Pharmacy Education (2025) 25(1) 204 - 229
https://doi.org/10.46542/pe.2025.251.204229

RESEARCH ARTICLE

Evaluating the impact of the 'Antibiotic Guardian Schools Ambassadors' programme on UK trainee pharmacists' learning and development

Tanya Miah[1], Jordan Charlesworth[1], Ellie Gilham[1], Adeola. H. Ayeni[2], Kirti Solanki[3], Richard Dunne[3], Tracey Thornley[4,5], Diane Ashiru-Oredope[1,5]

[1] Healthcare associated infections and Antimicrobial Resistance Division, United Kingdom Health Security Agency, London, United Kingdom
[2] MPH Student, Teesside University, Middlesbrough, United Kingdom
[3] Superintendent Pharmacist's Office, Boots UK Limited, Nottingham, United Kingdom
[4] Data, Analytics and Surveillance, United Kingdom Health Security Agency, London, United Kingdom
[5] School of Pharmacy, University of Nottingham, Nottingham, United Kingdom

Keywords
Antimicrobial resistance
Attitude
Education
Knowledge
Pharmacy
Trainee

Correspondence
Diane Ashiru-Oredope
School of Pharmacy
University of Nottingham
Nottingham
United Kingdom
diane.ashiru-oredope@ukhsa.gov.uk

Abstract

Background: The Antibiotic Guardian Schools Ambassadors programme engages healthcare professionals and scientists with young people to educate them about antibiotic use and resistance. In 2022, the UK Health Security Agency (UKHSA) and a national pharmacy chain involved trainee pharmacists across the UK in this effort. This study aims to evaluate the impact of participating in the Antibiotic Guardian Schools Ambassadors programme on UK trainee pharmacists' learning and development. **Methods:** Trainee pharmacists in the program received a digital toolkit to help plan and deliver educational lessons on antibiotic use and antimicrobial resistance to young people in their communities. Pre- and post-project questionnaires assessed changes in their knowledge, attitudes, and behaviours regarding these topics, as well as the impact of their participation on their learning and development. **Results:** The study included 195 trainee pharmacists from the UK, with a 67% participation rate. Only 45 post-project responses were received (23% response rate). The responses indicated that trainee pharmacists felt knowledgeable about antibiotic use and antimicrobial resistance, and they benefitted personally and professionally from the project. **Conclusion:** Trainee pharmacists took part in a national public health campaign, enhancing their knowledge, skills, and confidence while meeting General Pharmaceutical Council outcomes. Future improvements should focus on increasing post-project response rates and including pharmacy professionals from diverse organizations and sectors.

Introduction

Antimicrobial resistance (AMR) has grown over the last few decades and is now recognised as one of the greatest public health threats of the 21st century (Munita & Arias, 2016). AMR has widespread consequences with ever increasing impact upon many global sectors such as health, food, sanitation, water, agriculture and the environment (Prestinaci *et al.*, 2015; Munita & Arias, 2016; Dadgostar 2019). Despite this knowledge and growing list of initiatives to tackle AMR, the expansion of global AMR does not appear to be decelerating at pace (Dadgostar, 2019).

Without sustained efforts and effective interventions to reduce AMR, treating infections and infectious diseases will become even more challenging. Treatable conditions, such as urinary tract infections and pneumonia, will become harder to manage. This will increase morbidity and mortality rates as infections worsen. Healthcare systems worldwide are set to face difficulties such as surgeries, cancer treatments, and transplants become riskier due to the heightened risk

of resistant infections. Routine infections may become life-threatening, which will have an additional strain on resources and increase costs. Agriculture and food production also stand to be affected as antimicrobial effectiveness declines, leading to animal morbidity, decreased food output, and potential global shortages. Economically, AMR has the capacity to negatively impact productivity, healthcare expenses, labour force, trade, and tourism, especially affecting developing countries and further deepening global health inequalities (Manyi-Loh *et al*., 2018; Naylor *et al*., 2018; Pokharel *et al*., 2019).

Without concerted efforts to combat the growing problem of AMR, the most critical tools in modern medicine may be lost with inevitably devastating consequences. It is therefore essential to prioritise and invest in research, innovation, and global collaboration to prevent the emergence and spread of AMR and safeguard the health and wellbeing of future generations (Ahmed *et al*., 2024).

Antimicrobial stewardship (AMS) is defined as 'an organisational or healthcare-system-wide approach to promoting and monitoring judicious use of antimicrobials to preserve their future effectiveness' (National Institute for Health and Care Excellence, 2015). Addressing AMR requires a multi-faceted approach and key AMS interventions involve promoting the responsible use of antimicrobials in healthcare and improving public awareness and understanding of appropriate antimicrobial use (Prestinaci *et al*., 2015; Majumder *et al*., 2020). Research has demonstrated that younger generations are less knowledgeable about antimicrobials, for example, a research study demonstrated that individuals aged 15-24-years had poorer knowledge of AMR and appropriate antibiotic use compared to adults aged 55-64-years (OR: 1.52, CI: 1.05-2.20) (McNulty, Collin, Cooper *et al*., 2019). Therefore, it is vital to develop and implement AMS initiatives to improve awareness and knowledge within younger people. Programmes such as the 'Antibiotic Guardian Schools' Ambassadors' collaborate with schools to offer teaching to children regarding antimicrobials and stewardship.

Pharmacists have a crucial role in helping to tackle AMR by optimising antimicrobial use. Their expertise in medication use allows them to ensure responsible utilisation through AMS programmes, through collaboration across multi-disciplinary teams to create guidelines, policies, and providing vital education. Pharmacists monitor usage patterns, deliver interventions, lead and contribute to surveillance programmes, research initiatives, and patient/community education to ensure appropriate antimicrobial use (Gilchrist *et al*., 2015; Otieno, *et al*., 2020; Wong *et al*., 2021; Lim *et al*., 2022). The active involvement of pharmacists in AMS is important for preserving the effectiveness of antimicrobials, improving patient outcomes, and safeguarding public health for future generations (Lai *et al*., 2022). It is, therefore, essential that the principles of AMS should be embedded throughout pharmacy education, training, and early career development. Understanding AMR and practicing AMS are essential core skills regardless of the sector that pharmacists work within.

Antibiotic Guardian Schools Ambassadors

Public Health England (PHE), now known as UK Health Security Agency (UKHSA), initiated a pledge-based Antibiotic Guardian (AG) campaign in 2014 which aimed to raise awareness about AMR, and increase engagement and commitment to tackling AMR (Public Health England, 2018). The ongoing campaign asks human and animal health professionals, scientists and educators, and members of the public to choose a pledge regarding how they can amend their attitudes and behaviours to preserve the future effectiveness of antimicrobials. At the time of writing (21st July 2024), 207,365 pledges were recorded and visible on the AG website (https://antibioticguardian.com). The campaign also engages the public and professionals through various other initiatives, including the AG Shared Learning & Awards event, student conferences and the AG Schools Ambassadors programme. The AG Schools Ambassadors programme, first piloted in 2019, aims to connect healthcare professionals, scientists and public health practitioners with local schools and community groups for young people, to share information about antibiotic use, AMR and infection prevention and control (UK Health Security Agency, 2023).

AG Schools Ambassadors are supported in contacting schools and community groups, and in planning lessons for them, though a range of resources, curated within a digital toolkit. This toolkit links to letter templates for contacting head teachers to gain consent for school engagement, examples of previous AG shared learning and award-winning community-engagement projects. The digital toolkit also contains online health educator training and lesson-planning tools produced by the UKHSA-led e-Bug scheme which are designed to link to key stages 1-4 in the UK education system (ages 5-16) and for children in early years (ages 3-5).

