

A mixed methods pilot of Beat the Bugs: A community education course on hygiene, self-care and antibiotics

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Keyword:	antibiotics, self-care, hygiene, Community, Education
Abstract:	<p>Background e-Bug, operated by Public Health England and endorsed by NICE, is an international health education resource supporting public education WHO recommendations by educating young people about microbes, hygiene, and antibiotics use.</p> <p>e-Bug collaborated with Kingfisher Treasure Seekers to develop a six session course for community groups called Beat the Bugs covering: microbes, hygiene, antibiotic use and self-care. A pilot was used to inform further development and evaluation.</p> <p>Methods Pilot courses with 9-12 adults with learning difficulties and young parents were delivered by community leaders and observed by researchers. Participants completed before and after knowledge questionnaires. Two participant focus groups and two course leader interviews explored views on the course and retention of knowledge.</p> <p>Results Completed questionnaires and qualitative results showed an improvement in participant knowledge in each session; microbes and antibiotics sessions showed the greatest knowledge improvement. Self-care showed the greatest knowledge retention and participants reported behaviour change including an increase in appropriate hand-washing and tooth-brushing.</p> <p>Conclusion The Beat the Bugs course is a useful intervention for communities to give individuals the knowledge and confidence to manage their own infection and change behaviour around hygiene, self-care and antibiotics. Beat the Bugs is freely available to download: www.e-Bug.eu/Beat-The-Bugs</p>

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1 **Title page**

2 **Title:** A mixed methods pilot of Beat the Bugs: A community education course on hygiene, self-care
3 and antibiotics

4
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31 **Abstract**

32 **Background**

33 e-Bug, operated by Public Health England and endorsed by NICE, is an international health education
34 resource supporting public education WHO recommendations by educating young people about
35 microbes, hygiene, and antibiotics use.

36
37 e-Bug collaborated with Kingfisher Treasure Seekers to develop a six session course for community
38 groups called *Beat the Bugs* covering: microbes, hygiene, antibiotic use and self-care. A pilot was
39 used to inform further development and evaluation.

40
41 **Methods**

42 Pilot courses with 9-12 adults with learning difficulties and young parents were delivered by
43 community leaders and observed by researchers. Participants completed before and after
44 knowledge questionnaires. Two participant focus groups and two course leader interviews explored
45 views on the course and retention of knowledge.

46
47 **Results**

48 Completed questionnaires and qualitative results showed an improvement in participant knowledge
49 in each session; microbes and antibiotics sessions showed the greatest knowledge improvement.
50 Self-care showed the greatest knowledge retention and participants reported behaviour change
51 including an increase in appropriate hand-washing and tooth-brushing.

52
53 **Conclusion**

54 The *Beat the Bugs* course is a useful intervention for communities to give individuals the knowledge
55 and confidence to manage their own infection and change behaviour around hygiene, self-care and
56 antibiotics. *Beat the Bugs* is freely available to download: www.e-Bug.eu/Beat-The-Bugs

57
58 **Keywords**

59 Antibiotics, self-care, hygiene, community, education

60 **Main text**

61 **Background**

62 Controlling antimicrobial resistance is a Public Health England (PHE, 2014) and Department of Health
63 (2013) priority. The UK Five Year Antimicrobial Resistance Strategy outlines seven key areas for
64 future action (DoH, 2013) including improving public knowledge and understanding of antimicrobial
65 resistance through education. e-Bug supports this key area for action by educating children and
66 young people and is endorsed by the National Institute for Health Care Excellence (NICE, 2017).

67
68 e-Bug, operated by PHE, is an international health education evidenced based resource for children
69 and young people on microbes, the spread, treatment and prevention of infection, and antibiotics
70 developed with input from teachers, health professionals and students (Lecky et al., 2011). e-Bug
71 aims to help control antibiotic resistance in the UK and Worldwide by educating young people, who
72 are our future antibiotic prescribers and antibiotic users, about hygiene to reduce rates of infections
73 and the use of antibiotics (Lecky et al., 2011; McNulty et al., 2011). The school e-Bug activities have
74 led to significant improvements in student knowledge around antibiotics, hygiene and antibiotics
75 (Lecky et al. 2010).

