
<tr>
<td></td>
<td>Question</td>
</tr>
<tr>
<td>---</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>17</td>
<td>Have you taken actions in the last 2 months to avoid getting typhoid?</td>
</tr>
<tr>
<td>18</td>
<td>In what ways have you taken actions to avoid getting typhoid? Do not read the alternatives, select all that apply</td>
</tr>
<tr>
<td>19</td>
<td>Are you planning to take actions in the next year to avoid getting typhoid?</td>
</tr>
<tr>
<td>20</td>
<td>What kind of actions would you take in the next year to avoid getting typhoid? Do not read the alternatives, select all that apply</td>
</tr>
<tr>
<td>21</td>
<td>How does a person get malaria? Do not read the alternatives, select all that apply</td>
</tr>
<tr>
<td>22</td>
<td>Can you get typhoid without getting malaria?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>23 Where did you get this information? Do not read the alternatives, select all that apply</td>
<td>Health facility/hospital&lt;br&gt;Radio&lt;br&gt;Television&lt;br&gt;Church/mosque/other religious venues&lt;br&gt;Community meetings&lt;br&gt;Newspapers/text messages&lt;br&gt;Traditional leaders&lt;br&gt;Traditional healers&lt;br&gt;Government/Ministry of Health/Well Bodi&lt;br&gt;Ministry&lt;br&gt;Family/friends&lt;br&gt;Doctors&lt;br&gt;Nurses&lt;br&gt;Other health workers&lt;br&gt;Other community workers&lt;br&gt;Other: I don’t know/not sure&lt;br&gt;No response</td>
</tr>
<tr>
<td>24 How many audio messages did you get? Was it 2 or 4 audio messages?</td>
<td>No response</td>
</tr>
<tr>
<td>25 How many audio messages did you listen to?</td>
<td>No response</td>
</tr>
<tr>
<td>26 Was the audio about typhoid or about breastfeeding?</td>
<td>About typhoid → Q27&lt;br&gt;About breastfeeding → Q30</td>
</tr>
<tr>
<td>27 Who was the main character in the drama?</td>
<td>Mariama&lt;br&gt;Abu&lt;br&gt;Sullay&lt;br&gt;Other:</td>
</tr>
<tr>
<td>28 Where did Mariama possibly get infected with typhoid?</td>
<td>No response</td>
</tr>
<tr>
<td>29 What happened to the main character in the drama? Is the participant describing it correctly?</td>
<td>Yes&lt;br&gt;No&lt;br&gt;Not sure: describe what the participant is saying</td>
</tr>
<tr>
<td>30 Did you like the drama?</td>
<td>Yes&lt;br&gt;No</td>
</tr>
<tr>
<td>31 Did you discuss the audio messages with friends and/or family?</td>
<td>Yes&lt;br&gt;No</td>
</tr>
<tr>
<td>32 Have you received information about typhoid and malaria from other sources in the last 2 months?</td>
<td>Yes → from where?&lt;br&gt;No&lt;br&gt;Other:</td>
</tr>
<tr>
<td>33 Have you talked to anyone who has heard or received the Info Na Pawa messages as well?</td>
<td>Yes&lt;br&gt;No&lt;br&gt;Other:</td>
</tr>
<tr>
<td>34 Have you received the audio messages from anybody else as well, not just from Info Na Pawa study?</td>
<td>Yes&lt;br&gt;No&lt;br&gt;Other:</td>
</tr>
<tr>
<td>35 Do you feel you now know more, less, or the same about typhoid and malaria?</td>
<td>More&lt;br&gt;Less&lt;br&gt;The same&lt;br&gt;Other:</td>
</tr>
<tr>
<td>36 For data collectors only: Did the respondent mention ‘typhoid-malaria’ so far?</td>
<td>Yes&lt;br&gt;No</td>
</tr>
<tr>
<td>37 General remarks (data, top ups etc)</td>
<td>No response</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>38</td>
<td>Trial ID participant</td>
</tr>
<tr>
<td>39</td>
<td>WhatsApp phone number again</td>
</tr>
<tr>
<td>40</td>
<td>Record geo location</td>
</tr>
</tbody>
</table>
Transcripts of Audio dramas

Intervention Group A: Plausible Alternative

Group A – Episode 1

{Music playing}

Introduction

My people, listen to this drama! With the Freetong Players International, FOCUS 1000 and the Karolinska Institute in Sweden we bring to you..

Episode One

Abu: Mariama, are you still having a fever?
Mariama: Yes Sir. I am feeling weak and I also have a stomach ache.
Abu: You’ve been ill for five days, let’s go to the hospital.
Mariama: Ok Abu.

{Music playing}

Abu: Nurse … nurse, good morning.
Male Nurse: Yes Sir, good morning.
Abu: I am here with my wife.
Male Nurse: Ok. Madam good morning.
Mariama: Nurse good morning.
Male Nurse: What is your name and how exactly are you feeling?
Mariama: My name is Mariama.
Male Nurse: Ok.
Mariama: I am feeling weak and I have a stomach ache. I also have a fever.
Male Nurse: {Sighing} Your wife has typhoid-malaria.
Abu: I said that.
Male Nurse: Because the symptoms indicates typhoid-malaria.
Abu: That is why I decided to come to the hospital.
Head Nurse: Nurse, I heard you talking about typhoid-malaria.
Male Nurse: Yes Ma’am.
Head Nurse: There is nothing like typhoid-malaria.

Male Nurse: Ok.

Head Nurse: Typhoid is typhoid and malaria is malaria. Have you conducted a test?

Male Nurse: No Ma’am.

Head Nurse: Well, test her for malaria.

Male Nurse: Ok, we are going to do the test now.

Head Nurse: Test her now for malaria.

Male Nurse: Do not worry, it’s just a small prick.

Mariama: {Exclaim}

Head Nurse: Look at this, the patient does not even have malaria. Everything she complained about: weakness, stomach ache and fever indicates that the patient has typhoid. Therefore, we should treat her for typhoid.

Male Nurse: Ok Ma’am.

Head Nurse: Alright, treat her for typhoid. Thereafter, call all the other nurses. I want to talk to you all.

Male Nurse: Yes Ma’am.

Head Nurse: Ok.

Male Nurse: You are going to be okay. Everything will be alright.

Abu: Mariama, we should go home now.

Mariama: Ok.

Abu: Take it easy.

{Music playing}

Female nurse: Yes sister, we are told that you called us.

Male Nurse: Yes Ma’am, we are here.

Head Nurse: Alright. I want to talk about typhoid-malaria. Everybody is talking about typhoid-malaria, typhoid-malaria, typhoid-malaria.

Male Nurse: Exactly.

Head Nurse: There is nothing like typhoid-malaria! Typhoid is typhoid and malaria is malaria.

Male Nurse: Huh?
Head Nurse: These are two different diseases. They might have similar symptoms but they are two different diseases.

Male Nurse: Wow!

Head Nurse: That is why I called you guys to enlighten you.

Male Nurse: Thank you very much sister. Everything that you explained we never knew and this is the first time we hear this information. However, we have learned from what you explained. Thank you very much.

{Music playing}

**Group A – Episode 2**

{Music playing}

**Introduction**

My people, listen to this drama! With the Freetong Players International, FOCUS 1000 and the Karolinska Institute in Sweden, we bring to you.

**Episode Two**

Abu: Mariama!

Mariama: Yes Abu?

Abu: How are you feeling now?

Mariama: I am feeling better now. When I take my medicine, I am getting better.

Abu: Mariama, what causes typhoid?

Mariama: I am sure it is mosquitoes that are responsible for typhoid.

Abu: Don’t you think ground nut and cooking oil are responsible for typhoid?

Mariama: Hmm Abu, it is mosquitoes that cause typhoid.

Abu: You know what, let’s call Sullay and ask him.

Mariama: Okay, let’s call him.

Abu: Sullay, Sullay.

Sullay: Yes brother?

Abu: Sullay, come!

Sullay: Yes, yes brother.

Abu: What causes typhoid? Is it mosquitoes?
Sullay: Brother, I am not sure; I don’t know about that. I am not sure it is mosquitoes but I know a well-known doctor, I will meet him and ask him. He will tell me the truth whether it is mosquitoes.

Mariama: Okay Abu.

Sullay: I will meet him.

{Music playing}

Door knocking

Doctor: Who is it?

Sullay: It is Sullay.

Doctor: Sullay, my friend, come in, come in!

Sullay: Ha doc, doc.

Doctor: Long time Sullay.

Sullay: I am here to see you. I want to ask you a question. I want to ask you a question about typhoid and malaria. I know that typhoid and malaria are two different diseases.

Doctor: Of course.

Sullay: I do understand. However, I want to know what causes typhoid. Is it mosquitoes?

Doctor: No, no, no Sullay. Mosquitoes do not cause typhoid. Typhoid is caused by drinking unclean water, and also uncooked food causes typhoid. Also, hygiene; after using the toilet you must wash your hands before touching anything.

Sullay: Doctor, is that all.

Doctor: That's is all Sullay.

Sullay: Okay doctor. Thank you very much doctor. I will give you a call.

Doctor: Okay Sullay.

Sullay: Okay {Sullay laughing}

{Music playing}

Sullay: Brother, aunty, I am back.

Abu: Yes Sullay?

Sullay: I have seen the doctor.

Abu: Sullay, what did the doctor say?