In the UK, pharmacy graduates need to undertake a year-long foundation training year prior to sitting the registration assessment to become a qualified pharmacist; this placement can be within community pharmacy, general practice, pharmaceutical industry or

hospital pharmacy, and with different organisations. In 2022, the UK Health Security Agency (UKHSA) and a national community pharmacy chain (Boots UK) collaborated to expand the AG Schools' Ambassadors programme, which was in its fourth year, by integrating it into their Trainee Pharmacist Programme on a national scale. This joint project offered trainee pharmacists the opportunity to participate within the AG Schools' Ambassadors programme and to become empowered by actively contributing to tackling AMR.

The primary objective of this project was to equip participating trainee pharmacists with the necessary skills and knowledge to educate young individuals on public health topics such as microbes, hygiene, infection prevention, and antimicrobials. Engaging the trainee pharmacists within the AG Schools' Ambassadors programme sought to offer them comprehensive national public health experience while addressing some of the interim learning outcomes specified by their regulatory body, the General Pharmaceutical Council (GPhC). Examples of these learning outcomes include (1) proactively support people to make safe and effective use of their medicines and devices, (2) proactively participate in the promotion and protection of public health in their practice, and (3) develop, lead, and apply effective strategies to improve the quality of care and safe use of medicines.

Specific goals set for trainee pharmacists participating in the project were to:

1. Conduct educational sessions and engage in interactive activities at local schools and community groups.
2. Encourage the incorporation of an AMR-focused newsletter segment within local schools and community groups.
3. Enhance awareness and understanding of the pharmacy profession among young people.
4. Gather relevant data for subsequent analysis and evaluation.

By pursuing these objectives and goals, the project aimed to foster an informed and empowered future generation while contributing to the professional growth and development of trainee pharmacists. This research study aimed to assess the impact of the AG Schools' Ambassadors' programme on participating in trainee pharmacists' learning and development.

Methods

This was a descriptive evaluation study and collected data via an online questionnaire completed voluntarily by participants prior to commencing the project and upon completion. The data collected was both quantitative and qualitative through the use of closed and open-ended questions, a mixed methods approach.

Study design

The study was conducted with participants from the aforementioned Trainee Pharmacist Programme which spanned across the UK. Participating trainee pharmacists were enrolled from the cohort starting their foundation training year in the summer of 2022 and due to finish in 2023. Participating within the programme was optional for all trainee pharmacists employed by the national community pharmacy chain. Logistical support was provided by regional Learning & Development teams from the national community pharmacy chain; they provided regular guidance and support with undertaking the programme and conducting follow-up in addition to other elements of the foundation training year. Trainee pharmacists participating in the project received an adapted toolkit from UKHSA. It comprised of a dedicated webinar, written materials, and video resources to aid them with designing their lesson plan and activities. No additional funding was acquired for this project. The work was carried out as part of usual activity by UKHSA and collaborating national community pharmacy chain.

Data collection tool

To evaluate the project, the authors assessed the impact of the project on trainee pharmacists' knowledge, attitudes, and behaviours related to AMR, both pre- and post-project feedback questionnaires were employed and are available in Appendix 1 and 2. Both questionnaires, informed by previously developed and published questionnaires (Dyar *et al*., 2018; Ashiru-Oredope *et al*., 2021), were designed to enable the assessment of trainee pharmacists' AMR knowledge, their attitudes towards AMR, and their behaviours regarding the delivery of educational lessons.

The use of questionnaires with multiple choice and open-ended questions allowed for both quantitative and qualitative data to be collected, providing understanding of the trainee pharmacists' involvement and experiences throughout the AG Schools' Ambassadors programme. The use of this method can offer valuable insights into participants' experiences, attitudes, and behaviours, enriching the overall findings of the study (Tariq & Woodman, 2013). The pre-project questionnaire mainly consisted of closed-ended questions to establish an understanding of what approach trainee pharmacists were taking with regards to their lesson planning as well as their baseline

knowledge and attitudes. One open-ended question asked if they had any concerns regarding undertaking project. The post-project questionnaire contained similar closed-ended questions, and further open-ended questions to explore the trainee pharmacists' thoughts and ideas having completed the project. The pre and post project questionnaires are provided as Appendix A and B.

Ethics

The Health Research Authority decision tool was used to determine that the study did not need specific ethics approval (NHS Health Research Authority, 2022). The data analysed was collected as part of service evaluation of the existing project to incorporate the AG Schools' Ambassadors programme within the Trainee Pharmacist Programme. All participants consented to the use of evaluation data being used for reports and peer-reviewed publications. They were assured that participation was voluntary, that the obtained data would be anonymised prior to publication and that the Antibiotic Guardian privacy notice was adhered to. Data provided through questionnaires was only accessible to three authors, not linked to the trainee pharmacist's employer, for analysis.

Data collection process

The trainee pharmacists were provided with relevant information throughout the project, and their informed consent was sought prior to data collection. The questions within the pre- and post-project questionnaires were not made compulsory, which allowed participants to select whether they wanted to answer; this resulted in varying response rates to the questions. Both questionnaires (appendix 1 and 2) were made available to trainee pharmacists as online forms. They were asked to complete the pre-project feedback questionnaire when registering to participate within the project (before accessing the webinar and adapted lesson planning toolkit), and the post-project feedback questionnaire once they carried out their educational sessions and activities. Reminders were sent by email through the national chain's regional Learning & Development teams to improve response rates.

Data analysis

Data obtained from the questionnaires were analysed using a systematic and iterative approach. Descriptive statistics were calculated for quantitative questionnaire variables. To assess changes in attitude and knowledge-based questions, pre- and post-questionnaire samples were matched using full name and Pearson's Chi-squared and Pearson's cumulative test statistic ($\chi 2$) were used to outline significant changes. A p-value threshold of $p < 0.05$ was used to determine significance. Data was analysed using Microsoft Excel and Stata Version 17.0.

In addition to this, the qualitative data was manually analysed to identify themes, which involved identifying recurring themes, patterns, and emerging concepts. Finally, the quantitative and qualitative results were compared and integrated through data triangulation to generate a more comprehensive and nuanced understanding of the trainee pharmacists' experiences throughout the project (Wasti *et al*., 2022).

Results

Background

A total of 195 of the 290 trainee pharmacists on the national community pharmacy chain's Trainee Pharmacists Programme registered as participants in the project (67% participation rate). On registration, the trainee pharmacists provided informed consent before completing the pre-project questionnaire between September and December 2022. Table I provides the geographical distribution of the trainee pharmacists during the project. Following the conclusion of the project, post-project feedback questionnaires were sent out to all participants; 45 responses were received (45, n=195; 24% response rate) between May to July 2023. The project timeline for completion depended on participant circumstances and support from the regional teams. Completing the questionnaires was encouraged and recommended, but not mandatory as it did not affect participation within the programme. Those who completed the post-project questionnaire were sent a certificate of completion for evidence.

Table I: Countries and workplace regions where trainee pharmacists were based

England		**154**	
North East	16	East of England	12
Yorkshire & the Humber	7	South West	9
North West	20	South East	18
West Midlands	28	London	30
East Midlands	14		
Northern Ireland		**11**	
Scotland		**29**	
Wales		**1**	

Attitudes towards AMR

Question number 20 (pre-project questionnaire, Appendix A) and 37 (post-project questionnaire, Appendix B) determined the attitudes of participating trainee pharmacists using a 5-point Likert scale (Table II). In the pre-project feedback questionnaire, most participants (94%, n=195) agreed or strongly agreed that they possessed a clear understanding of AMR, and a large proportion of participants (98%, n=194) acknowledged the correlation between antimicrobial prescribing and the emergence of resistance.

Furthermore, most participants (92%, n=194) indicated familiarity with the information to be conveyed to patients regarding the prudent use of antibiotics and AMR. Similarly, a large proportion (93%, n=194) agreed or strongly agreed they possessed sufficient knowledge on the appropriate use of antibiotics for their current practice in the pre-project questionnaire, with a significant increase seen in the number of participants strongly agreeing with this statement (pre: 12/31, 39%; post: 22/31, 71%) in the post-project questionnaire (X^2=32.7744, $p < 0.001$) (Appendix B).