76
77 Antibiotics prescribed in the community equate to 74% of all prescribed antibiotics (PHE, 2017) and
78 up to 50% of these may be unnecessary or inappropriate (Davey et al., 2005; Wise et al., 1998).
79 Furthermore, there is public misunderstanding about how long infections usually last and how to use
80 antibiotics correctly (McNulty et al., 2007). Therefore, public education within the community on
81 hygiene, infection prevention and self-care is important to increase appropriate antibiotic use. As
82 community education in this area is so important, e-Bug has recently expanded its educational
83 resources into the community through the Beat the Bugs course.

84
85 Beat the Bugs, is a six week community hygiene and self-care course developed in close
86 collaboration between e-Bug and the Kingfisher Treasure Seekers (KTS) community group. KTS have
87 extensive experience working with vulnerable adults and the collaboration enabled the learning
88 outcomes and the key messages of the course to be framed in a way that was accessible and
89 appropriate to vulnerable adults, a group that are often under represented when interventions like
90 these are developed. The aim of Beat the Bugs is to target hard to reach groups in the community to
91 increase awareness and change behaviour around hygiene, self-care and antibiotic use in an
92 interactive and fun way. Beat the Bugs is designed to be delivered by community leaders including
93 school nurses, public health nurses, health visitors, and support workers, to a range of community

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94 groups, including vulnerable adults, young parents, guides and scouts. The Beat the Bugs course is
95 freely available to download and use from the e-Bug website www.e-Bug.eu/Beat-The-Bugs.

96
97 Use of health behavioural pledges including the Germ Defence (Little et al. 2015) and antibiotic
98 guardian (Kesten et al. 2017) have shown to increase knowledge and influence behaviour. Therefore,
99 action planning and pledges will form a key part of the Beat the Bugs activities in order to help
100 change participants intentions into behaviour and reinforce the learning objectives.

101
102 The aim of this study was to pilot the Beat the Bugs hygiene and self-care intervention, in two
103 different learning environments. Key objectives were: to assess the impact of the course on
104 knowledge, to assess impact on self-reported behaviour, to assess acceptability to users and course
105 leaders, and to consider feasibility of transferability in order to refine the course in response.

106
107 **Methods**

108 **Research design**

109 The study was a mixed method evaluation using quantitative and qualitative methods of enquiry.
110 Two pilots of the Beat the Bugs course were conducted. The first pilot was conducted with adults
111 with learning, physical and/or mental health difficulties in a community learning environment; seven
112 to nine participants attended each week. The course was delivered by a Community Leader who
113 regularly delivers training to this group of adults. The second pilot was delivered in a children’s
114 centre with young parents; two to four participants attended each week. The course was delivered
115 by a Family Support Worker who regularly delivers training to groups of parents.

116
117 **Sampling and recruitment**

118 Data collection took place between September 2016 and April 2017 inclusive. The two pilot centres
119 were recruited for the Beat the Bugs pilot course through convenience sampling of local community
120 groups. Participants who normally attended the centres were invited to attend the free Beat the
121 Bugs course.

122
123 **Ethics**

124 This study did not require National Research Ethics Service (NRES) approval as it was outside the
125 National Health Service and was classed as a service evaluation. Consent was deemed accepted if
126 participants completed the before and after knowledge questionnaires. Questionnaires were
127 collected in line with the Data Protection Act 1998 and Caldicott 1999 regulations on handling and

distributing sensitive participant information. Focus group and interview participants provided verbal and written informed consent for participation in the research, audio recording and the publishing of anonymised quotes. The community leader was present during the focus group with adults with learning difficulties, and ensured that all participants understood what was being asked of them. All researchers who observed the sessions were DBS checked, through PHE, to work with vulnerable adults and children.

Data collection

Short before and after knowledge questionnaires developed by e-Bug and the community groups were completed at the start and end of each session. Questionnaires for each learning environment had different completion methods to suit participant ability, but tested the same area of knowledge, in order to fit the ability needs of the participants in each community group and ensure the highest return rate was achieved. See appendix A for examples of the questionnaires used. Pilot 1 questionnaires were colourful one page documents that had knowledge based statements and participants circled a cross, a tick or a question mark image as to whether the statements were “right”, “wrong” or “not sure”. The course leader read out the statements to the group to assist with any reading difficulties. All participants referred to the questionnaires as “quizzes” to reduce any negative perceptions of “doing a test”; suggested by the course leader. Pilot 2 questionnaires followed similar statements to Pilot 1 but participants used tick boxes to choose the correct answer. Pilot 2 questionnaire followed the format and questions from previous e-Bug evaluations.