Sullay: He said typhoid is not caused by mosquitoes. He said typhoid is caused by drinking unclean water and eating uncooked food. Thirdly, he talked about hygiene. He
said after using the toilet, you must wash your hands properly. These are all responsible for typhoid.

Abu: All these things cause typhoid?

Sullay: Yes.

Abu: Mariama?

Mariama: Yes Abu.

Abu: How did you contract typhoid?

Mariama: Myself I don’t really understand. Hmm … I remember. When I visited Aunty Sylvia, the environment was filthy and I drank the unclean water. I am sure I contracted typhoid when I drank the unclean water.

Abu: Alright, it is okay now that we know.

Mariama: Yes Abu.

Abu: We are going to be careful now.

Mariama: Okay Abu.

Abu: Alright.

{Music playing}

**Group A - Episode 3**

My people, listen to this drama! With the Freetong Players International, Focus 1000 and the Karolinska institute in Sweden, we bring to you…

**Episode three**

Mariama: Thanks to God, I am feeling better now. However, I am only feeling weakness.

Abu: You seem to be feeling better now. Because now you can eat. You look okay now.

Mariama: I must eat Abu. What I went through, I do not want any member in my family to go through that. Because I nearly died.

Abu: I think we should fix a bed net.

Mariama: I am not sure. I think we should call the Doctor

Abu: Do you have the Doctor’s telephone number?

Mariama: Yes I have his number

Abu: Call the doctor.
{Phone ringing}
Mariama: Hello, hello?
Doctor: Who’s on the line?
Mariama: Yes Doctor its Mariama
Doctor: How are you feeling now?
Mariama: I am feeling okay now, thank God
Mariama: Doctor to avoid contracting typhoid disease, are we to use bed net?
Doctor: No, No, No, Mariama, bed nets are meant for the prevention of mosquito bites, so that you don’t get malaria. For typhoid, make sure you drink clean and pure water. And make sure you cook your food properly and make sure that when you come from the toilet, you wash your hands, so you have good hygiene. With that, you won’t get typhoid.
Mariama: Ok doctor, thank you.
Doctor: you’re welcome
Mariama: Ok bye bye.
{Music playing}

Group A – Episode 4

[Music]
My people, listen to this drama! With the Freetong Players International, Focus 1000 and the Karolinska institute in Sweden, we bring to you…

Episode four

[Phone rings] Hello? Hello Mariama, how are you doing?
Mariama: Yes Sister I am doing fine, and you?
Sister: Mariama it’s been a while, what’s going on?
Mariama: hmm it’s a long story, I was sick and my husband took me to the health facility for treatment.

[Music, introducing flashbacks to previous episodes]
Man: Nurse?
Nurse: Yes Sir
Man: Nurse good morning. I brought my wife for treatment
Nurse: Madam good morning, what’s your name and how are you feeling?

Mariama: My name is Mariama. Nurse, I am feeling weak, my stomach is aching and I have a fever.

Nurse: Your wife is having typhoid-malaria

Man: I said it

Mariama: [SHIVERING]

Man: That’s why I decided to take her to the hospital for treatment

Head nurse: Nurse I heard you saying about typhoid-malaria. There is nothing like typhoid-malaria. There is a clear cut distinction between typhoid and malaria and they have different treatments.

Head nurse: Have you done a test?

Nurse: No Ma’am

Head nurse: Okay please go and do a test first

Nurse: Okay ma’am we will carry out the test

Head nurse: Do it now

Nurse injects patients and she shouted [woaaa]

Head nurse: Do you see, the patients does not have malaria and all the signs and symptoms are from typhoid. Therefore, she should be treated for typhoid.

[Back with her sister on phone]

Mariama: After realizing that I had typhoid, they treated me immediately. I didn’t really know the cause of typhoid sister

[Introducing the next flashback, Someone knocks on the door bang bang]

Doctor: Who is knocking on my door?

Sullay: It’s me Doc Sullay your friend

Doc: Eh Sullay please come in

Sullay: Doc it’s been a while. I am here to ask you a question.

Doc: Yes, you may proceed

Sullay: I would like to know the cause of typhoid, it is caused by mosquitoes or what?

Doc: No, No, No, Sullay, mosquito bites is the not the cause of typhoid, it is caused by consumption of uncleaned water, uncooked food, unhygienic behaviour as not washing hands before and after using the toilets. That’s all.
Sullay: Is that all?
Doc: Yes, that’s all I have to say.
Sullay: Okay Doctor, thank you very much.

[Sullay returns home]

Sullay: Brother, aunty I am just coming from the Doctor
Sullay: The Doctor said that typhoid is caused by uncooked food, unclean water and thirdly, he mentioned that unhygienic attitudes will cause typhoid. He advised that we should wash our hands when we want to eat or use the toilet. He said that mosquito bites are not the cause of typhoid at all.
Family: Hmm

[Mariama back to her sister on the phone]
Mariama: Sister, those were the measures I took to regain my health and I am fully aware of the things to do not to get typhoid.
Sister: Okay Mariama I have heard you and will abide to what you have said. I will make sure I abide to the rules and regulations regarding typhoid, so me and my family stays safe. Extend my sincere greetings to everyone
Sister: Alright Mariama bye

[Music continue playing till it fades out]

**Intervention Group B: Avoiding Misinformation**

**Group B – Episode 1**

[Music playing]

My people, listen to this drama! With the Freetong Players International, Focus1000 and the Karolinska institute in Sweden, we bring to you…

**Episode 1**

Abu: Mariama how are you feeling now?
Mariama: My stomach hurts, I am feeling weak and I have a fever. My sister is getting married soon and I don’t know if I will have the chance to attend [shivering]
Abu: It’s been five days since you’ve been shivering, I think you have to visit the hospital to know the cause of your illness
Mariama: I am unable to go the hospital
Abu: Okay I will accompany you to the hospital
Mariama: Okay

[Music playing]

AT THE HOSPITAL

Abu: Good morning nurse
Nurse: Yes sir, good morning
Abu: I came with my wife for check ups
Nurse: Madam, good morning
Mariama: Yes, nurse good morning
Nurse: How are you feeling?
Mariama: I am feeling weak, my stomach is aching
Nurse: Typhoid is disturbing her
Abu: Typhoid?
Nurse: Yes, she is suffering from typhoid
Abu: Typhoid?
Nurse: Of course, she has typhoid
Abu: Nurse I am not convinced. My wife is not only suffering from typhoid, I think there are other diseases.
Nurse: No, my brother, from your explanation, all signs and symptoms you have highlighted are signs that are attributed to typhoid diseases. People suffering from typhoid get sick and weak. Don’t think typhoid won’t make someone sick, it does.
Abu: Nurse, I insist, my wife is having another disease, it’s not only typhoid disease.
Nurse: Okay!

Head nurse: Nurse, what’s going on here?
Nurse: This man came to me with his wife and he told me that his wife feeing weak, she had stomach ache and I told him that his wife had typhoid and he said that his wife had another disease. This is the scenario.

Head nurse: No, she has typhoid. Typhoid usually comes all by itself and when you contract typhoid disease, you will begin to feel unwell and feel sick
Nurse: Exactly

Head nurse: Typhoid is treated with antibiotic drugs
Abu: Yes Sister

Abu: Don’t worry okay, things will get better. Let’s go home

[Music playing]

Mariama: Abu do you think I will get well soon and make it to my sister’s wedding?

Abu: Yes, you will surely make it. Please continue with the drugs given to you at the facility

Mariama: Okay Abu

[Music playing]

**Group B – Episode 2**

{Music playing}

My people, listen to this drama! With the Freetong Players International, FOCUS 1000 and the Karolinska Institute in Sweden, we bring to you...

**Episode Two**

{Phone ringing}

Woman: Hello Mariama.

Mariama: Yes sister. How are you doing?

Woman: I am doing fine. I am here to check my wedding dress and I decided to call you to ask about your sickness.

Mariama: Sister, I went to the hospital and I was diagnosed with typhoid. Presently I am on treatment.

Woman: Mariama?

Mariama: Yes sister.

Woman: How did you get typhoid?

Mariama: My sister I don’t really know.

Woman: Alright Mariama, I will pray for you to get better because I want to see you at my wedding.

Mariama: By God’s grace.

Woman: Alright Mariama. Take care of yourself. Take it easy.

Mariama: Okay sister. Abu, Abu?
Abu: Yes Mariama.
Mariama: How do you get typhoid?
Abu: Mariama I don’t know but let us ask Sullay.
Mariama: Okay Abu.
Abu: Let me ask him. Sullay?
Sullay: Yes brother?
Abu: Sullay come here!
Sullay: Yes brother.
Abu: How can a person get typhoid?
Sullay: Brother, I don’t know. But I have a friend who is a well-known doctor. I will meet and ask him. He will explain exactly how typhoid is contracted.
Abu and Mariama: Okay. Alright.