Most participating trainee pharmacists (92%, n=193) recognised their pivotal role in aiding the control of AMR, with the majority (84%, n=194) confirming access to and utilisation of local antibiotic prescribing guidelines.

Table II: Trainee pharmacists' attitudes towards AMR pre and post project

AMR attitude statement		Pre		Post	
		Number of respondents (n=195)	%	Number of respondents (n=45)	%
I know what antibiotic resistance is	Strongly agree	129	66	32	84
	Agree	55	28	3	8
	Disagree	0	0	1	3
	Strongly disagree	10	5	2	5
	Unsure	1	1	0	0
	Missing	0	-	7	-
I know there is a connection between the prescribing of antibiotics and the emergence of antibiotic resistance	Strongly agree	136	70	32	84
	Agree	54	28	3	8
	Disagree	1	1	0	0
	Strongly disagree	2	1	2	5
	Unsure	1	1	1	3
	Missing	1	-	7	-
I know what information to give to individuals about prudent use of antibiotics and antibiotic resistance	Strongly agree	81	42	26	68
	Agree	98	51	9	24
	Disagree	3	2	0	0
	Strongly disagree	2	1	2	5
	Unsure	10	5	1	3
	Missing	1	-	7	-
I have sufficient knowledge about how to use antibiotics appropriately for my current practice	Strongly agree	82	42	27	71
	Agree	98	51	7	18
	Disagree	1	1	0	0
	Strongly disagree	2	1	2	5
	Unsure	11	6	2	5
	Missing	1	-	7	-
I have a key role in helping control antimicrobial resistance	Strongly agree	103	53	27	71
	Agree	75	39	8	21
	Disagree	1	1	0	0
	Strongly disagree	2	1	2	5
	Unsure	12	6	1	3
	Missing	2	-	7	-
I have access to and utilise local antibiotic prescribing guidance	Strongly agree	70	36	26	68
	Agree	94	48	7	18
	Disagree	2	1	1	3
	Strongly disagree	3	2	2	5
	Unsure	25	13	2	5
	Missing	1	-	7	-

n, sample size; AMR, antimicrobial resistance

Knowledge of AMR

Question number 21 (pre-project questionnaire, Appendix A) and 38 (post-project questionnaire, Appendix B) determined that knowledge of AMR and appropriate antibiotic usage among trainee pharmacists was high with most trainee pharmacists providing accurate responses (Table III). These was no demonstrable difference in responses to the knowledge assessment questions from the pre- and post-project feedback questionnaires. However, most responses from the post-project feedback questionnaire (82%, n=38) acknowledged a heightened understanding of AMR through their involvement in the project. Responses from question number 36 of the post-project questionnaire demonstrate an increase in knowledge in 3 key areas:

1. A recap of basic AMR and antimicrobial use
2. Awareness of AMR resources to signpost to
3. Communicating health related issues with children

Table III: AMR knowledge statements correctly answered pre and post project

		Pre		Post	
		Number of respondents (n=195)	%	Number of respondents (n=45)	%
Antibiotics are effective against viruses	False	192	99	37	97
	True	2	1	1	3
	Missing	1	-	7	-
Antibiotics are effective against cold and flu	False	185	96	38	100
	True	8	4	0	0
	Missing	2	-	7	-
Unnecessary use of antibiotics makes them become ineffective	False	2	1	1	3
	True	192	99	37	97
	Missing	1	-	7	-
Taking antibiotics has associated side effects such as nausea, diarrhoea and skin rashes	False	4	2	4	11
	True	190	98	34	89
	Missing	1	-	7	-
Taking antibiotics may have associated risks such as drug allergy or colitis associated with *Clostridium difficile*	False	1	1	1	3
	True	193	99	37	97
	Missing	1	-	7	-
Every person treated with antibiotics is at an increased risk of antibiotic resistance	False	25	13	7	18
	True	168	87	31	82
	Missing	2	-	7	-
Antibiotic resistance bacteria can spread from person to person	False	28	15	7	18
	True	164	85	31	82
	Missing	3	-	7	-
Health people can carry antibiotic resistant bacteria	False	12	6	3	8
	True	182	94	35	92
	Missing	1	-	7	-

n, sample size

Benefits of participation

As demonstrated in question number 27 of the post-project questionnaire (Appendix B), most trainee pharmacists (91%, n=45) reported experiencing professional, personal, or both types of benefits as a result of their participation (See Table IV for further data). Analysis of the open-ended question responses regarding professional benefits included (1) the development of professional skills such as teamwork, time management, and leadership, (2) increased knowledge of AMR and antimicrobial use, (3) increased confidence, and (4) developing public health promotion skills.

Personal benefits detailed by participants can be grouped into (1) positive attitudes, and (2) skill development. In terms of positive attitudes, participants described increased self-confidence, personal fulfilment, a greater sense of purpose, a sense of accomplishment in positively impacting the local community, greater resilience in overcoming challenges and barriers, and improved communication and leadership skills.

Additionally, more than half of the trainee pharmacists (55%, n=38) believed they were able to effectively promote the pharmacy profession during educational activities, as per question number 23 of the post-

project questionnaire. Participants provided examples of promoting the pharmacy profession; these included relating and linking the educational session content back to pharmacy where possible and clearly explaining pharmacy roles to the young people, holding Q&A sessions related to pharmacy, preparing presentation slides about the pharmacy profession, and engaging the audience about their experiences of pharmacy to generate conversation. Responses also detailed barriers in promoting the pharmacy profession, which included the age of the children, as they may not be aware of different healthcare professions, and having to adapt language used to help them understand. Suggestions for improvement included more pharmacy-specific resources within the toolkit and clear guidance on how to promote the profession.

Table IV: Personal and professional benefits experienced by participants

Benefit gained from participation	No. of participating trainee pharmacists (n=45)	Example of comments
Personal and professional benefit	27 (60%)	*'1. Communication skills and teamwork have been two main pillars of the skills that have been developed throughout the project work at both preparation and execution stages* *2. Connecting with our communities under the umbrella of 'public health awareness' has created the base for future objectives that rely on the framework to ensure continuity of care'*
Professional benefit	7 (16%)	*'Helped with improving time management and team working skills. Improved in confidence and public speaking'*
Personal benefit	7 (16%)	*'The project gave me a sense of purpose. I was contributing in a positive way to impact the community.'*
No benefit	2 (4%)	-
Unsure	2 (4%)	-

National rollout of AG Schools' Ambassadors Project

Most of the trainee pharmacists (80%, n=45) who participated in the post project feedback questionnaire indicated their belief that the AG Schools Ambassadors' programme should be rolled out nationally to include all trainee pharmacists across the UK.

Discussion

Participating in the AG Schools' Ambassadors programme allowed trainee pharmacists to actively contribute to tackling AMR, gain experience participating in national public health initiative, and gather evidence to meet various learning outcomes specified by the GPhC which is required in order to become a qualified and registered pharmacist. Results have highlighted that participating trainee pharmacists felt they had developed the necessary skills and knowledge to educate young individuals on critical public health subjects such as microbes, hygiene, infection prevention, and antimicrobials. A key aim of this joint endeavour was to contribute to the professional growth and development of trainee pharmacists; analysis of results obtained from the post-project questionnaire suggests this was achieved.

Background

In terms of geographic location, most trainee pharmacists who participated in the project were based in England (Table I). This could be attributed to the distribution of pharmacies within the national chain across the country. According to trend data recorded by the GPhC, as of November 2024, there are 13,262 pharmacies registered across England, Wales and Scotland; 11,261 (84.9%) of these are situated in England (GPhC, 2024). While the number of trainee pharmacists within the project from England is significantly higher, it is worth noting the presence of participants from Northern Ireland, Scotland, and Wales. Though smaller in numbers, trainees from these countries offer insight from their respective regions and support the project to have a more rounded national perspective across the four UK nations.