Each session was observed by an e-Bug researcher to increase validity and monitor fidelity with the activity plans. Two semi-structured face-to-face focus groups with participants at each setting were conducted 6 weeks after the final session to explore in depth participant views on the course and to establish retention of knowledge. CE and CH (researchers for Public Health England) facilitated one focus group each. During both focus groups, a second researcher was present to record notes and observe the group. Two course leader interviews were facilitated by CE, one face to face and one via telephone. Figure 1 is a process map of the pilot courses.

Quantitative data analysis

Before and after knowledge questionnaire data were analysed using Microsoft Excel software and visual graphs were used to represent the findings of quantitative results. Pilot 1 had six questionnaires each with six statements and the option for “right”, “wrong” or “not sure”. Pilot 2 had different number of questions for each session with 13, 12, 10, 11, 10 and 10 respectively. Each

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162 correct answer equated to 1 score. Individual participant before and after scores were calculated;
163 corresponding percentages were also calculated. Individual before and after percentages were then
164 comparable between the two pilots. Questions that were left empty by participants were given a 0
165 score.

166
167 **Qualitative data analysis**

168 Interviews and focus groups were recorded, transcribed verbatim, checked for accuracy by CE and
169 CH, anonymised, and imported to NVivo (version 10). NVivo 10 qualitative data analysis software
170 was used to organise, code and analyse the interview and focus group transcripts and open ended
171 evaluation responses.

172
173 Two researchers independently coded categories and themes. The lead researcher coded all
174 transcripts and a second researcher (CH) coded a quarter of the transcripts. Transcripts were re-
175 visited to ensure coding consistency and minor discrepancies over coding language were resolved
176 through discussion; there were no major disagreement were raised. Initial themes and sub-themes
177 were discussed with the whole study group. A descriptive analysis report was developed including
178 illustrative quotes.

179
180 **Results**

181 **Main findings**

182 Before and after questionnaire data was collected from between nine and twelve participants for
183 each of the six Beat the Bugs sessions (table 1).

184
185 Quantitative results from the before and after knowledge questionnaires showed an improvement in
186 participant knowledge in each session in both learning environments (table 1). Overall in both pilots,
187 a significant ($p<0.05$) improvement in knowledge was seen in every sessions except Food Bugs which
188 was approaching significance ($p=0.06$). Overall the greatest improvement in knowledge was in the
189 microbes and antibiotics session.

190
191 Two focus groups were conducted; one focus group with five adults with learning difficulties and one
192 focus group with two parents from the Children’s Centre. Two course leader interviews were
193 conducted; one face-face and one via telephone. Qualitative results showed that participants in both
194 pilots had retained knowledge particularly around self-care. Positive behaviour change was also

reported in the qualitative findings including an increase in appropriate hand washing and tooth brushing behaviour. Themes were common across the focus groups unless specified.

Session 1: Meet the Bugs

This session aims to give an overview of microbes and explores different types and shapes of microbes, and discusses useful and harmful microbes. Both pilots reported the lowest baseline knowledge in this session (40% and 42%). Overall this session had the greatest improvement in knowledge (Table 1). In this session about microbes, participant knowledge in Pilot 1 improved the most on statements; *"Bacteria, Viruses and Fungi are the three main types of microbes"* (38 to 100% correct responses) and *"It is important to protect our useful microbes"* (13 to 88%). Participant knowledge in Pilot 2 improved the most on the question *"which of these is not a microbe?"* (0 to 100% correct responses)

Qualitative results showed that participants could recall the three types of microbes 6 weeks after the course.

"The smallest [microbe] would be virus." (Participant, Pilot 1)

The three different types of microbes are "Viruses, and bacteria, and fungi." (Participant, Pilot 2)

Course leaders reported enjoying delivering this session especially the make a microbe activity but felt like they were also *"learning along with the participants"* (Course Leader, Pilot 2).

"I was really impressed with how well the plasticine went I wasn't expecting that degree of engagement with that. I think everyone took part in that one [making a microbe]." (Course Leader, Pilot 1)

"The parents really liked the visual activities, the arts and crafts especially; you had it spot on with the activities." (Course Leader, Pilot 2)

Session 2: Spreading Bugs

This session aims to give an overview of the spread of infection by learning how microbes are spread through sneezing and how correct hand washing with soap can break the chain of infection. Both