{Music playing}

{Door knocking}

Doctor: Who is it?
Sullay: Doctor it is Sullay, your friend.
Doctor: Come in, come in. Long time, Sullay!
Sullay: Doctor I am here to see you. I have a question to ask you.
Doctor: Go ahead Sullay.
Sullay: How is typhoid contracted?
Doctor: Sullay, people get typhoid through contaminated water that is unclean water and also make sure you cook food properly and after using the toilet, wash your hands before touching food.
Sullay: Doctor is that all?
Doctor: That is all.
Sullay: Okay doctor, thank you.
Doctor: You are welcome.
Sullay: We shall meet again.
Doctor: Alright.
{Music playing}
Sullay: Brother and aunty I am back.
Mariama: Yes.
Abu: Sullay what did the doctor said?
Sullay: The doctor said a person can contract typhoid through drinking contaminated water or unclean water, uncooked food and also not washing your hands after using the toilet. Do you understand? That is what the doctor told me.
Abu: Mariama, how did you contract typhoid?
Mariama: Abu, I don’t really understand … okay I remember when I went to Aunty Sylvia. The environment was not clean at all and the water Aunty Sylvia gave me to drink was unclean. That is how I contracted typhoid.
Abu: Okay. But you are on treatment now.
Mariama: Yes Abu.
Abu: I will make sure that will never happen again. Okay.
Mariama: Okay Abu.
{Music playing}

**Group B – Episode 3**

{Music playing}
My people, listen to this drama! With the Freetong Players International, FOCUS 1000 and the Karolinska Institute in Sweden, we bring to you...

**Episode Three**
Mariama: Thanks to God, I am feeling better now. However, I am still feeling weak.
Abu: You seem to be feeling better now. Because now you can eat. You look okay now.
Mariama: I must eat Abu. What I went through, I do not want any member in my family to go through that. Because I nearly died.
Abu: Mariama?
Mariama: Yes Abu?
Abu: What are we going to do to avoid typhoid?
Mariama: I don’t know. Let us call Sullay.
Abu: Sullay.
Sullay: Yes Sir.
Abu: Sullay.
Sullay: Yes brother.
Abu: Sullay, I want you to call doctor to advise us what we should do to avoid contracting typhoid.
Sullay: Okay.
{Phone ringing}
Doctor: Hello.
Sullay: Yes doctor this is Sullay.
Doctor: Sullay, how are you?
Sullay: Not bad. Doctor I want to ask you a question.
Doctor: Go ahead.
Sullay: Doctor what should we do to avoid getting typhoid.
Doctor: Sullay.
Sullay: Yes.
Doctor: Make sure you drink clean water, cook your food properly and always was your hand clean.
Sullay: Thank you doctor.
Doctor: Okay, you are welcome.
Mariama: Okay Sullay thank you.
Sullay: Okay aunty.
Mariama: Abu.
Abu: Yes.
Mariama: I am feeling okay but I still feel the weakness. However, I am sure that I will go to my sister wedding.
Abu: That is true, you will go to sister wedding.
Mariama: Okay Abu.
Abu: You will go.
My people, listen to this drama! With the Freetong Players International, FOCUS 1000 and the Karolinska Institute in Sweden, we bring to you…

**Group B – Episode 4**

My people, listen to this drama! With the Freetong Players International, FOCUS 1000 and the Karolinska Institute in Sweden, we bring to you…

**Episode Four**

{At the wedding}

Mariama: Sister, congratulations. I am happy for you.

Sister: Thank you Mariama. I appreciate that you attended my wedding. Thank you my sister.

Mariama: My sister it wasn’t easy what I went through.

Mariama: I have learned about typhoid. I learned that person can get typhoid when you drink contaminated water, eat contaminated food like uncooked food and live in a filthy environment. My sister. I also learned that to avoid typhoid, you should drink clean water, cook the food properly and wash our hands always.

First woman: Alright Mariama, let us celebrate.

{Music playing}
Study Protocol

Contagious Misinformation Trial

Karolinska Institutet, Sweden
Maike Winters
Helena Nordenstedt
Helle Mölsted Alvesson
Zangin Zeebari
Carl Johan Sundberg
Mohamed F. Jalloh

FOCUS1000, Sierra Leone
Paul Sengeh
Mohammad B. Jalloh
Nance Webber
Samuel Abu Pratt
James Sengeh

COMAHS, Sierra Leone
Bailah Leigh

New York University, USA
Ben Oppenheim

Version 10: September, 2019

Table of Contents

Background & Rationale ................................................................. 2
Contagious Misinformation Trial .................................................. 3
Typhoid-malaria ............................................................................. 3
Research Questions ......................................................................... 4
PICOT ............................................................................................... 5
Population ....................................................................................... 5
Intervention ..................................................................................... 5
Comparator ....................................................................................... 6
Outcome .......................................................................................... 7
Target .............................................................................................. 8
Sample Size, Sampling & Recruitment ........................................... 8
Randomization ............................................................................... 10
Data collection ............................................................................... 10
Baseline survey ............................................................................. 10
Follow-up survey ........................................................................... 10
Blinding .......................................................................................... 11
Timeline ........................................................................................ 11
Data Analysis Plan .......................................................................... 12
Ethical Considerations .................................................................... 13
References .................................................................................... 14
Background & Rationale

In a time that is dubbed the ‘post-truth era’, people around the world are regularly exposed to misinformation and fake news (1). Whereas misinformation has been around since mankind, social media and the increased media fractionation has created echo chambers and information silos that can potentially amplify misinformation (1–3). This is problematic, as misinformation can lead to misconceptions, which might in turn influence knowledge and behaviour (4).

One of the most well-known examples of how misinformation influences behaviour concerns the (non-existing) link between the measles vaccine and autism. Following the fraudulent and retracted paper by Wakefield in the Lancet (5), online, very vocal anti-vaccination campaigners keep spreading false information and urge parents not to have their children immunized. In several European countries and in the USA, vaccine coverage has declined over the last years – which led to several measles outbreaks (6,7).

In other recent disease outbreaks, misinformation has played an important role as well. In the 2016 Zika outbreak for instance, a rumour went around that Zika was not the cause of microcephaly, but that it was a consequence of a larvicide (8). Similarly, blame was placed on vaccines distributed by the Brazilian government (9,10).

These kinds of misinformation and rumours can make people less likely to adhere to public health advice to curb an outbreak. In the world’s largest outbreak of Ebola virus disease (EVD) in West Africa in 2014-2016, a widespread rumour dictated that through washing with salt and hot water, the body would be protected from the virus (11). Whereas the washing in itself might seem harmless, the belief that they were protected from the virus might have induced risky behaviours (11). In this outbreak, mass media such as radio, are believed to have played a role in disseminating incorrect information, which could have influenced societal perceptions of EVD and the likelihood for individuals to seek medical attention (12). A study looking at the public’s exposure to different types of information channels during the EVD outbreak in Sierra Leone, found that especially radio was important in enhancing people’s knowledge and protective behaviour, but was at the same time also associated with misconceptions and risk behaviour (13). Risk communication in a disease outbreak has the potential to save lives, but could also ravage communities, depending on the type of communication channel and the quality of the content.

It is therefore of vital importance to find ways to counter misinformation and misconceptions – especially in infectious disease outbreaks. Unfortunately, simply rejecting a piece of false information might have the opposite effect by actually enhancing the belief in the false information; the so-called backfire effect (14). This is especially true when the false information is in line with people’s existing worldviews (15). For instance, a randomized trial in the USA using text messages with pro-vaccine information found that the effectiveness of the messages depended on the parental attitudes towards vaccination; among parents who were opposed to vaccination, the misconceptions were enhanced (16). Similar results have been reported elsewhere (17). A trial among staff of autism intervention centres in Australia aimed to decrease support for non-evidence-based autism therapies, while at the same time enhancing support for proven therapies (18). The study found that support for non-evidence-based therapies significantly decreased in the intervention group, whereas support for proven
therapies did not change. These effects were not sustained over time however, showing that more needs to be done to make the debunking effect stick long-term (18).

A meta-analysis investigating the effect size of different strategies of debunking misinformation found that certain types of refutations might actually enhance the belief in the wrong information (19). It was also found that most successful debunking strategies included detailed counterarguments (19). While providing a plausible alternative explanation to why information is wrong can reduce misconceptions, this effect is not always observed (19). Other suggestions that might yield positive results include not mentioning the wrong information at all (15). Furthermore, factors such as the credibility of the source, explanations in line with existing world views and social norms, giving a warning about misinformation coming up, showing graphical representations and salience of the corrective message all have the potential to enhance the chance of successful debunking (18).

A large part of the trials carried out so far, have been carried out in highly experimental settings, with relatively small sample sizes and included young, mostly female participants (college students) (19). Furthermore, most studies have focused on messages that were unfamiliar to the participants at the start of the trials. These studies started with a piece of misinformation which through interventions was tried to be countered (14,20–22). Not much is known about the effectiveness of correcting real-world misinformation; i.e. debunking misinformation that is already prevalent among the public. As described above, health-related misinformation can have grave consequences in infectious disease outbreaks. Whereas studies have reported the existence of misinformation and misconceptions around infectious diseases, to our knowledge no other study has studied the effectiveness of debunking strategies of misinformation about infectious diseases with a randomized trial.

Contagious Misinformation Trial
The Contagious Misinformation Trial (CMT) will be carried out in Freetown, the capital of Sierra Leone. Previous studies by the research team were set in Sierra Leone, using data from the EVD outbreak in 2014-2016 and were described above (11,13). For the CMT, misinformation about different infectious diseases were explored. The initial idea to try to counter lingering misinformation about Ebola was dismissed, as the disease is still a very sensitive topic in Sierra Leone. By investigating and spreading messages about Ebola, there is a risk that the public will mistake the renewed interest in the disease for a recurrence of an EVD outbreak.

Typhoid-malaria
Another disease that was found to be prone to misinformation was typhoid. The disease spreads through contaminated food and water and can be transmitted between people through the oral-faecal route. Typhoid can be successfully treated with antibiotics, however multidrug-resistant typhoid is increasingly common in West Africa (23). Symptoms of typhoid, such as high fevers, are similar to malaria. The estimated prevalence of typhoid in Sierra Leone is 0.01% (24).