The reduced response rate for the post-project questionnaire is important to acknowledge and could be due to many factors. These are further considered as part of study limitations.

Attitudes towards AMR

The responses received from trainee pharmacists regarding their attitudes towards AMR (Table II) were positive and supports their position in being ideally placed to help educate the public and other healthcare

professionals regarding reducing AMR and appropriate antibiotic use (Inácio *et al*., 2017; Jairoun *et al*., 2019). The high percentage of trainee pharmacists indicating a clear understanding of AMR and the correlation between prescribing and AMR suggests that undergraduate education and the trainee pharmacist programmes have been effective in equipping trainee pharmacists with the necessary perceived knowledge regarding AMR. This is an improvement from previous exploratory research which indicated that undergraduate pharmacy students felt they needed more information about AMR (70%, n=132) and the prescription of antibiotics (54%, n=132) (Dyar *et al*., 2018). Recognising the relationship between antibiotic use and AMR is important for advising on responsible prescribing practices. The high percentage of trainees acknowledging this correlation suggests that they are well-informed about the potential consequences of inappropriate antibiotic prescribing and are likely to prioritise AMS within their own clinical practice.

In terms of possessing sufficient knowledge on the appropriate use of antibiotics, and familiarity with information to be conveyed to patients, participant responses demonstrated that trainees are confident in their ability to communicate with and educate patients. Effective patient education can play a crucial role in reducing inappropriate antibiotic use and promoting AMS (McNicholas & Hooper, 2022). The high level of self-perceived knowledge suggests that the trainees feel confident in their ability to make informed decisions about prescribing antibiotics. However, it is essential to ensure that this self-perceived knowledge aligns with evidence-based guidelines and that trainees receive ongoing education and support to maintain their competence in antibiotic prescribing practices.

Questionnaire responses also demonstrated a positive attitude and understanding of their responsibilities in promoting responsible antibiotic use and combating AMR. Acknowledging their role as healthcare professionals in this context is crucial for ensuring their active participation in AMS initiatives. These results also indicate that the trainees are aware of the importance of evidence-based guidelines and are actively incorporating them into their practice. Utilising guidelines can help ensure appropriate antibiotic prescribing, improve patient outcomes, and contribute to efforts in controlling AMR (Powell *et al*., 2023). However, it is important to note that 25 participants (13%, n=194) in the pre-project questionnaire were 'unsure' about having access to and utilising local antibiotic prescribing guidance. Whilst this is a relatively low percentage of participants, it is notably higher than in the other AMR attitude statements. This suggests trainee pharmacists could benefit from further education related to accessing and utilising local antibiotic prescribing guidance.

Knowledge of AMR

Results from the post-project questionnaire suggest that the project successfully enhanced the participants' knowledge and awareness of a crucial healthcare issue. Questionnaire responses indicate that the increased knowledge involved a recap of basic knowledge of AMR and antimicrobial use, better understanding of resources to signpost to, and how to communicate health issues with children. By equipping trainee pharmacists with this knowledge, the programme contributes to building a cadre of professionals who can address and educate wide audiences about the challenges and implications of AMR. These findings demonstrate the initiative's effectiveness in not only educating children but also empowering trainee pharmacists with valuable skills and knowledge related to their profession and emphasise the positive outcomes of the project.

Benefits of participation

The proportion of participants (60%, n=45) indicating that the project benefited them both professionally and personally is positive. The reported benefits suggest that the project successfully provided valuable outcomes that extended beyond the immediate scope of the project. Analysis of the questionnaire responses demonstrated that the professional benefits included enhanced team building and time management skills, leadership development, greater knowledge of AMR and antimicrobial use, increased confidence in delivering educational activities to tailored audiences, promoting the pharmacy profession, and developing public health promotion skills. The responses corroborate findings from previous research related to scientific outreach programs (Suresan *et al*., 2019; Mhade *et al*., 2023). The project likely contributed to the participants' professional growth, preparing them for future roles and responsibilities.

The personal benefits encompassed increased self-confidence, personal fulfilment, a greater sense of purpose throughout the foundation training year, a sense of accomplishment in positively impacting the local community, a greater sense of resilience in overcoming challenges and barriers, and transferable improved communication and leadership skills. These personal growth aspects indicate that the project not only enhanced the trainee pharmacists' professional abilities but also positively influenced their personal development. The majority of trainee pharmacists reporting such benefits indicate the initiative's contribution in delivering meaningful outcomes and creating a positive impact on the participants. This result

highlights the project's value in supporting the professional and personal growth of participating trainee pharmacists, further reinforcing the importance of initiatives like the AG Schools Ambassadors' project in the field of pharmacy education.

While the percentage of trainee pharmacists who felt they were able to effectively promote the pharmacy profession during educational activities was lower compared to some of the other results obtained in the questionnaire (55%, n=38), it suggests that a significant portion of the participants believed they effectively showcased the role and value of pharmacists in their interactions with the children. Studies have demonstrated that the wide range of activities carried out by pharmacists is not understood by the general public; therefore, it is important for pharmacy professionals to help alter this public perception (Kelly *et al*., 2014; Raza *et al*., 2022). More work could be done to support trainee pharmacists with promoting the profession through their project activities in future. Some participants stated they were able to promote the pharmacy profession by relating and linking their educational session content back to pharmacy where possible and clearly explaining their roles to the young people; examples of specific activities included running a Q&A session related to pharmacy, preparing specific presentation slides about the pharmacy profession, and asking the audience about their experiences of pharmacy to start an informative conversation. These examples provided by participants suggest that public health campaigns and schools' outreach projects can be useful in teaching young people about different healthcare professions. Suggested barriers from participants included the age of the children as they may not be aware of different healthcare professions and having to adapt language used to help them understand. Suggestions for improvement included more pharmacy-specific resources within the toolkit and clear guidance on how to promote the profession. This outcome highlights the potential impact of the initiative in fostering positive perceptions of the pharmacy profession among young learners. Based on the constructive feedback received, further work could be carried out to improve the possibility of promoting pharmacy as a profession through this project.

National rollout of AG Schools' Ambassadors Project and feedback on initiative

The support for a nationwide rollout by participants implies that the project is perceived as effective, impactful, and beneficial for trainee pharmacists in their professional development. The participants' belief in the project's wider implementation indicates their confidence in its potential to contribute positively to the pharmacy profession. Participants felt that participating in teamwork, planning, and presenting sessions, engaging with the local community, promoting public health messages, delivering age-appropriate education on important topics, and communicating with enthusiastic children were all positive aspects of the project. These results support findings from previous research supporting engaging trainee pharmacists and pharmacy students in public health campaigns for the purpose of self-development and educating the public on important health matters (White *et al*., 2021; Herbert *et al*., 2024). When asked about challenges faced during the project in the post-project questionnaire, participants expressed key issues such as time management, large geographical spread of groups, difficulties finding schools to deliver educational sessions, organisational issues, and some issues engaging with desired target audience in terms of communication. They were able to make recommendations for improvements to the project; these included integrating it within all foundation pharmacist training programmes, ensuring participating schools have a greater awareness of the project, updating the toolkit to include more resources, videos and personal blogs, utilising social media to promote the project, gaining better access to schools and streamlining the process of recruiting schools, and increasing scope and content to include more age groups such as university students.

Feedback from the trainee pharmacists provides a perceived importance and potential impact of the AG Schools Ambassadors' project and further areas of improvement. It highlights the need for further consideration and exploration of scaling up the project to reach a broader audience, allowing more trainee pharmacists to benefit from the project's objectives and outcomes.