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229 pilots reported average baseline knowledge of over 50% and both reported an improvement in
230 knowledge by 24 and 25 percent respectively. In this session, participant knowledge in Pilot 1
231 improved the most on the “wrong” statement; *“Microbes do not spread from person to person”* (22
232 to 67% correct responses). Participant knowledge in Pilot 2 improved the most on *“The best way to*
233 *stop microbes spreading is by using a tissue when you sneeze.”* (33 to 100% correct responses)
234
235 Qualitative results at 6 week follow up showed that participants could explain why it is important to
236 wash their hands and reported an increase in appropriate hand washing behaviour and an increase
237 in appropriate behaviours around using tissues when you sneeze. Parents at the Children’s Centre
238 also reported improving their children’s health behaviours by encouraging them to wash their hand
239 appropriately.
240
241 *“So we don’t get any germs to our foods or anywhere that you may catch a cold.”*
242 *(Participant, Pilot 1)*
243
244 *“I try to use a tissue, to use a tissue if I can.” (Participant, Pilot 1)*
245
246 *“[Handwashing] prevents spread of bacteria.” (Participant, Pilot 2)*
247
248 *“I’m taking him [child] to the bathroom a lot to wash his hands, rather than just using a wet*
249 *wipe which I used to do. I take him to the bathroom and he uses his step and get him to wash*
250 *hands with the soap now and before he eats, go and wash his hands, after he uses his potty,*
251 *or when I take off his nappy I get him to wash his hands to get him used to it so yeah.”*
252 *(Participant, Pilot 2)*
253
254 Course leaders reported enjoying the activities in this session particularly the handwashing and snot
255 gun.
256
257 *“Oh the snot gun. I think it generates quite a lot of interest but oh yeah it does cause a lot of*
258 *discussion about where on the runway everything falls.” (Course Leader, Pilot 1)*
259
260 *“The snot gun was a visual activity and everybody understood how far a sneeze goes and it*
261 *really caught the parent’s eyes. I think they enjoyed that one.” (Course Leader, Pilot 2)*
262

Session 3: Food Bugs

This session aims to give an overview of how easily potentially harmful microbes in raw food can transfer to humans causing illness, and how to store different foods in the fridge to prevent microbes spreading from one food (especially raw meat) to another. Both pilots had high baseline knowledge (61% and 70% respective) and there was less opportunity to increase in knowledge. In this session about food hygiene, participant knowledge in Pilot 1 improved the most on the “wrong” statement; *“You can reheat food as many times as you want”* (34 to 67% correct responses).

Qualitative results at follow up showed that participants could explain why it is important to store food correctly in the fridge.

273

“Also the meats shouldn’t touch between like dairy or raw meat because it will contain salmonella or food poisoning.” (Participant, Pilot 1)

276

“The meat has to be at the bottom...otherwise it would be leaking down.” (Participant, Pilot 2)

279

Course leaders reported that the activities worked well including the fridge raiders activity where participants have to store food correctly in the fridge.

282

“The activities seemed to work really well and the people that did them definitely benefitted.” (Course Leader, Pilot 1)

285

Session 4: Mouth Bugs

This session aims to give an overview of how to prevent tooth decay through limiting sugar intake and brushing teeth twice a day. Both pilots had average baseline knowledge of 50% and both had a 23 percentage increase in knowledge. In this session about oral hygiene, participant knowledge in Pilot 1 improved the most on the “right” statement; *“Dental plaque is a build up of bacteria on our teeth”* (63 to 100%). Participant knowledge in Pilot 2 improved the most on *“Some foods and drinks cause tooth decay because they contain a lot of sugar”* (50 to 100%).

293

Qualitative results at follow up showed that participants knew why they brush their teeth, recalled what drinks contained the most sugar and also reported an increase in appropriate tooth brushing behaviours.