In Sierra Leone, people tend to put typhoid and malaria together, often calling typhoid ‘typhoid-malaria’ (25,26). Given the believed similarity to malaria, many people think that...
Typhoid is caused by mosquitoes as well (in addition to contaminated food and water). People commonly think that typhoid and malaria come together: usually you get malaria first, and then typhoid comes on top of it.

Typhoid is ideally diagnosed through blood culture. Unfortunately, in Sierra Leone, there is only one hospital that has the equipment to do this, but even there, resources are not sufficient to carry out the test (personal communication at Connaught Hospital Freetown). Instead, the Widal test is commonly used across the country to diagnose typhoid. This diagnostic test has reportedly low sensitivity, specificity and positive predictive value (27,28). It is suggested that the Widal test cross-reacts with malaria antigens, making the Widal test more likely to be positive among malaria patients (29). True co-infection of typhoid and malaria rarely happens (30,31). In reality however, with the poor performance of the Widal test, patients frequently get to hear in the health centers in Sierra Leone that they have ‘typhoid-malaria’.

The belief in this misinformation around typhoid seems to be prevalent, with 70-80% of respondents in our small survey responding that typhoid is caused by mosquitoes. Given the low number of doctors and health centres in Sierra Leone, many people visit a traditional healer or a local pharmacy to self-medicate. Thinking that they might have typhoid, people take antibiotics and antimalarials – both drugs are prone to become resistant. Countering the misinformation around typhoid can therefore not only improve health-related knowledge, but can potentially also have an effect on drug-taking habits.

Two pieces of misinformation will be targeted in the CMT:
- The belief that typhoid is caused by mosquitoes
- The belief that typhoid can only come together with malaria

In the CMT, we will evaluate whether our intervention of a series of audio messages in the form of an audio drama is effective in countering misinformation.

**Research Questions**

**Main research question:**
Does the proposed intervention of audio messages reduce the belief in misinformation about typhoid compared to a control group among adults in urban Freetown in Sierra Leone, using an intention-to-treat analysis?

**Secondary research questions:**
1. Does the proposed intervention of audio messages prevent a ‘backfire’ effect, whereby the belief in misinformation is enhanced?
2. Does the proposed intervention of audio messages reduce the belief in misinformation about typhoid compared to a control group among adults in urban Freetown in Sierra Leone, using an ‘as treated’-analysis?
3. Does the proposed intervention of audio messages increase the knowledge about preventive methods for typhoid compared to a control group?
4. Does the proposed intervention lead to more health-related discussions with family and friends compared to a control group?
5. Is the proposed intervention successful in reducing the belief in misinformation and increasing the belief in the correct information about typhoid when administered in an alternative way?

**PICOT**

**Population**
Adults aged 18 and older in urban Freetown, with fluency in Krio, in possession of a mobile phone that has WhatsApp. Systematic random sampling will be used to select sections in urban Freetown. The Housing Census List of Enumeration Areas will function as a sampling frame, comprising 64 Sections in the Western Urban area. Within the selected sections, a modified random walk method will be used to select households with a predetermined skip interval. Exclusion criteria: Deafness, as one needs to be able to hear the audio messages.

**Intervention**
There are two intervention groups in the CMT: The Plausible Alternative group and the Avoiding Misinformation group (see figure 1). In line with previous research, offering a plausible alternative, i.e. explaining why the misinformation is wrong, has been shown to have a higher success rate of countering misinformation than simple rejections, that can backfire and unintentionally reinforce the misinformation (14). Another, slightly less explored strategy to counter misinformation is through avoiding mentioning the wrong information entirely (15).

In the **Plausible Alternative group**, we will explicitly mention the wrong information. This is then followed by an explanation of why this is not true and providing the alternative, correct information.

The messages in the **Avoiding Misinformation group** will instead solely focus on the correct information about that typhoid; the causes, as well as ways to prevent infection. Any mentioning of the existing misinformation around typhoid will be avoided.

**Core elements**
Consultations with media experts in Sierra Leone and published literature highlight the need to have a trusted messenger deliver the information (32). Furthermore, repeated exposure to messages is vital to increase the chances of successful debunking. Some studies thus far have been limited in this approach, by only letting participants be confronted to debunking messages at one timepoint (20–22). In the CMT we will have 4 messages (i.e. 4 episodes) per intervention group, of around 4-5 minutes each. The episodes will be sent to the participants every 7 days.

**Content of the audio dramas**
The audio messages will be in the form of an audio drama with a clear storyline, making the messages easy to follow and creating an emotional connection with the audience. The Sierra Leonean actor’s group Freetong Players will develop the audio dramas. They are a well-known and trusted group of actors in Sierra Leone, and highly experienced in making audio dramas. To ensure that the message comes from a trusted authority, there is a statement in each
episode that the message was developed by FOCUS1000 and Karolinska Institutet. The format will be the same in the two intervention groups, but the content will differ. The core message of each episode in the two intervention groups are described in table 1. The storylines for the two audio dramas can be found in Appendix A.

Table 1. Core messages per episode per intervention group

<table>
<thead>
<tr>
<th>Episode</th>
<th>Group 1: Plausible Alternative</th>
<th>Group 2: Avoiding Misinformation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>People think there is a disease called typhoid-malaria, but these are two different diseases.</td>
<td>You can get typhoid by itself, without having other diseases.</td>
</tr>
<tr>
<td>2</td>
<td>Typhoid is not caused by mosquitoes, only by contaminated water and food.</td>
<td>Typhoid is only caused by contaminated water and food.</td>
</tr>
<tr>
<td>3</td>
<td>People think sleeping under a bed net helps to prevent typhoid, but actually good hygiene, drinking treated water and cooking food properly help prevent typhoid</td>
<td>Prevent yourself from getting typhoid by cooking your food properly and drinking only treated water</td>
</tr>
<tr>
<td>4</td>
<td>Repetition of messages of episodes 1-3</td>
<td>Repetition of messages in episodes 1-3</td>
</tr>
</tbody>
</table>

Administration of the intervention

Participants in the CMT will receive the four episodes on their phone, through WhatsApp. The first episode will be sent to the participants on Monday October 21\(^{st}\), 2019. Every 7\(^{th}\) day after that, the following episode will be sent on WhatsApp, using the Broadcast function on WhatsApp whereby one sender can send messages to up to 256 recipients. Recipients will receive the message in an individual chat, so they don’t see who else received the message. Before receiving the audio message, the participant receives 10,000Le data credit, to ensure that the audio message can be received. The intervention will last for 4 weeks.

WhatsApp is commonly used in Sierra Leone. The advantage of this platform is that we can see whether the message has arrived and (for the large majority) whether it has been seen – we don’t know whether it has been listened to however. Restricting the sample to only those that have WhatsApp means in practice that we will probably exclude the poorest part of the population, as they are unlikely to have a phone that is suitable for WhatsApp. This also means that the educational level of our participants will likely be higher than the average educational attainment of the Sierra Leonean population. To compare whether the audio dramas work irrespective of WhatsApp, we will recruit 60 people who don’t have WhatsApp. They will be called every week and listen on the phone to the episodes. They will be randomized so that 30 of them will listen to the episodes from intervention group 1 (Plausible Alternative) the other 30 to the episodes of intervention group 2 (Avoiding Misinformation). Similar to the WhatsApp groups, these 60 people receive the baseline and follow-up surveys. The two Non-WhatsApp groups will be used to answer secondary research question 5.

Comparator

In the primary analysis, the two interventions will be compared to a control group. To keep participants engaged in the trial, and to avoid contaminating the control group with messages about typhoid or malaria, messages to the control group will be about exclusive breastfeeding. Participants in the control group will receive 2 messages, which will be sent at the same time as episode 1 and 3 are to be sent to the intervention groups. Similar to the intervention
groups, the participants in the control group will receive 10,000 Le data credit directly before receiving the messages.

### Outcome

**Primary outcomes**

The primary outcomes of the CMT are the reduced beliefs in two pieces of misinformation about typhoid:

1. Typhoid is caused by mosquitoes
2. Typhoid can only come together with malaria

These beliefs will be captured in the baseline and follow-up surveys with ‘yes/no’ questions. The primary analysis will be an intention-to-treat analysis.

**Secondary outcomes**

1. We will test a potential ‘backfire effect’, whereby our intervention unintentionally might have increased the belief in the misinformation.
2. We will carry out an ‘as-treated-analysis’ for the primary outcomes and the potential backfire effect. This will be captured through questions in the follow-up survey asking about the content of the intervention messages. Only the participants who accurately remember the content will be included in this analysis.
3. Knowledge about preventive methods for typhoid will be captured with the question: ‘Can you name up to three ways how you can prevent yourself from getting typhoid?’ This will be asked as an open question; the data collector ticks the appropriate boxes. Based on how many correct / incorrect answers the participant gives, a score will be created that can vary between -3 and +3.
4. To estimate whether the invention leads to more health-related discussions with family and friends, we ask ‘How often do you discuss health issues with family or friends?’ in the baseline and follow-up. In the follow-up, there will be an additional question: ‘Did you discuss the audio fragments with friends and/or family?’ to which people can answer yes or no.
5. To understand whether a reduction in the belief in misinformation and increase in the belief in the correct information is also achieved without using WhatsApp, 60 people with no WhatsApp will be recruited. We will carry out analyses to test the primary outcome, comparing the Non-WhatsApp groups with the control group, and with the WhatsApp intervention groups.
6. Self-efficacy will be tested in the follow-up survey only, through 3 questions based on 3 preventive method, e.g. ‘how confident do you feel in your abilities to cook food properly?’ We will evaluate whether there is a difference between the intervention groups and control group in people’s self-efficacy.
7. To understand whether the interventions had an effect on risk perception and preventive behaviours of typhoid compared to the control group, we will evaluate the questions about risk perception and typhoid actions. The hypotheses put forward by Brewer et al., 2004 (33) will be tested using these questions. This analysis will likely be published in a separate paper.
8. People might feel they have learned something from the audio dramas; to test whether subjective and objective learning match, we associate the outcomes of the question ‘do you feel that you learned something from the audio dramas?’ with the scores on the primary outcomes.
Target
This is a superiority trial, to find out if any of the intervention groups is better in achieving the primary outcome than the comparator.