Summary

The information from feedback questionnaires supports the notion that trainee pharmacists are ideal participants for the AG Schools Ambassadors' programme as they possess an understanding of the vital messages to help educate young people. Results indicate positive attitudes and understanding among trainee pharmacists in relation to teaching sessions and AMR. The willingness to engage in teaching and the high levels of understanding regarding AMR bode well for the future of these trainees as they progress in their professional careers and in their participation within the AG Schools Ambassadors' project. The findings also emphasise the importance of continuing education programmes and training initiatives that focus on teaching skills, effective communication, and staying updated on developments within AMR. This can further enhance the trainees' confidence and competence in delivering educational

interventions and promoting responsible antimicrobial use. Overall, feedback questionnaire results highlight the positive attitudes and understanding of trainee pharmacists, indicating their potential to contribute to patient education, public health initiatives, and the appropriate use of antimicrobials within their practice.

Limitations of study

Future iterations of the project should consider incorporating more robust feedback collection methods from trainee pharmacists to better assess the programme's benefits and understand the challenges and barriers the trainee pharmacists faced. The reduced response rate to the post-project questionnaire poses a significant limitation in this study. Analysis was completed based on the presumption that all registered participants completed the project; there was no dropout rate provided by the national pharmacy chain. Completing the questionnaires was highly encouraged but not mandatory to complete the foundation training year. When a considerable number of participants do not provide answers, it can undermine the reliability and validity of a study's findings (Galdas, 2017). Low response rates can introduce bias and impact the generalisability of the results to a target population, however results should not be dismissed as they still provide valuable insight (Meterko *et al*., 2015). The absence of data from non-respondents prevents a more in-depth understanding of the impact of the project overall and could potentially skew the outcomes by disproportionately representing a particular subset of participants who were keen to respond. The possible reasons behind non-response to the post-project questionnaire may include the engagement of participants, questionnaire length, mode of questionnaire, timing of questionnaire (for example, the lag between start and end of project), issues with contacting participants, and a lack of incentive (Nair *et al*., 2008). Therefore, it is essential to acknowledge and address the limitations of non-response, consider potential biases, and explore strategies to maximise response rates in future versions of this project. It is also worth noting that all the trainee pharmacists that participated in the project were undertaking their foundation training year employed by the same national pharmacy chain. Whilst it may be possible to draw conclusions regarding non-participating trainee pharmacists in similar situations, the results may not necessarily be able to be applied to trainee pharmacists employed by other organisations or in different sectors; though suggestions could be made as they will have undergone GPhC regulated undergraduate degree programmes with approved syllabuses. Future operations of the project could include trainee pharmacists from other organisations and sectors to compare results and provide greater commentary on the benefits of the AG Schools' ambassador's programme.

A key limitation that was highlighted within questionnaire responses for trainee pharmacists was balancing full time work with taking on a project such as this; this may shed light on the lack of engagement with the post-project questionnaire towards the end of the year when trainee pharmacists were still working full time and preparing for their registration assessment to qualify as a pharmacist. This element of study design could be addressed in the future to bolster responses from participants, generate a more thorough understanding of trainee pharmacist's experiences, and strengthen overall findings and results.

Conclusion

The AG Schools' Ambassadors programme allowed participating trainee pharmacists to actively engage in a national public health awareness campaign, acquire valuable skills and confidence, and demonstrate evidence of meeting crucial UK pharmacist regulator's (GPhC) interim learning outcomes within their foundation training programme. Their efforts in educating young people about the significance of AMR and AMS hold particular importance, given that a substantial proportion of antimicrobials are prescribed to this demographic. Feedback suggests that trainee pharmacists are well equipped and confident in educating the public about AMR and appropriate antibiotic usage. They reported both personal and professional benefits from participating within the programme. Future endeavours to enhance the project involve updating the UKHSA toolkit based on feedback and making it accessible to all trainee pharmacists and pharmacy technicians for use.

Conflict of interest

The authors declare no conflict of interest.

Source of funding

The authors did not receive any funding.

References

Ahmed, S. K., Hussein, S., Qurbani, K., Ibrahim, R. H., Fareeq, A., Mahmood, K. A., & Mohamed, M. G. (2024). Antimicrobial resistance: Impacts, challenges, and future prospects. *Journal of Medicine, Surgery, and Public Health*, **2**(1), 100081. https://doi.org/10.1016/j.glmedi.2024.100081

Ahmer Raza, M., Aziz, S., Noreen, M., Anjum, I., & Raza, S. M. (2022). A portrait of the pharmacy profession globally: Pharmacist universal professional identity and establishment of global pharmacy council. *Innovations in Pharmacy*, **13**(1). https://doi.org/10.24926/iip.v13i1.4502

Ashiru-Oredope, D., Hopkins, S., Vasandani, S., Umoh, E., Oloyede, O., Nilsson, A., Kinsman, J., Elsert, L., Monnet, D. L., & ECDC Antibiotic Survey Project Advisory Group. (2021). Healthcare workers' knowledge, attitudes and behaviours with respect to antibiotics, antibiotic use and antibiotic resistance across 30 EU/EEA countries in 2019. *Euro surveillance: European communicable disease bulletin*, **26**(12), 1900633. https://doi.org/10.2807/1560-7917.ES.2021.26.12.1900633

Dadgostar, P. (2019). Antimicrobial resistance: Implications and costs. *Infection and Drug Resistance*, **12**(1), 3903–3910. https://doi.org/10.2147/IDR.S234610

Dyar, O. J., Hills, H., Seitz, L. T., Perry, A., & Ashiru-Oredope, D. (2018). Assessing the knowledge, attitudes and behaviors of human and animal health students towards antibiotic use and resistance: A pilot cross-sectional study in the UK. *Antibiotics*, **7**(1), 10. https://doi.org/10.3390/antibiotics7010010

Galdas, P. (2017). Revisiting bias in qualitative research: Reflections on its relationship with funding and impact. *International Journal of Qualitative Methods,* **16**(1). https://doi.org/10.1177/1609406917748992

General Pharmaceutical Council (GPhC). (2024). *GPhC registers data – The GPhC register as of 30 November 2024 – Trend data*. https://www.pharmacyregulation.org/about-us/publications-and-insights/research-data-and-insights/gphc-registers-data

Gilchrist, M., Wade, P., Ashiru-Oredope, D., Howard, P., Sneddon, J., Whitney, L., & Wickens, H. (2015). Antimicrobial stewardship from policy to practice: experiences from UK antimicrobial pharmacists. *Infectious Diseases and Therapy*, **4**(1), 51–64. https://doi.org/10.1007/s40121-015-0080-z

Herbert, S. M. C., Falcione, B., Hutar, M., & McGivney, M., Carroll, J. C. (2024). Expanding public health initiatives through community pharmacies and student pharmacists: A programmatic case study. *Journal of the American Pharmacists Association: JAPhA*, **64**(6), 102191. https://doi.org/10.1016/j.japh.2024.102191

Inácio, J., Barnes, L. M., Jeffs, S., Castanheira, P., Wiseman, M., Inácio, S., Bowler, L., & Lansley, A. (2017). Master of Pharmacy students' knowledge and awareness of antibiotic use, resistance and stewardship. *Currents in Pharmacy Teaching & Learning*, **9**(4), 551–559. https://doi.org/10.1016/j.cptl.2017.03.021

Jairoun A., Hassan N., Ali A., Jairoun O., & Shahwan M. (2019). Knowledge, attitude and practice of antibiotic use among university students: A cross sectional study in UAE. *BMC Public Health*, **19**(1), 518. https://doi.org/10.1186/s12889-019-6878-y

Kelly, D. V., Young, S., Phillips, L., & Clark, D. (2014). Patient attitudes regarding the role of the pharmacist and interest in expanded pharmacist services. *Canadian Pharmacists Journal*, **147**(4), 239–247. https://doi.org/10.1177/1715163514535731