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4 298 *"It is important to brush your teeth so you don't get any cavities in them and also you won't*
5 *get any holes so you won't get your teeth damaged."* (Participant, Pilot 1)
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7 300
8 301 *"I've started brushing [child's] teeth too!"* (Participant, Pilot 2)
9 302
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11 303 Course leaders reported an increase in appropriate health behaviours about oral hygiene including
12 304 participants now registering with a dentist after not going for years.
13 305
14 306 *"I quite enjoyed doing the teeth cleaning with the little model that worked quite wellalso a*
15 307 *couple of them actually have thought about how to go to the dentist now because there*
16 308 *were a few of them ... that hadn't been for years so that's good news as well."* (Course
17 309 *Leader, Pilot 1)*
18 310
19
20 311 **Session 5: Bug Busters**
21
22 312 This session aims to give an overview of what antibiotics are, when to take antibiotics and how to
23 313 take antibiotics correctly. Higher baseline knowledge was reported in Pilot 2 of parents (75%)
24 314 compared to Pilot 1 of adults with learning difficulties (48%). Both pilots saw a positive change in
25 315 knowledge by 31 and 25 percent respectively. In the antibiotics session, participant knowledge in
26 316 Pilot 1 improved the most on the "right" statements; *"You should only take antibiotics if your doctor*
27 317 *has prescribed them to you"* (50 to 100%) and *"You must not use other people's antibiotics"* (50 to
28 318 100%). Participant knowledge in Pilot 2 improved the most of statement *"Antibiotics affect other*
29 319 *bacteria in your body, not just the ones which cause infection."* (0 to 100%)
30 320
31 321 Qualitative results at follow up showed that adults with learning difficulties in Pilot 1 struggled to
32 322 explain what antibiotics were and when they should take them, however they did understand that
33 323 they should only take antibiotics if they really needed them, they should not share antibiotics with
34 324 friends or family, and should only take antibiotics as the doctor or nurse has prescribed.
35 325
36 326 Researcher: What should you do if your doctor gives you antibiotics?
37 327 *"I would take them like they told me to and if you have any left take them to the pharmacy."*
38 328 *(Participant, Pilot 1)*
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330 Parent participants in the Pilot 2 focus group displayed a very high knowledge about antibiotics
331 particularly that antibiotics do not work on viruses.

332

333 Researcher: If your friend came to you and said 'I've got a cold, I'm going to go to the
334 doctor', what would you say to them?

335 *"There's no point visiting the doctor, because they won't give you antibiotics" (Participant,*
336 *Pilot 2)*

337 *"Antibiotics doesn't kill flu." (Participant, Pilot 2)*

338

339 Course leaders expressed that this antibiotics session was difficult to deliver and improve
340 understanding around.

341

342 *"I am still not convinced they know what antibiotics are but I really got a sense during the*
343 *course that they understood that they didn't keep tablets, didn't take tablets they didn't*
344 *know what they were for, and that they would take them back [to the pharmacy]." (Course*
345 *Leader, Pilot 1)*

346

347 *"I think there are still loads of work we need to do with antibiotics... It's just a really difficult*
348 *concept to teach in a literal way. " (Course Leader, Pilot 1)*

349

350 *The key learning points that participants took away from the course would "definitely be*
351 *about the antibiotics." (Course Leader, Pilot 2)*

352

353 **Session 6: Know Your Bugs**

354 This session aimed to give an overview of how to self-care at home for common infections, make
355 decisions on their own health, think about their own antibiotic use, and action plan for the future.
356 Both pilots had high baseline knowledge (71% and 80% respectively) which may be because
357 participants had already completed the previous sessions. Participants reported an increase in
358 knowledge following the session (22% and 10% increase in knowledge). Participant knowledge in
359 Pilot 1 improved the most on the "right" statement; *"A cold usually lasts 10 days"* (43 to 86%) and *"If*
360 *you need advice on whether to go to the doctors or not then ring NHS 111."* (29 to 86%) Participant
361 knowledge in Pilot 2 improved the most on *"A cold usually lasts 10 days"* (50 to 100%).

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3 363 Qualitative results at follow up showed that participants had retained knowledge around self-care
4 364 particularly the importance of getting plenty of rest and drinking enough fluids.
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8 366 *“Always drink plenty of water, always get a good rest and always wash your hands and use a*
9 367 *clean tissue and use paracetamol if you need them.” (Participant, Pilot 1)*
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11 368
12 369 *“Stay at home, have a rest and drink plenty of water.” (Participant, Pilot 2)*
13
14 370
15 371 Course leaders described that this session brought all the previous sessions together to reinforce
16 372 how individuals can look after themselves and prevent infection.
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20 374 *“I am optimistic about participants self-care.” (Course Leader, Pilot 1)*
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22 375
23 376 *“How long illnesses last and when they should and shouldn’t go to the doctors were the key*
24 377 *learning points I think.” (Course Leader, Pilot 2)*
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28 379 **Discussion**
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30 380 **Main findings**
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32 381 The Beat the Bugs pilot provides an insight into the benefits, learning outcomes and transferability
33 382 of the course across different community groups. The course is a useful intervention in increasing
34 383 awareness and educating the community on important public health topics including microbes,
35 384 hand, respiratory, food and oral hygiene, self-care and antibiotics.
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39 386 Action plans to pledge behaviour change were a useful addition to the Beat the Bugs course as
40 387 participants reported an increase in appropriate health behaviours such as hand washing and tooth
41 388 brushing behaviour.
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45 390 Modifications to the Bug Busters session covering suggestions from participants and the course
46 391 leaders, especially on the antibiotic activities, will be included in order to help community leaders
47 392 facilitate the course and increase participant understanding.
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51 394 **Strengths and limitations**
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53 395 A strength of this study is the use of both quantitative and qualitative methods of enquiry in order to
54 396 determine knowledge change and perceived behavioural change. The before and after knowledge
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questionnaire provided an insight into whether the learning outcomes of each sessions were being met and whether the sessions were pitched at the correct ability level. Qualitative interview and focus group follow-ups provided a more detailed insight into participants and course leader views on the course and what they have learnt. The qualitative data focused on reported behaviour change by the participants rather than measuring actual behaviour change. All sessions were observed by researchers and all qualitative data collection was conducted or observed by CE which increased validity.