Flowchart of trial

*Figure 1. Flowchart of the Contagious Misinformation Trial*

Sample Size, Sampling & Recruitment

**Sample Size**
Sierra Leone comprises 4 regions, with 14 districts. Freetown is part of the Western Urban district, with about 1.5 million inhabitants. Western Urban is further divided into 64 sections (see figure on next page), which are comprised of 2139 Enumeration Areas. Enumeration Areas each contain about 80-110 households.

For the Contagious Misinformation Trial (CMT), we will randomly select 20 of the 64 sections in the Western Urban district. The 64 sections vary in the number of households they contain: the largest has over 6000 households and the smallest around 600. Therefore, the random selection of the cluster will be weighted proportionate to size, so that the clusters with the largest number of households have more chance to be included than smaller clusters. In Excel, the 64 sections are sorted according to size, starting with the smallest cluster. Next, we calculate the cumulative percentage of the sections. Using a variable that creates 21 random numbers between 0 and 1, the sections that are closest to the random numbers in terms of...
the cumulative percentage will be selected. If through this method a section will be randomly selected more than once, the system will automatically pick a new number until there are 21 exclusive sections selected.

During the recruitment and data collection period (8 days for baseline), we will send 3 teams of 4 data collectors and 1 supervisor to one section every day. The enumerators have the task to recruit 32 people in that section on that day. The team will start in the approximate middle of the section and will drop a pen there. The first data collector will walk in the direction of the tip of the pen, the second data collector will go in a direction about 90 degrees from the first data collector, data collector 3 in a 180 degrees angle, etc until all 4 enumerators have found their direction. All data collectors will use a skip interval of 15 houses. The first interview of the day will be with a woman, the second with a man, the third with a woman etc. In case there is nobody home, or nobody eligible is available, a house one skip interval away will be approached. Data collectors will make notes how many houses they approached and how many declined to participate and this will be reported back to the research team. With 12 data collectors and 3 supervisors, we will cover 3 sections per day, recruiting 96 people per day. The supervisors will be supervising only in the first 2 days of data collection; they will visit the enumerators, join their recruitment and survey administration tasks and provide feedback. From day 3, the supervisors will recruit and collect data as well. Supervisors will focus on recruitment of 4 people per day who do not have WhatsApp. The enumerators will reached the target sample size of 750 in 7 days, the 3 supervisors will reach the target of 60 people with no WhatsApp in 5 days.

Other useful map: https://www.openstreetmap.org/#map=15/8.4333/-13.1640
Recruitment
Participants will be recruited based on the following inclusion criteria:
- Adults (18 years or older)
- In possession of a mobile phone that has WhatsApp
- Fluency in Krio
- Good hearing ability

If yes, the potential participant will be extensively briefed on what it means to participate in the trial, guided by an information sheet (Appendix B). When the participant agrees to take part in the trial, the data collector will also explain how WhatsApp audio messages are to be received and listened to. We ask the participant to program the phone number from which the audio messages in the participant’s phone, so that we ensure that audio messages can be received. The information sheet will be given to the participants, with contact details of the trial staff. If the participant gives consent, the baseline survey will be administered. In case the participant is illiterate, verbal consent will be recorded.

Randomization
After the required sample size has been reached, all data will be downloaded in an Excel file and split into the WhatsApp groups (i.e. 750 participants) and the Non WhatsApp groups (60 participants). Randomization will be done using already programmed code in Excel that randomly assigns each of the participants in one of the three groups (i.e. 2 intervention groups, 1 control group). The code will also ensure that each group will end up with 250 participants. The same code, but adjusted to 2 groups will be applied to the Non WhatsApp spreadsheet.

Data collection

Baseline survey
Directly after informed consent has been given by the participant, the baseline survey will be administered. This survey contains questions about basic demographics (age, sex, educational level, religion etc.), after which questions about typhoid and malaria are asked. The data collector asks the questions in person and directly enters the answers on the data capturing tablet. The baseline survey was pilot tested in May 2019 in Freetown. The latest version of the survey is attached in Appendix C.

Follow-up survey
At baseline, phone numbers and addresses of participants will be collected. A few days before the follow-up survey is to be administered, the participant will be called / WhatsApp’ed, to schedule a time for the follow-up survey. Similar to the baseline data collection, teams of 4 enumerators and 1 supervisor will visit every day a different section to do all follow-up surveys. The same teams will go to the same sections as much as possible, so that we ensure that the households can be easily traced back. If the participant is not home, the participant will be called and an alternative time will be arranged. We try as much as possible to do all follow-up surveys in the same section on the same day, but if this is not possible, the interview will be conducted on one of the last days. If the participant can still not be met in person, we will conduct the survey over the phone.
The survey administered at follow-up (around 3 weeks after the last episode has been sent out) is similar to the baseline survey, but has two important differences:

1. It does not contain the questions about demographics.
2. It contains extra questions regarding the content of the messages, to capture whether participants have actually listened to it.

After completion of the follow-up survey, the participant will receive the final 10,000Le for data top up. The participant will also receive an information sheet explaining typhoid and malaria, so that all participants (also the control group) will have the correct information at the end of the study.

**FOCUS1000**

Our main partner for the data collection is the Sierra Leonean non-governmental organization FOCUS1000. During the EVD outbreak in 2014-2016, they initiated the planning and data collection of four Knowledge, Attitude and Practice Surveys. This data was used to inform the ongoing outbreak response and were later the basis of several scientific publications.

Given their experience and expertise in data collection in Sierra Leone, FOCUS1000 will take the lead in data collection. They will oversee the data collection process, recruit suitable data collectors and supervisors from their pool of experienced data collectors, loan tablets for data capturing and they will administer the surveys at baseline and follow-up. The data collectors should be fluent in English and Krio. The data capturing software ‘Kobo Collect’ will be used on the tablets. The linguistics department of the University of Freetown will translate the survey from English to Krio, both in a written version and in a spoken version.

**Blinding**

Participants are blinded to the assignment of the group. As all groups (also the control group) will receive audio messages, participants will not know whether they were in the intervention or in the control group. Data collectors are to a large degree blinded to the assignment of the groups. The follow-up survey will contain questions about the content of the audio drama (which will be used for the as-treated analysis), answering those questions will reveal the group the participant was in. These questions will be asked last, so that the data collector is blinded up to those questions. The data analysis team at Karolinska Institutet will only receive the anonymized dataset.

**Timeline**

The data collection will begin in October 2019. Before that, in September, 12 data collectors and 3 supervisors will be recruited by FOCUS1000. Training will be organized by both KI and FOCUS100 in Freetown in the first week of October and is expected to last 3 working days. Recruitment and administration of the baseline survey will take place between 7-15 October. The intervention will start on October 21st and will last 4 weeks. The follow-up survey will be administered 3-4 weeks after the last episode of the audio dramas has been sent. There will be another 2-day training for the data collectors before the start of the follow-up survey in early December.

**Key dates in 2019:**

Oct 2-4: Training of data collectors at FOCUS1000
Oct 7-15: Recruitment of participants and administration of baseline survey  
Oct 21: Episode 1 to the two intervention groups  
         Message 1 to the control group  
Oct 28: Episode 2 to the two intervention groups  
Nov 4: Episode 3 to the two intervention groups  
         Message 2 to the control group  
Nov 11: Episode 4 to the two intervention groups  
Nov 28-29: Training of data collectors at FOCUS1000  
Dec 2-14: Administration of the follow-up survey

Data Analysis Plan
A core team comprising of a statistician, an Associate Professor, a PhD student and a social scientist, will carry out the statistical analysis, using STATA v.15. Before any analysis is done, the team will determine the extent of missing values in the dataset. Any patterns that are found in missing values will be reported. All models, statistical tests and table shells are detailed in a separate Statistical Analysis Plan.

Baseline characteristics
Baseline characteristics of the clusters, and of individuals will be calculated and described in two tables, stratified by trial arm.

Primary analysis
The primary outcomes of this trial are the reduced beliefs in the two main pieces of misinformation about typhoid. Both outcomes are binary, based on ‘yes/no’ questions. The proportions of participants believing in the misinformation in the intervention groups and control group will be summarized both at baseline and at follow-up. In this intention-to-treat analysis, the primary analysis will be a logistic regression test to determine whether there was a difference between the intervention groups and control group follow-up. Several models will be fitted, adjusting for covariates, including age, sex, educational level and religion. Results will be presented in a table, together with p-values and 95% Confidence Intervals to demonstrate whether results are statistically significant.