Lai, W. M., Islahudin, F. H., Khan, R., & Chong, W. W. (2022). Pharmacists' perspectives of their roles in antimicrobial stewardship: A qualitative study among hospital pharmacists in Malaysia. *Antibiotic*s, **11**(2), 219. https://doi.org/10.3390/antibiotics11020219

Lim, K., Olsen, A., Broom, A., & Seale, H. (2022). Review of position statements on antimicrobial resistance and stewardship from professional pharmacy organisations. *Research in Social and Administrative Pharmacy*, **18**(1), 3974–3979. https://doi.org/10.1016/j.sapharm.2022.07.001

Majumder, M. A., Rahman, S., Cohall, D., Bharatha, A., Singh, K., Haque, M., & Gittens-St Hilaire, M. (2020). Antimicrobial stewardship: Fighting antimicrobial resistance and protecting global public health. *Infection and Drug Resistance*, **13**(1), 4713–4738. https://doi.org/10.2147/IDR.S290835

Manyi-Loh, C., Mamphweli, S., Meyer, E., & Okoh, A. (2018). Antibiotic use in agriculture and its consequential resistance in environmental sources: Potential public health implications. *Molecules*, **23**(4), 795. https://doi.org/10.3390/molecules23040795

McNicholas, M., & Hooper, G. (2022). Effects of patient education to reduce antibiotic prescribing rates for upper respiratory infections in primary care. *Family Practice*, **39**(1), 1-5. https://doi.org/10.1093/fampra/cmab054

McNulty, C. A., Collin, S. M., Cooper, E., Lecky, D. M., & Butler, C. C. (2019). Public understanding and use of antibiotics in England: findings from a household survey in 2017. *BMJ Open*, **9**(10), e030845. https://doi.org/10.1136/bmjopen-2019-030845

Meterko, M., Restuccia, J. D., Stolzmann, K., Mohr, D., Brennan, C., Glasgow, J., & Kaboli, P. (2015). Response rates, nonresponse bias, and data quality: Results from a national survey of senior healthcare leaders. *Public Opinion Quarterly*, **79**(1), 130–144. https://doi.org/10.1093/poq/nfu052

Mhade, S., Kadam, S., Kaushik, K. (2023). Talk To A Scientist: a Framework for a Webinar-Based Outreach Program for Scientists to Engage with K-12 Students. Journal of microbiology & biology education, 24(2), e00046-23. https://doi.org/10.1128/jmbe.00046-23

Munita, J. M., & Arias, C. A. (2016). Mechanisms of antibiotic resistance. *Microbiology Spectrum Journal*, **4**(2). https://doi.org/10.1128/microbiolspec.VMBF-0016-2015

Nair, C. S., Adams, P., & Mertova, P. (2008). Student engagement: The key to improving survey response rates. *Quality in Higher Education*, **14**(3), 225–232. https://doi.org/10.1080/13538320802507505

National Institute for Health and Care Excellence. (2015) *NICE guideline NG15. Antimicrobial stewardship: systems and processes for effective antimicrobial medicine use*. https://www.nice.org.uk/guidance/NG15

Naylor, N. R., Atun, R., Zhu, N., Kulasabanathan, K., Silva, S., Chatterjee, A., Knight, G. M., & Robotham, J. V. (2018). Estimating the burden of antimicrobial resistance: A systematic literature review. *Antimicrobial Resistance & Infection Control*, **7**(1), 58. https://doi.org/10.1186/s13756-018-0336-y

NHS Health Research Authority, UKRI, Medical Research Council. (2022). *Is my study research?* https://www.hra-decisiontools.org.uk/research/

Otieno, P. A., Campbell, S., Maley, S., Arunga, T., & Okumu, M. (2022). A systematic review of pharmacist-led antimicrobial stewardship programs in Sub-Saharan Africa. *International Journal of Clinical Practice*, 3639943. https://doi.org/10.1155/2022/3639943

Pokharel, S., Raut, S., & Adhikari, B. (2019). Tackling antimicrobial resistance in low-income and middle-income countries. *BMJ Global Health*, **4**(6), e002104. https://doi.org/10.1136/bmjgh-2019-002104

Powell, R. E., Felt-Lisk, S., Chen, A., & Sullivan, C. (2023). Optimising clinical guidelines to address antimicrobial-resistant infections: A conceptual framework reflecting stakeholder perspectives. *Antimicrobial Stewardship & Healthcare Epidemiology: ASHE*, **3**(1), e30. https://doi.org/10.1017/ash.2022.319

Prestinaci, F., Pezzotti, P., & Pantosti, A. (2015). Antimicrobial resistance: A global multifaceted phenomenon. *Pathogens and Global Health*, **109**(7), 309–318. https://doi.org/10.1179/2047773215Y.0000000030

Public Health England. (2018). *National campaign: Keep antibiotics working*. https://antibioticguardian.com/keep-antibiotics-working/

Suresan, V., Jnaneswar, A., Swati, S. P., Jha, K., Goutham, B. S., & Kumar, G. (2019). The impact of outreach programs on academics development, personal development and civic responsibilities of dental students in Bhubaneswar city. *Journal of Education and Health Promotion*, **8**(1), 188. https://doi.org/10.4103/jehp.jehp_56_19

Tariq, S., & Woodman, J. (2013). Using mixed methods in health research. *Journal of the Royal Society of Medicine Short Reports*, **4**(6), 2042533313479197. https://doi.org/10.1177/2042533313479197

UK Health Security Agency. (2023). *English Surveillance Programme for Antimicrobial Utilisation and Resistance (ESPAUR) report, 2022 to 2023*. https://www.gov.uk/government/publications/english-surveillance-programme-antimicrobial-utilisation-and-resistance-espaur-report

Wasti, S.P., Simkhada, P., van Teijlingen, E.R., Sathian, B., & Banerjee, I. (2022). The growing importance of mixed-methods research in health. *Nepal Journal of Epidemiology*, **12**(1), 1175–1178. https://doi.org/10.3126/nje.v12i1.43633

White, S., Gifford, A., & Frisher, M. (2021). Experiential learning in public health: evaluation of a health promotion campaign assessment for pharmacy students. *Pharmacy Education*, **21**(1), 56–64. https://doi.org/10.46542/pe.2021.211.5664

Wong, L. H., Tay, E., Heng, S. T., Guo, H., Kwa, A. L., Ng, T. M., Chung, S. J., Somani, J., Lye, D. C., & Chow, A. (2021). Hospital pharmacists and antimicrobial stewardship: A qualitative analysis. *Antibiotics*, **10**(12), 1441. https://doi.org/10.3390/antibiotics10121441

Appendix A: Antibiotic Guardian Schools Ambassadors registration questionnaire

Registration for Trainee Pharmacists - Antibiotic Schools' Ambassador - 2022/23

The survey will take approximately 5 minutes to complete. For 2022 World Antimicrobial Awareness Week (WAAW, 18-24 November 2022) the UK Health Security Agency (UKHSA) welcome trainee pharmacist to become schools ambassadors in 2022 and continue to play a role in keeping antibiotics working. We are encouraging trainee pharmacists to connect with local schools and community groups for young people to provide teaching sessions and promote a newsletter item on important public health topics; microbes, hygiene, infection prevention and antibiotics - this will be achieved through the Antibiotic Guardian Schools Ambassadors programme, which is now in its fourth year.

Ambassadors are encouraged to provide a teaching session during WAAW, supported by a toolkit of lesson-planning resources. There are other ways that Ambassadors can be involved however, if they are constrained for time or would prefer not to enter schools. Ambassadors can share the toolkit with schools for them to provide a session during WAAW, Ambassadors can also promote an article focussed on antimicrobial stewardship, infection prevention and hygiene for schools to include in their newsletters, Ambassadors may also be interested in recording a short 'Why tackling antimicrobial resistance is important to me' video, to be used during a lesson, in order to share their unique perspectives. The toolkit and newsletter item resources will be circulated in due course, and in plenty of time for ambassadors and schools to plan ahead of WAAW.