The sample size of the two pilots was relatively small; 9-12 participants each session in total and 2 course leaders. However, 4-10 individuals are the optimum size to deliver the Beat the Bugs course following feedback in the development stages from participants and course leaders. Obtaining feedback from two different community groups is very worthwhile as we attained knowledge and behaviour change data which is valuable. We also attained qualitative evaluation feedback that participants valued the course and community leaders found it feasible to run, informing researchers that an extended evaluation would be feasible on a larger scale.

The action plans that were pledged at the end of each session and revisited at the start of the next session helped to change intended behaviour into actual behaviour. Following the course, participants reported a higher understanding about hygiene, self-care and the consequences of their health behaviours which was a mechanism for behaviour change. However, as this study did not measure actual behavioural change, reported or perceived behaviour change may be subject to some acquiescence bias.

A further strength of this study is that it links to the guidance of the Medical Research Council (2006) in the processes involved in the development, pilot and feasibility of a complex intervention.

Comparison with existing literature

Previous evaluations of the e-Bug school activities have shown significant improvements in student knowledge around antibiotics (Lecky et al. 2010). Our study supports this research that improvements in knowledge around the correct antibiotic behaviours were reported with the community groups; however, some participants struggled to understand exactly “what an antibiotic is” and “when it is required”. Several of the individual activities within the Beat the Bugs community course including; making a microbe, the hand washing activity, the snot gun and how clean is your kitchen, have previously been evaluated in a school environment as part of the e-Bug peer education

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431 project delivered to 9-11 year olds, and found that there was a significant improvement in
432 participant knowledge for all topics covered in the intervention (Young et al., 2017). This present
433 study confirms that these activities are transferable to community groups.

434
435 A large randomised control trial with 20,066 participants, found that individuals who pledged to
436 wash their hands more often using the Germ Defence website had fewer colds, flu and stomach
437 upsets, than those who hadn't seen the website (Little et al., 2015). Germ defence is an online tool
438 that suggests hand-washing pledges and action planning to change behaviour and reduce household
439 infections, colds and flu (Little et al., 2015). A qualitative study with 22 individuals found that pledges
440 made on the Antibiotic Guardian campaign website were fulfilled by either a behaviour change or
441 the pledge reinforcing a pre-existing behaviour (Kesten et al. 2017). Our research supports these
442 findings as the Beat the Bugs pledges have addressed the intention-behaviour gap in relation to
443 appropriate hygiene, self-care and antibiotic use by supporting individuals to translate their health
444 intentions into behavioural action.

445
446 Total page views from the official Beat the Bugs website launch on 9th September 2016 for 12
447 months were 2310 visits; the full Beat the Bugs pack was downloaded 342 times over 12 months.
448 The Beat the Bugs website visits will need to be monitored regularly along with which learning
449 resources are being downloaded from the website.

450
451 **Implications for future research**

452 On-going efforts will be made to refine and focus key messages in a way that is acceptable and
453 accessible to course recipients. Future research will also include larger evaluations of Beat the Bugs
454 with different community groups to determine the transferability of the course.