Secondary analyses
1. The backfire effect will be analysed through ordinal logistic regression models, whereby the outcome has three levels: increased belief in misinformation, no change in belief in misinformation, decreased belief in misinformation. Models will be adjusted for covariates.
2. The ‘as-treated-analysis’, will be carried out among the respondent who accurately remember the messages. This will be evaluated using the memory questions of the follow-up survey. Participants answering at least those questions correctly will be included in the analysis. The as-treated-analysis will be done for the primary outcomes as well as the backfire effect.
3. A score will be created for knowledge about preventive methods for typhoid, reflecting how many correct or incorrect preventive methods the participants names. Ordinal logistic regression analysis will determine whether there is a difference between intervention and control groups knowledge about preventive methods.
4. A logistic regression analysis will be carried out to determine whether there is a difference in health-related discussions among intervention and control groups.

5. The primary analysis will be carried out comparing the non-WhatsApp groups with the control group and with the WhatsApp groups.

6. The effect of the intervention on self-efficacy around three preventive methods will be analysed using ordinal logistic regression models.

7. The influence of the intervention on risk perception and preventive practices and associations between those two will be tested using Brewer et al (2004)’s three hypotheses

8. A Chi-square analysis will be carried out to determine whether participants who felt that they learned from the audio dramas in reality also scored better on the primary outcomes.

Post hoc analysis
If the analyses yield significant results, post hoc analyses will be carried out to determine if there are statistically significant differences between the two different intervention groups.

Ethical Considerations
Potential benefits and the generation of evidence should never come at a cost of participants of medical research. This research project will adhere to the premises of respect of persons, beneficence and justice.

In this randomized controlled trial, the research participants are the individuals to whom the interventions are administered. All participants will be extensively briefed on what it means to participate in the study and will not be further enrolled before an informed consent form is signed.

All information regarding the study, including contact details of field team members and the principal investigator will be provided in writing to all participants. They will further be ensured that they can drop out at any stage of the trial, without having to give a reason for doing so. Given the high illiteracy rates in Sierra Leone, it is likely that some of the participants won’t be able to read the consent form. We will pursue the inclusion of illiterate or low-literate adults, provided that they meet the other inclusion criteria of using WhatsApp (which illiterate people tend to do, mainly for audio messages). In case of illiteracy, a field team member will read all information out loud and, if agreed, verbal consent will be given, which will be written down by the field team member and a witness.

Participating in the study is not expected to present any harm to participants. However, if participants feel they are exposed to any harm or risk, they are encouraged to contact the team members of the study. Contact details will be provided to all participants.

Ethical permission for this study was granted by the Sierra Leone Ethics and Scientific Review Committee on May 30th, 2019. The Swedish Ethical Review Authority in Stockholm has granted ethical permission: dnr 2018/1276-31.
References


Appendix A  Storylines per intervention group

Group 1: Plausible Alternative

<table>
<thead>
<tr>
<th>Core message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Episode 1</td>
</tr>
<tr>
<td>Typhoid and malaria are 2 different diseases</td>
</tr>
<tr>
<td>Episode 2</td>
</tr>
<tr>
<td>Typhoid is not caused by mosquitoes</td>
</tr>
<tr>
<td>Episode 3</td>
</tr>
<tr>
<td>Preventive methods for typhoid</td>
</tr>
<tr>
<td>Episode 4 (RECAP of episodes 1,2,3)</td>
</tr>
</tbody>
</table>

Episode 1:
- At home
  - A woman (Mariama) is getting sicker every day (weakness, fever) since several days. Her husband (Abu) brings her to the health clinic
  - In the health clinic, a nurse diagnoses the woman with typhoid-malaria, gets treatment
  - Husband says – “I told you”.
  - Head nurse overhears the typhoid-malaria diagnosis and intervenes, orders the nurse to do a malaria test, which is negative
  - Mariama gets diagnosed with typhoid
  - The head nurse calls all the other nurses, and explains that people talk a lot about typhoid-malaria, but that this doesn’t exist
  - ‘Typhoid is typhoid, malaria is malaria’
  - End of episode tune

Episode 2:
- Mariama is getting better, but wonders how she got typhoid
  - Was is from mosquitoes?
- Mariam and Abu don’t know, ask their neighbour Abu
- Abu knows a doctor, goes there to ask for clarifications
- Doctor explains that mosquitoes cause malaria, but typhoid is caused by other things: eating bad food, drinking bad water, bad hygiene
- Abu reports this back to Mariama and Abu
  - Mariama figures it out; she drank bad water at Aunt Sylvia’s place 2 weeks ago
- End of episode tune

Episode 3:
- Mariama has recovered. But she never wants to experience typhoid again; she felt like she was almost dying.
- The couple discusses how they can prevent themselves from getting typhoid
  - Maybe by using a bed net?
- Abu calls doctor, who explains that bed net will help against malaria, not typhoid.
- To avoid typhoid, they should drink good water and wash hands and cook food properly

Episode 4 (RECAP of episodes 1-3)
- Recap of the 3 episodes, highlighting the core messages of each episode
Group 2: Avoiding Misinformation

<table>
<thead>
<tr>
<th>Core message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Episode 1</td>
</tr>
<tr>
<td>Typhoid diagnosis, it normally comes alone</td>
</tr>
<tr>
<td>Episode 2</td>
</tr>
<tr>
<td>Typhoid is caused by dirty water &amp; food</td>
</tr>
<tr>
<td>Episode 3</td>
</tr>
<tr>
<td>Preventive methods for typhoid</td>
</tr>
<tr>
<td>Episode 4</td>
</tr>
<tr>
<td>Recap of Episodes 1,2,3:</td>
</tr>
</tbody>
</table>

Episode 1:
- A woman (Mariama) is getting sicker every day (weakness, fever) since several days. Her husband (Abu) brings her to the health clinic
- A nurse diagnoses the patient with typhoid and explains a bit about treatment
  → Typhoid normally comes alone
- Head nurse overhears, and confirms
  → Abu and Mariama are surprised, she is so sick, there must be more?
- Head nurse confirms that you can get very sick from typhoid
- Mariama worries that she can’t go to her sister’s wedding in 2 weeks
  (no mention of malaria or typhoid-malaria)

Episode 2:
- Mariama is getting better with the treatment
- They ask around to understand what caused typhoid
- Abu calls doctor, who confirms the correct information
  → Doctor explains it is bad water (water no good for drink) and bad food
- Patient and husband try to figure out how the patient got infected
  → Why did Mariama get sick and not the husband? (Remember 2 weeks ago when I was so thirsty at Aunty Silvia’s place and I drank water outside her house that looked dirty?)
- No mention of mosquitoes
- Still anxious that she won’t be fit enough for her sister’s wedding

Episode 3:
- The patient has almost recovered. But she never wants to experience typhoid again; she felt like she was almost dying.
- The couple discusses how they can prevent themselves from getting typhoid
- Doctor: To avoid typhoid they should drink good water and wash hands and cook food properly

Episode 4 (RECAP of episodes 1-3)
- Mariama made it to her sister’s wedding
- Tell her sister what she went through and what she learned on the way
Appendix B

Information for participants: The Information Na Pawa Study

Dear Sir/Madam,
You are asked to participate in a scientific study. Participating in this study is voluntary. Your participation requires your written consent. Before you decide whether you want to participate in this study, you will be given an explanation about what the study involves. Please read this information carefully and ask the investigator/enumerator for an explanation if you have any questions.

1. General Information
This study is carried out by FOCUS1000 in Freetown and Karolinska Institutet, a university based in Stockholm, Sweden. This study has been approved by the Sierra Leone Ethics and Scientific Review Committee and by the Swedish Ethical Authority.

2. Purpose & background of the study
The purpose of this study is to understand how people perceive information about health. It is important that the general public has a good understanding of diseases that can threaten their health, so that people know how to prevent and treat diseases.

3. What participation involves & what is expected of you
If you agree to participate in this study, the enumerator will administer a survey, asking questions about you and about certain health topics. People who participate in this study will be assigned to one of the three groups in this study. Depending on which group you will be randomly assigned to, you will receive between 2-4 audio messages on your WhatsApp. This starts on Monday October 21\(^{st}\); you will receive first 10.000Le data top up and that same day you will receive an audio message on your WhatsApp. We ask you to listen to all the audio messages you receive. Note that we can see whether you have listened to the messages. Please don’t share the audio messages further in any way, we only want YOU to listen to them. You can discuss the content with family or friends, but please don’t share the actual message or file further. New audio messages will be sent on Mondays (every week or every 2 weeks, depending on the study group you are assigned to), and you will receive Le10.000 data top up every time before receiving the audio message. It is important that your mobile phone and your WhatsApp are close to you and work properly in the next two months. Between December 2-14, we will visit you again, with some more health-related questions we would like to ask you. We will send you a message on WhatsApp to notify when we come. When you have completed the last survey, you will receive the last 10.000Le data top up.

It is important that you save the following number on your phone under the name ‘Information Na Pawa’: 030070104

This is the phone number that you will receive the audio messages from. You need to have this phone number in your address book on your phone, otherwise you will not be able to receive the audio messages.

Please do NOT answer to the messages you receive, we will not respond to messages written on WhatsApp. If you have questions or problems receiving the audio messages, please contact the study team on this phone number: 030070138

4. Possible risks
Because the study only involves answering questions and listening to audio messages, there is no personal risk for you to participate in this study.
5. If you want to stop participating in the study
Your participation is entirely voluntary, it is your choice if you want to participate or not. You can withdraw your participation at any moment in the study and you don’t need to give a reason for doing so. There are no consequences if you decide to withdraw your consent. You can refuse to answer any questions.