Please fill in the short registration form below and then use the link at the bottom of the form to download a template email to your local school headteachers in order to request their involvement.

For any questions please email Dr Diane Ashiru-Oredope at ESPAUR@ukhsa.gov.uk.

* Required

1. Personal information collected on this form is used for the purposes of providing further details to support your activity, analysing and evaluating the progress of the Antibiotic Guardian Schools ambassadors. As such information will be held for as long as necessary to fulfil the stated purpose (analysis and continued monitoring of the Antibiotic Guardian campaign). Personal data collected during the process of this campaign will be kept only as long as the Antibiotic Guardian campaign is active, for the purpose of monitoring of earlier and future seasons of the campaign. It will be reviewed regularly to maintain accuracy and to determine whether it is still necessary to store this information.

   Privacy Notice: https://antibioticguardian.com/privacy-policy/

   Whilst we may share summary findings of the evaluation in reports and peer review publication, no individuals will be identifiable

   Please confirm you have read and consent to above *

   ◯ Yes

   ◯ No

2. What is your full name? *

   Enter your answer

3. Where is your trainee year taking place? *

   ◯ Boots

   ◯ Other

4. If you selected 'other' please provide details of your trainee year

   Enter your answer

5. Which country are you based in? *

   ◯ England

   ◯ Northern Ireland

   ◯ Scotland

   ◯ Wales

   ◯ Other

6. In which region is your work place? *

   ◯ North East

   ◯ North West

   ◯ Yorkshire and the Humber

   ◯ East Midlands

   ◯ East of England

   ◯ West Midlands

   ◯ South East

   ◯ South West

   ◯ London

   ◯ National team/role

   ◯ Scotland

   ◯ Wales

   ◯ Northern Ireland

7. What county is the school or community group that you plan to approach as an Antibiotic Ambassador? *

- ◯ Bedfordshire
- ◯ Berkshire
- ◯ Buckinghamshire
- ◯ Cambridgeshire
- ◯ Cheshire
- ◯ City of London
- ◯ Cornwall
- ◯ Cumbria
- ◯ Derbyshire
- ◯ Devon
- ◯ Dorset
- ◯ Durham
- ◯ East Riding of Yorkshire
- ◯ East Sussex
- ◯ Essex
- ◯ Gloucester
- ◯ Greater London
- ◯ Greater Manchester
- ◯ Hampshire
- ◯ Herefordshire
- ◯ Hertfordshire
- ◯ Isle of Wight
- ◯ Kent
- ◯ Lancashire
- ◯ Leicestershire
- ◯ Lincolnshire
- ◯ Merseyside
- ◯ Norfolk
- ◯ North Yorkshire
- ◯ Northamptonshire
- ◯ Northumberland
- ◯ Nottinghamshire
- ◯ Oxfordshire
- ◯ Rutland
- ◯ Shropshire
- ◯ Somerset
- ◯ South Yorkshire
- ◯ Staffordshire
- ◯ Suffolk

- ◯ Surrey
- ◯ Tyne and Wear
- ◯ Warwickshire
- ◯ Wiltshire
- ◯ Worcestershire
- ◯ Scotland
- ◯ Wales
- ◯ Northern Ireland
- ◯ Not applicable (outside of UK)
- ◯ Other

8. Which type of school do you plan to approach? If you plan to approach a community based activity such as scouts/brownies, please select 'other' and provide details in the next question *

- ☐ Primary school (key stages 1 and 2) - private
- ☐ Primary school (key stages 1 and 2) - state
- ☐ Primary school (key stages 1 and 2) - academy
- ☐ Primary school (key stages 3 and 4) - private
- ☐ Primary school (key stages 3 and 4) - grammar
- ☐ Primary school (key stages 3 and 4) - state
- ☐ Primary school (key stages 3 and 4) - academy
- ☐ Undecided
- ☐ Community group - please specify below
- ☐ Other - please specify below

9. If you selected 'Community group' or 'Other' for question 8 please provide further details, including age range

Enter your answer

10. How many schools/community groups do you think you might approach? *

Enter your answer

11. Do you intend to engage with schools individually or as a group *

- ◯ Individually
- ◯ As a group
- ◯ Undecided

12. Do you intend to record a short introductory video entitled 'Why tackling antimicrobial resistance is important to me' for schools/community groups to play during their lesson? *

- ◯ Yes
- ◯ No
- ◯ Undecided

13. Do you intend to provide a teaching session? *

- ◯ Yes - in person

- ◯ Yes - virtually
- ◯ No - I will promote lesson planning resources for schools to provide sessions
- ◯ Undecided

14. Do you intend to promote an article for inclusion in school newsletters? *
    - ◯ Yes
    - ◯ No
    - ◯ Undecided

15. How confident do you feel about talking to the following demographics about their antibiotic use? *

	Very unconfident	Quite unconfident	Unsure	Quite confident	Very confident
Colleagues	◯	◯	◯	◯	◯
Members of the public	◯	◯	◯	◯	◯
Young people	◯	◯	◯	◯	◯

16. How do you plan to use/disseminate the toolkit of lesson planning resources if you do not plan to run a teaching session in person/virtually?

    Enter your answer

17. Which Boots trainee group are you part of? If your training year is not with Boots, please state name of pharmacy *

    Enter your answer

18. Do you have any concerns about taking part in the Antibiotic Guardian Schools Ambassadors scheme? Please let us know below

    Enter your answer

19. To what extent to you agree/disagree with the following statement?

    I know what antibiotic resistance is *
    - ◯ Strongly disagree
    - ◯ Disagree
    - ◯ Undecided
    - ◯ Agree
    - ◯ Strongly agree
    - ◯ I do not understand/not applicable

20. To what extent do you agree/disagree with the following statements? *

	strongly disagree	disagree	undecided	agree	strongly agree	I do not understand / not applicable
I know there is a connection between the prescribing of antibiotics	◯	◯	◯	◯	◯	◯

	strongly disagree	disagree	undecided	agree	strongly agree	I do not understand / not applicable
and the emergence of antibiotic resistance						
I know what information to give to individuals about prudent use of antibiotics and antibiotic resistance	○	○	○	○	○	○
I have sufficient knowledge about how to use antibiotics appropriately for my current practice	○	○	○	○	○	○
I have a key role in helping control antibiotic resistance	○	○	○	○	○	○
I have access to and utilise local antibiotic prescribing guidance	○	○	○	○	○	○

Please indicate whether you believe these statements are true or false *

	True	False
Antibiotics are effective against viruses	○	○
Antibiotics are effective against cold and flu	○	○
Unnecessary use of antibiotics makes them become ineffective	○	○
Taking antibiotics has associated side effects such as nausea, diarrhoea and skin rashes	○	○
Taking antibiotics may have associated risks such as drug allergy or colitis associated with Clostridium Difficile (C.Diff)	○	○
Every person treated with antibiotics is at an increased risk of antibiotic	○	○

	True	False
resistant infection		
Antibiotic resistant bacteria can spread from person to person	◯	◯
Healthy people can carry antibiotic resistant bacteria	◯	◯

22. In the last week, have you dealt with prescriptions for antibioitics or given advice to patients/prescribers on antibiotic use? *

- ◯ Yes
- ◯ No

23. To what extent have you acted within the following statements? *

	Never	Occasionally	Sometimes	Most of the time	Always	N/A
In the last week if a customer/patient requested advice on a potentially self-limiting infection, I am satisfied that I have used this opportunity to provide self-care resources and give information/advice	◯	◯	◯	◯	◯	◯
In the last week I have faced challenges in advising patients due to COVID-19 restrictions (e.g., patient not being able to be present in person)	◯	◯	◯	◯	◯	◯
I am aware of local guidance on antibiotics and in the last week checked prescriptions, that did not comply, with the prescriber before dispensing	◯	◯	◯	◯	◯	◯
I have ensured that health promotion materials about antibiotic use were available to my patients/cust	◯	◯	◯	◯	◯	◯

	Never	Occasionally	Sometimes	Most of the time	Always	N/A
omers and referred to these when necessary (e.g., leaflet in bag/displayed posters)						
In the last week when dispensing antibiotics, I have ensured the patient has no known allergies to the medication (either verbally or by checking patient records)	○	○	○	○	○	○

24. Thank you for completing this form. If you have any queries, do not hesitate to send an email to Prof Diane Ashiru-Oredope via espaur@ukhsa.gov.uk

Appendix B: Antibiotic Guardian Schools Ambassadors feedback questionnaire

Antibiotic Guardian Schools Ambassadors - Trainee Pharmacists Feedback

An opportunity for AG Schools Ambassadors to provide feedback on their activity in 2022, as well as any feedback on the ambassadors campaign itself.