455
456 In response to feedback from the pilot courses, and after discussions with other community groups,
457 a 'Train the Trainer' workshop has been developed for community leaders to learn about Beat the
458 Bugs and provide them with the knowledge, confidence and skills to deliver the course in their
459 community groups. In the year October 2017, 64 community leaders have become Beat the Bugs
460 Approved trainers including; teachers, school nurses, scout leaders, family support workers, and
461 community support workers. This presents a clear mechanism through which the course can and is
462 being scaled up. e-Bug aims to deliver the 'Train the Trainer' workshops on a termly basis to further
463 promote the course. Feedback from the training has been very positive; *"It was all really helpful and*
464 *interesting. The activities were great - very engaging", "The activities were fantastic, the children will*

love these interactive sessions. It educated me also.” Training dates and approved trainers are listed on the Beat the Bugs webpage: www.e-Bug.eu/Beat-The-Bugs

Conclusion

The Beat the Bugs course is a useful intervention for community groups to help increase individuals’ confidence and knowledge on managing their own infections and change behaviour around hygiene, self-care and antibiotic use. e-Bug will continue to work with the community to develop and promote resources to educate the public including hard to reach individuals about hygiene, self-care and antibiotics. The pictorial self-care leaflet used in this resource is now endorsed by NICE.

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Conflicts of interest statement

At the time this work was conducted, the authors (CE, VY, CH, CM) all worked for Public Health England to produce and disseminate e-Bug teaching resources for schools covering microbes, the spread, treatment and prevention of infection, and antibiotic resistance.

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523	Figures
524	Figure 1: Process map of the pilot evaluations
525	
526	Figure 2: Before and after average knowledge scores of both pilots

Tables

Table 1: Summary of before and after knowledge of each session

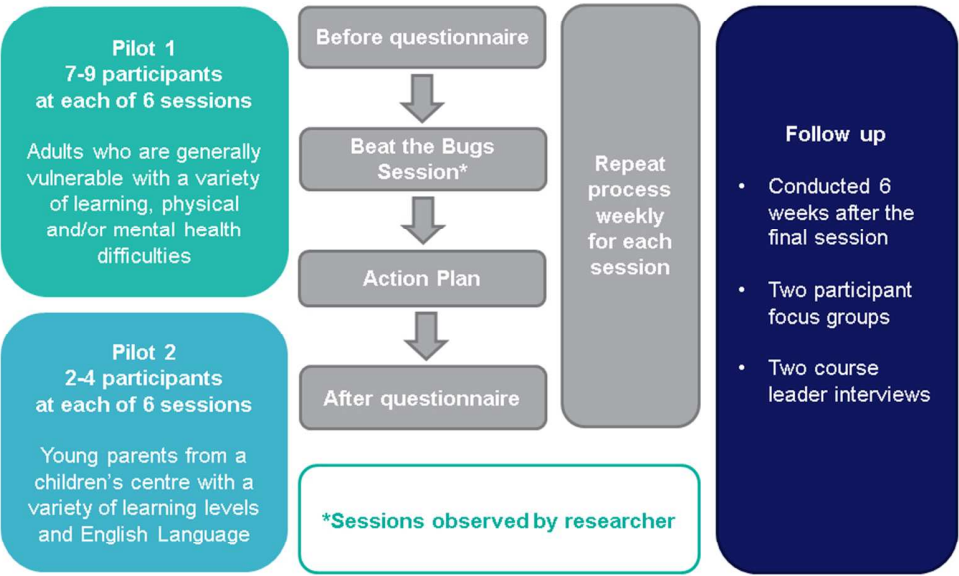


Figure 1: Process map of the pilot evaluations
254x190mm (96 x 96 DPI)

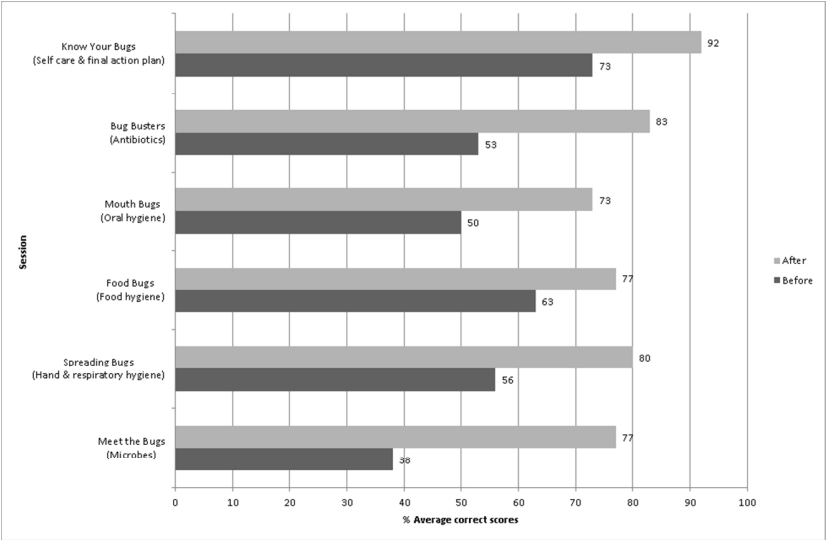


Figure 2: Before and after average knowledge scores of both pilots
243x137mm (120 x 120 DPI)