6. Usage and storage of your data
Your personal data will be collected, analysed and stored for this study. This is data such as your name, address, phone number and educational level. We need to collect this personal data to be able to carry out this study. We ask your permission to use your personal data for this purpose. Karolinska Institutet is a public authority and is thereby obliged to comply with, among other things, the rules on public documents, public authority archives and public statistics. Karolinska Institutet will therefore also process personal data in the manner required to comply with other applicable legislation.

Confidentiality of your data
To protect your privacy, we will remove your name and other information that can be traced back to you when we analyse the data. Instead, we will give your data a unique code, so that the data cannot be traced back to you. The encryption key remains safely stored at Karolinska Institutet and will only be accessible to authorized researchers who are directly involved in the analysis of the data for this study. The data cannot be traced back to you in reports and publications about the study.

Storage and use of data
Your data will be stored on safe servers at Karolinska Institutet in Sweden. Your personal data is handled in accordance with regulations regarding public authority archives. Collected personal data may be used in future research projects at Karolinska Institutet that have been approved by the Ethical Review Board. Your data will be stored for 10 years for reviewing purposes.

Withdrawing consent
You can withdraw your consent to the use of your personal data at any time. This applies to this study and also to storage and use for future research. The study data collected until the moment you withdraw your consent will still be used in the study.

7. Compensation for participation
If you decide to participate in this study, you will receive a data top up of Le10,000 on your phone every time you receive an audio message on WhatsApp. Depending on which study group you will be randomly assigned to, you will receive 2 or 4 audio messages. After completion of the follow-up survey, you will receive a final Le10,000. All participants who have completed the follow-up survey have an extra chance to win an additional Le30,000 phone top up.

8. Any questions
If you have any questions, please contact the study team: 030070138
Or email the study team members:
Maike Winters (Karolinska Institutet): maike.winters@ki.se
Helena Nordenstedt (Karolinska Institutet): helena.nordenstedt@ki.se
Paul Sengeh (FOCUS1000): p sengeh@gmail.com

9. Signing the consent form
When you are sure you understand the above presented information, you will be asked to decide on participation in this study. If you give permission, we will ask you to confirm this in writing on the appended consent form. By your written permission, you indicate that you have understood the information and consent to participation in the study. Both yourself and the investigator will receive a signed copy of the consent form.
Consent Form Information Na Pawa Study

I have read the participant information form. I was able to ask questions. My questions have been answered to my satisfaction. I had enough time to decide whether to participate. I know that participation is voluntary. I know that I may decide at any time not to participate after all or to withdraw from the study. I do not need to give a reason for this. I give permission for the collection and use of my data to answer the research question in this study.

I want to participate in this study.

Name of the participant:

Signature: Date:

I hereby declare that I have fully informed the participant about this study. If information comes to light during the course of the study that could affect the participant’s consent, I will inform him/her of this in a timely fashion.

Name of investigator / enumerator:

Signature: Date:

I: □ do □ do not consent to keeping my personal data longer and for it to be used for future research
Appendix C

Baseline Survey Contagious Misinformation Trial

1. Name of enumerator

2. Does the participant have WhatsApp?
   a. Yes
   b. No

3. Does the participant want to be part of the study?
   a. Yes
   b. No -> end of survey

4. Is the study phone number programmed in the participant’s phone?
   a. Yes \(\rightarrow Q6\)
   b. No \(\rightarrow Q5\)

5. If no, why not?
   a. Open

6. Did the participant sign the informed consent forms?
   a. Yes
   b. No -> end of survey

7. First Name:.........

8. Last Name:.......  

9. Address

10. Describe house / address / landmark:

11. WhatsApp phone number:

12. Is your WhatsApp number from Orange, Africell or Qcell?
   a. Orange
   b. Africell
   c. Qcell
   d. Other:
   e. I don’t know
   f. No answer

13. Other phone number participant can be reached on:

14. Gender:
   a. Male
   b. Female

15. Age: .......... years

16. What is your highest level of education?
   a. No formal education
   b. Primary education
   c. Secondary education
   d. Post-secondary education
   e. I don’t know / not sure
17. Average monthly household income from paid job: Le..................

18. What is your religion?
   a. Islam
   b. Christianity
   c. Other: ............
   d. No response

Awareness / risk perception:

19. How often do you discuss health issues with family or friends?
   a. Daily
   b. Weekly
   c. Monthly
   d. When necessary
   e. Never
   f. I don’t know / not sure
   g. No response

20. Do you know of any diseases that can be spread by being in contact with another person? Do not read the alternatives, select all that apply
   a. Malaria
   b. HIV
   c. Ebola
   d. Typhoid
   e. Measles
   f. Lassa Fever
   g. Cholera
   h. Zika
   i. Tuberculosis
   j. Leprosy
   k. Scabies
   l. Sexually transmitted diseases
   m. Other

21. Have you ever had typhoid?
   a. Yes: go to Q22
   b. No: go to Q25
   c. I don’t know / not sure

22. How did you know you had typhoid? Do not read the alternatives, select all that apply
   a. Diagnosed in a hospital
   b. Diagnosed in a health facility other than hospital
   c. Diagnosed in a private clinic
   d. From a pharmacy
   e. From a health center
   f. From a non-health worker
   g. From a lab
   h. Somebody told me
   i. From the symptoms
   j. I don’t know / not sure
   k. No response

23. How many times have you had typhoid?
   a.
24. When was the last time you had typhoid?
   a. In the last 3 months
   b. In the last 6 months
   c. In the last year
   d. Longer ago
   e. I can’t remember
   f. No response

25. For data collectors only: Did the respondent mention ‘typhoid-malaria’ so far?
   a. Yes
   b. No

26. How does a person get typhoid? Do not read the alternatives, select all that apply
   a. Mosquitoes
   b. After getting malaria
   c. Bacteria
   d. Virus
   e. Parasite
   f. Witchcraft / Evildoing / Sin
   g. God or higher power
   h. By eating contaminated food
   i. By drinking contaminated water
   j. Eating with dirty hands
   k. Contact between houseflies and food
   l. Contact with vomit or stool
   m. Drinking too much beer
   n. Eating too many oranges
   o. Eating peanuts
   p. Eating oily foods
   q. Not washing off sweat
   r. Other:....................
   s. I don’t know / not sure
   t. No Response

27. Can a person get typhoid from mosquitoes?
   a. Yes
   b. No
   c. I don’t know / not sure
   d. No response

28. How would you know that someone is infected with typhoid (signs and symptoms)? Do not read the alternative, select all that apply
   a. Weakness
   b. Fever
   c. Chills
   d. Headache
   e. Muscle pain
   f. Diarrhea
   g. Vomiting
   h. Abdominal (stomach) pain
   i. Constipation
   j. Lack of appetite
   k. Sore throat
   l. Cough
   m. Rash
   n. Difficulty breathing
29. Can you name up to three ways how you can prevent yourself from getting typhoid? Do not read the alternative, select all that apply (max three!)
   a. Sleep under a bednet
   b. Drink treated water
   c. Wash hands with soap before eating
   d. Wash hands before cooking food
   e. Wash hands after leaving the toilet
   f. Wash food before eating
   g. Cook foods thoroughly
   h. Eat foods while hot
   i. Take anti-malarials
   j. Don’t eat too many oranges
   k. Don’t eat oily food
   l. Don’t drink too much beer
   m. Keep environment clean
   n. Other:
      o. I don’t know / not sure
      p. No response

30. If you think that you or someone in your family has typhoid, what would you do? Do not read the alternative, select all that apply
   a. Go to a health facility / hospital
   b. Go to a traditional healer, or traditional birth attendant
   c. Get medication from a pharmacy
   d. Get antibiotics from a pharmacy
   e. Get antimalarials from a pharmacy
   f. Self-medicate
   g. Other:
      h. I don’t know / not sure
      i. No Response

31. Let's say you keep doing what you already do to avoid typhoid, do you think it is likely or unlikely for you to get typhoid in the next year?
   a. Likely
   b. Unlikely
   c. I don’t know
   d. No response

32. Do you currently take actions to avoid getting typhoid?
   a. Yes
   b. No \(\rightarrow\) Q34
   c. I don’t know
   d. No response

33. What kind of actions do you currently take to avoid getting typhoid? Do not read the alternatives, select all that apply
   a. Sleep under a bednet
   b. Drink treated water
   c. Wash hands with soap before eating
   d. Wash hands before cooking food
e. Wash hands after leaving the toilet
f. Wash food before eating
g. Cook foods thoroughly
h. Eat foods while hot
i. Take anti-malarials
j. Don't eat too many oranges
k. Don't eat oily food
l. Don't drink too much beer
m. Keep environment clean
n. Other:
  o. I don't know / not sure
  p. No response

34. Would you take actions in the next year to avoid getting typhoid?
   a. Yes
   b. No → Q36
   c. I don't know
   d. No response

35. What kind of actions would you take in the next year to avoid getting typhoid? Do not read the alternatives, select all that apply
   a. Sleep under a bednet
   b. Drink treated water
c. Wash hands with soap before eating
d. Wash hands before cooking food
e. Wash hands after leaving the toilet
f. Wash food before eating
g. Cook foods thoroughly
h. Eat foods while hot
i. Take anti-malarials
j. Don't eat too many oranges
k. Don't eat oily food
l. Don't drink too much beer
m. Keep environment clean
n. Other:
  o. I don't know / not sure
  p. No response