* Required

Introduction

1. Name *

2. Email *

3. Please indicate that, by completing this form, you agree to participate in evaluation of the Antibiotic Guardian Schools Ambassadors programme *

- ◯ I agree

4. Do you consent for the information you provide (this will be provided at GROUP level only and never individual) to be used for analysis by your employer and those responsible for managing the Antibiotic Guardian Schools Ambassadors programme? *

- ◯ Yes
- ◯ No

5. Organisation *

6. Who is your Healthcare Academy Trainer? (N/A if not employed by Boots)

About your project

7. Which pharmacy sector do you predominantly work in? (i.e. >50% of your time)* *

- ○ Community
- ○ Hospital
- ○ GP/Primary Care
- ○ Other

8. In which region is your work place? *

- ○ North East
- ○ North West
- ○ Yorkshire and the Humber
- ○ East Midlands
- ○ East of England
- ○ West Midlands
- ○ London
- ○ Scotland
- ○ Wales
- ○ Northern Ireland
- ○ South West
- ○ South East
- ○ Other

9. What is your project group name? (N/A if not employed by Boots)

10. Did you approach a local school/community group in order to provide a teaching session or share lesson planning/educational resources? *

- ☐ Yes - by email/phone
- ☐ Yes - in person
- ☐ Yes - other
- ☐ No

11. Which type of school did you approach? If you approached a community based activity such as Scouts/brownies, please select 'Other' and provide details. *

- ☐ Primary School (Key Stages 1 and 2) - Private
- ☐ Primary School (Key Stages 1 and 2) - State
- ☐ Primary School (Key Stages 1 and 2) - Academy
- ☐ Secondary School (Key Stages 3 and 4) - Private
- ☐ Secondary School (Key Stages 3 and 4) - Grammar
- ☐ Secondary School (Key Stages 3 and 4) - State
- ☐ Secondary School (Key Stages 3 and 4) - Academy
- ☐ Other
- ☐ None of the above

12. If you did approach one or more school/community group, how many did you approach? *

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ More than 5
- ○ N/A

13. Did the school/community group(s) accept your invitation to provide a teaching session or share lesson planning/educational resources? *

- ○ Yes
- ○ No
- ○ N/A

14. If you were able to engage with schools, which of the following were you able to do? *

Please select at most 3 options.

- ☐ Provide a lesson in person
- ☐ Provide a toolkit of lesson-planning resources for schools to provide a lesson
- ☐ Promote an article for distribution in school newsletters
- ☐ Record and share a short introductory video for use within a lesson
- ☐ N/A
- ☐ Other

15. How many students do you estimate your activity reached? *

16. (For those that ran a teaching session) The activities that I chose were age appropriate for my group(s)

1 - Strongly Disagree 5 - Strongly Agree

1	2	3	4	5

17. I am likely to volunteer as an Ambassador again or recommend to another colleague *

1 - Strongly Disagree 5 - Strongly Agree

1	2	3	4	5

18. The toolkit provided all of the information to enable me to run the activities that I wanted t run *

1 - Strongly Disagree 5 - Strongly Agree

1	2	3	4	5

19. (For those that ran a teaching session) I think the children in my group understood at least some of the topics being presented to them

1 - Strongly Disagree 5 - Strongly Agree

1	2	3	4	5

20. (For those that ran a teaching session) Before completing the programme with my group, I felt confident to deliver it and answer questions

1 - Strongly Disagree 5 - Strongly Agree

1	2	3	4	5

21. Now I have completed the programme I feel confident to deliver this programme again *

1 - Strongly Disagree 5 - Strongly Agree

1	2	3	4	5

22. I feel the topics covered are important for children to understand *

1 - Strongly Disagree 5 - Strongly Agree

1	2	3	4	5

Promoting pharmacy as a profession to young people

This may include briefly mentioning the pharmacy profession and basic roles/responsibilities or a more formal component

23. During your education lessons and activities, were you able to promote pharmacy as a profession to young people? *

- ◯ Yes
- ◯ No
- ◯ Maybe
- ◯ Unsure

24. If you were able to promote pharmacy as a profession, please provide more details including how you did this and what resources you used

25. Did you face any barriers or challenges to promoting pharmacy as a profession to young people during the course of this project? (If no challenges or barriers, please state this) *

26. How could the project be improved to promote pharmacy as a profession? (If no improvements, please state this) *

Evaluating the project

27. Did you feel that you benefitted, either personally or professionally, from your involvement in the AG Schools Ambassadors campaign *

- ◯ Yes, personally
- ◯ Yes, professionally
- ◯ Yes, both personally and professionally
- ◯ No
- ◯ Unsure

28. If you feel that you benefitted from being involved in the campaign, please provide further details

29. Whilst working on the project, what did you find went well? *

30. If you feel that you did not benefit from being involved in the campaign, please provide further details

31. What were your biggest challenges whilst working on the project? Please provide further details on how you overcame them. (If no challenges, please state this) *

32. Do you think the Antibiotic Guardian Schools Ambassadors programme should be rolled out nationally to other trainee pharmacists? *

- ◯ Yes
- ◯ No
- ◯ Maybe
- ◯ Unsure

33. How could the AG Schools Ambassadors campaign be improved in future years, based on your experience? *

34. Do you agree to being contacted in the future about the AG Schools Ambassadors campaign or similar programmes? *

- ◯ Yes
- ◯ No

Reassessing your knowledge

35. Do you feel your knowledge of antimicrobial resistance and the use of antimicrobials has increased throughout this project? *

- ◯ Unsure
- ◯ Not at all
- ◯ A little
- ◯ Yes, somewhat
- ◯ Yes, significantly

36. If you feel your knowledge has increased, please provide more details as to how

37. To what extent to you agree/disagree with the following statements? *

	Strongly disagree	Disagree	Undecided	Agree	Strongly agree	Not applicable/I do not understand
I know what antibiotic resistance is	○	○	○	○	○	○
I know there is a connection between the prescribing of antibiotics and the emergence of antibiotic resistance	○	○	○	○	○	○
I know what information to give to individuals about prudent use of antibiotics and antibiotic resistance	○	○	○	○	○	○
I have sufficient knowledge about how to use antibiotics appropriately for my current practice	○	○	○	○	○	○
I have a key role in helping control antimicrobial resistance	○	○	○	○	○	○
I have access to and utilise local antibiotic prescribing guidance	○	○	○	○	○	○

38. Please indicate whether you believe these statements are true or false *

	True	False
Antibiotics are effective against viruses	○	○
Antibiotics are effective against cold and flu	○	○
Unnecessary use of antibiotics makes them become ineffective	○	○
Taking antibiotics has associated side effects such as nausea, diarrhoea and skin rashes	○	○
Taking antibiotics may have associated risks such as drug allergy or colitis associated with Clostridium Difficile (C.Diff)	○	○
Every person treated with antibiotics is at an increased risk of antibiotic resistant infection	○	○
Antibiotic resistant bacteria can spread from person to person	○	○
Healthy people can carry antibiotic resistant bacteria	○	○