Session (Total number of participants)	Knowledge Measured	Total Average correct scores (%)	Pilot 1 Average correct scores (%)	Pilot 2 Average correct scores (%)
Meet the Bugs (12)	Baseline	40	40	42
	Post Intervention	82	92	65
	Change	+42	+52	+23
Spreading Bugs (12)	Baseline	56	52	67
	Post Intervention	80	76	92
	Change	+24	+24	+25
Food Bugs (11)	Baseline	63	61	70
	Post Intervention	77	78	75
	Change	+14	+17	+5
Mouth Bugs (10)	Baseline	50	50	50
	Post Intervention	73	73	73
	Change	+23	+23	+23
Bug Busters (10)	Baseline	53	48	75
	Post Intervention	83	79	100
	Change	+30	+31	+25
Know Your Bugs (9)	Baseline	73	71	80
	Post Intervention	92	93	90
	Change	+19	+22	+10

Table 1: Summary of before and after knowledge of each session

190x189mm (300 x 300 DPI)

Meet the Bugs

Please circle whether you think the following statements are right, wrong or you are not sure:

	Right	Not sure	Wrong
1. Bacteria, Viruses and Fungi are three main types of microbes.	✓	?	✗
2. Microbes can be found everywhere.	✓	?	✗
3. Some microbes are useful.	✓	?	✗
4. Useful microbes can be found in and on our body.	✓	?	✗
5. It is important to protect our useful microbes.	✓	?	✗
6. Harmful microbes can make us ill.	✓	?	✗



Name:

Meet the Bugs

Please tick ONE answer for each question.

Microbes	Which of these is not a microbe?		Most microbes can be seen:	
	Bacteria	<input type="checkbox"/>	Only with a microscope	<input checked="" type="checkbox"/>
	Virus	<input type="checkbox"/>	With the naked eye	<input type="checkbox"/>
	Antibiotic	<input checked="" type="checkbox"/>	With a magnifying glass	<input type="checkbox"/>
	Fungi	<input type="checkbox"/>	Never, they are invisible	<input type="checkbox"/>
	Microbes:		Our microbes grow better:	
	Are all bad/harmful	<input type="checkbox"/>	In the fridge	<input type="checkbox"/>
	Are all useful	<input type="checkbox"/>	With sugars	<input checked="" type="checkbox"/>
	Can be useful or harmful	<input checked="" type="checkbox"/>	In a hot oven	<input type="checkbox"/>
	Have no effect on our body	<input type="checkbox"/>	On clean surfaces	<input type="checkbox"/>
	Bacteria cause:		Viruses cause:	
	Most colds and flu	<input type="checkbox"/>	Most colds and flu	<input type="checkbox"/>
Most sore throats	<input type="checkbox"/>	Most sore throats	<input type="checkbox"/>	
Most vomiting/sickness	<input type="checkbox"/>	Most vomiting/sickness	<input type="checkbox"/>	
All of the above	<input type="checkbox"/>	All of the above	<input checked="" type="checkbox"/>	
None of the above	<input checked="" type="checkbox"/>	None of the above	<input type="checkbox"/>	

Please tick TRUE or FALSE for the following statements.

Statement	True	False
Microbes are all the same size and shape.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Microbes can be found everywhere.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Useful microbes keep us healthy.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Some microbes can be used in the food industry to make food.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
There are no live microbes in yoghurt.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Microbes are used to make bread.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Microbes cause hayfever.	<input type="checkbox"/>	<input checked="" type="checkbox"/>



Name: _____

Meet the Bugs

We are grateful for any feedback you can provide on the session.

1. How enjoyable was the *Meet the Bugs* session?

Please circle (1 = not enjoyable, 10 = very enjoyable)

1 2 3 4 5 6 7 8 9 10

2. What was your favourite activity and why?

.....
.....
.....

3. What was your least favourite activity and why?

.....
.....
.....

4. What did you learn in this session?

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.....
.....

5. Are there any ways we can improve the session?

.....
.....
.....

6. Any other comments on the session or activities you have done today?

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