36. How does a person get malaria? Do not read the alternatives, select all that apply
   a. Mosquitoes
   b. Bacteria
c. Virus
d. Parasite
e. Witchcraft / Eviddoing / Sin
f. God or higher power
g. By eating contaminated food
h. By drinking contaminated water
i. Eating with dirty hands
j. Contact between houseflies and food
k. Contact with vomit or stool
l. Drinking too much beer
m. Eating too many oranges
n. Eating Peanuts
o. Eating Oily foods
p. Not washing off sweat
q. Other:.................
r. I don't know / not sure
37. Can you get typhoid without getting malaria?
   a. Yes; Q40
   b. No; Q38
   c. I don’t know
   d. No response

38. Why do you think that? Do not read the alternative, select all that apply
   a. Typhoid and malaria go together
   b. First you get malaria, then typhoid
   c. Typhoid is a bad form of malaria
   d. Both are caused by mosquitoes
   e. Signs and symptoms are the same
   f. Other:

39. Where did you get this information? Do not read the alternatives, select all that apply
   a. Health facility / Hospital
   b. Radio
   c. Television
   d. Church / mosque / other religious venues
   e. Community meetings
   f. Newspapers / brochures / other print material
   g. Mobile phones / text messages
   h. Traditional leaders
   i. Traditional healers
   j. Government / Ministry of Health / Well Bodi Ministry
   k. Family/friends
   l. Doctors
   m. Nurses
   n. Other health workers
   o. Other community workers
   p. Other:
   q. I don’t know / not sure
   r. No Response

40. Have you heard of typhoid-malaria?
   a. Yes
   b. No
   c. I don’t know / not sure
   d. No response

41. Geo location
Follow-up survey Contagious Misinformation Trial
Version 2, September 2019

1. First Name:........
2. Last Name:........
3. WhatsApp phone number

Awareness / risk perception

4. How often do you discuss health issues with family or friends? Do not read the alternatives, select all that apply
   a. Daily
   b. Weekly
   c. Monthly
   d. When necessary
   e. Never
   f. I don’t know / not sure
   g. No response

5. Do you know of any diseases that can be spread by being in contact with another person?
   a. Malaria
   b. HIV
   c. Ebola
   d. Typhoid
   e. Measles
   f. Lassa Fever
   g. Cholera
   h. Zika
   i. Tuberculosis
   j. Leprosy
   k. Scabies
   l. Sexually transmitted diseases
   m. Other

6. Have you had typhoid in the last 2 months?
   a. Yes: go to Q7
   b. No: go to Q9
   c. I don’t know / not sure

7. How did you know you had typhoid? Do not read the alternatives, select all that apply
   a. Diagnosed in a hospital
   b. Diagnosed in a health facility other than hospital
   c. Diagnosed in a private clinic
   d. From a pharmacy
   e. From a health center
   f. From a non-health worker
   g. From a lab
   h. Somebody told me
   i. From the symptoms
j. I don’t know / not sure
k. No response

8. Do you think it is likely or unlikely for you to get typhoid in the next year?
   a. Likely
   b. Unlikely
   c. I don’t know
   d. No response

9. For data collectors only: Did the respondent mention ‘typhoid-malaria’ so far?
   a. Yes
   b. No

Knowledge, attitudes, practices:

10. Have you taken actions to avoid getting typhoid?
    a. Yes
    b. No: Q12
    c. I don’t know
    d. No response

11. In what ways have you taken actions to avoid getting typhoid? Do not read the alternatives, select all that apply
    a. Sleep under a bednet
    b. Drink treated water
    c. Wash hands with soap before eating
    d. Wash hands before cooking food
    e. Wash hands after leaving the toilet
    f. Wash food before eating
    g. Cook foods thoroughly
    h. Eat foods while hot
    i. Take anti-malarials
    j. Don’t eat too many oranges
    k. Don’t eat oily food
    l. Don’t drink too much beer
    m. Clean environment
    n. Other:
    o. I don’t know / not sure
    p. No response

12. Would you take actions in the next year to avoid getting typhoid?
    a. Yes
    b. No: Q 14
    c. I don’t know
    d. No response

13. What kind of actions would you take in the next year to avoid getting typhoid? Do not read the alternatives, select all that apply
    a. Sleep under a bednet
    b. Drink treated water
    c. Wash hands with soap before eating
    d. Wash hands before cooking food
e. Wash hands after leaving the toilet
f. Wash food before eating
g. Cook foods thoroughly
h. Eat foods while hot
i. Take anti-malarials
j. Don’t eat too many oranges
k. Don’t eat oily food
l. Don’t drink too much beer
m. Clean environment
n. Other:
o. I don’t know / not sure
p. No response

14. How does a person get typhoid? Do not read the alternatives, select all that apply
   a. Mosquitoes
   b. After getting malaria
   c. Bacteria
   d. Virus
   e. Parasite
   f. Witchcraft / Evildoing / Sin
   g. God or higher power
   h. By eating contaminated food
   i. By drinking contaminated water
   j. Eating with dirty hands
   k. Contact between houseflies and food
   l. Contact with vomit or stool
   m. Drinking too much beer
   n. Eating too many oranges
   o. Eating peanuts
   p. Eating oily foods
   q. Other: ..................
r. I don’t know / not sure
   s. No Response

15. Can a person get typhoid from mosquitoes?
   a. Yes
   b. No
   c. I don’t know / not sure
   d. No response

16. How would you know that someone is infected with typhoid (signs and symptoms)? Do not read the alternative, select all that apply
   a. Weakness
   b. Fever
   c. Chills
   d. Headache
   e. Muscle pain
   f. Diarrhea
   g. Vomiting
   h. Abdominal (stomach) pain
   i. Constipation
   j. Lack of appetite
k. Sore throat
l. Cough
m. Rash
n. Difficulty breathing
o. Confusion
p. Dizziness
q. Yellow eyes / yellow urine
r. Other:....
s. I don’t know / not sure
t. No response

17. Can you name up to three ways how you can prevent yourself from getting typhoid? **Do not read the alternative, select all that apply**
   a. Sleep under a bednet
   b. Drink treated water
   c. Wash hands with soap before eating
   d. Wash hands before cooking food
   e. Wash hands after leaving the toilet
   f. Wash food before eating
   g. Cook foods thoroughly
   h. Eat foods while hot
   i. Take anti-malarials
   j. Don’t eat too many oranges
   k. Don’t eat oily food
   l. Don’t drink too much beer
   m. Clean environment
   n. Other:
      o. I don’t know / not sure
      p. No response

18. If you think that you or someone in your family has typhoid, what would you do? **Do not read the alternative, select all that apply**
   a. Go to a health facility / hospital
   b. Go to a traditional healer, or traditional birth attendant
   c. Get medication from a pharmacy
   d. Get antibiotics from a pharmacy
   e. Get antimalarials from a pharmacy
   f. Self-medicate
   g. Other:
      h. I don’t know / not sure
      i. No Response

19. How does a person get malaria? **Do not read the alternatives, select all that apply**
   a. Mosquitoes
   b. Bacteria
   c. Virus
   d. Parasite
   e. Witchcraft / Evildoing / Sin
   f. God or higher power
   g. By eating contaminated food
   h. By drinking contaminated water
   i. Eating with dirty hands
j. Contact between houseflies and food
k. Contact with vomit or stool
l. Drinking too much beer
m. Eating too many oranges
n. Eating Peanuts
o. Eating Oily foods
p. Not washing off sweat
q. Yellow eyes / yellow urine
r. Other:..................
s. I don’t know / not sure
t. No Response

20. Can you get typhoid without getting malaria?
   a. Yes; Q28
   b. No; Q26
   c. I don’t know
   d. No response

21. Why do you think that? Do not read the alternative, select all that apply
   a. Typhoid and malaria go together
   b. First you get malaria, then typhoid
   c. Typhoid is a bad form of malaria
   d. Both are caused by mosquitoes
   e. Signs and symptoms are the same
   f. Other:

22. Where did you get this information? Do not read the alternatives, select all that apply
   a. Health facility / Hospital
   b. Radio
   c. Television
   d. Church / mosque / other religious venues
   e. Community meetings
   f. Newspapers / brochures / other print material
   g. Mobile phones / text messages
   h. Traditional leaders
   i. Traditional healers
   j. Government / Ministry of Health / Well Bodi Ministry
   k. Family/friends
   l. Doctors
   m. Nurses
   n. Other health workers
   o. Other community workers
   p. Other:
   q. I don’t know / not sure
   r. No Response

23. Have you heard of typhoid-malaria?
   a. Yes
   b. No
   c. I don’t know / not sure
   d. No response
Audio messages:

24. How many audio messages did you get? Was it 2 or 4 audio messages?

25. How many audio messages did you listen to?

26. Was the audio about typhoid or about breastfeeding?
   a. About typhoid (go to Q37)
   b. About breastfeeding (go to Q40)

27. Who was the main character in the drama?
   a. Mariama
   b. Abu
   c. Sullay
   d. Other:

28. What happened to the main character in the drama?
   a. Is the participant describing it correctly?
      i. Yes
      ii. No
      iii. Not sure
   b. If not sure: describe what participant says

29. Did you discuss the audio fragments with friends and/or family?
   a. Yes
   b. No

30. Did you like the drama?
   a. Yes
   b. No

31. Have you talked to anyone who has heard or received these messages as well?
   a. Yes
   b. No
   c. Other:

32. Geo location