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Can the research impact of broadcast programming be determined?

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Abstract

The study used a pragmatic mixed methods approach to evaluate the change in knowledge and habits of viewers of research broadcast during two factual TV entertainment programmes to see if it was possible to measure the impact of watching. It was possible to demonstrate some changes in knowledge, though this is likely to be transient, and while potential changes in behaviour were reported, they are difficult to verify. Limitations of the approaches are discussed. Complexity of the participants' lifestyles and social interactions will additionally influence outcomes.

Keywords: impact evaluation; questionnaire; oral health; mass media; TV

Key messages

- The mixed methods approach used could demonstrate changes in knowledge and behaviour of viewers of the broadcast.
- Focus groups gave the most detailed information but were most expensive.
- Analysis via Twitter altmetrics gave the smallest quantity of evidence of change but was the least expensive.

Introduction

The interest in the effect of research beyond the halls of academia continues to grow: in several countries there are concerted efforts to measure it. In the UK, impact has become the term of choice for research influence beyond academia and the Research Excellence Framework (REF) specifically defined it as 'an effect on, change or benefit to the economy, society, culture or public policy or services, health, the environment or quality of life, beyond academia' (REF, 2011).

In 2014, the outputs of REF for each higher education institution (HEI) included impact case studies to report on the impacts from each unit of assessment (or subject area). This exercise generated nearly 7,000 case studies, forming a rich seam of data on the impacts that research has had. An analysis of all the cases studies (King's College London and Digital Science, 2015), via text mining and qualitative analysis to determine the nature, scale and beneficiaries of research impact revealed 65 topics around which

they were constructed. One of the topics was public engagement. However, its use across the 36 different disciplines was not uniform: much higher percentages of case studies in the arts and languages (panel D) reported public engagement impacts than in the sciences and engineering (panels A–C), and community and local government gained higher percentages for arts and languages and also humanities (panels C and D). It is expected in the next REF assessment (expected in 2021) that the importance and value of the impact case studies will increase, with a potential for case studies with greater diversity of impact, as well as reach and significance, being well received. This will likely see a rise in the inclusion of public engagement impacts. While there are many ways to engage the public, one way may be through the involvement of researchers in the creation of mass media broadcast, and it will be vital to be able to demonstrate impact beyond counting numbers of viewers. Indeed Penfield and colleagues (2014) suggest that citation of research through the media, including analysis of social media through altmetrics (alternative metrics), can generate evidence alongside other forms to indicate impact.

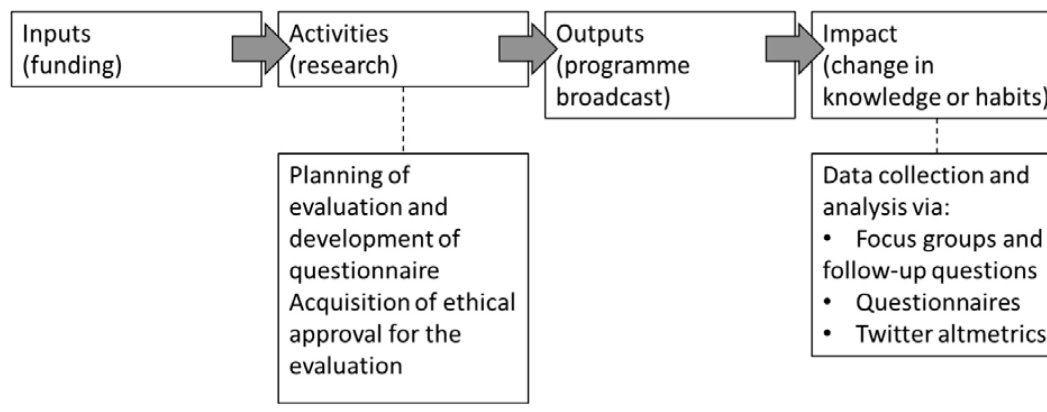
The pervasiveness of television culture lends itself to being a tool for reaching vast numbers of interested viewers, and potentially for engaging new, curious citizens via science communication and public engagement. Eye-catching imagery is easily remembered and commented upon. Although wide-reaching, the individual impact of mass media broadcast is likely to be small, on the scale of informing rather than instigating more collaborative approaches between researchers and the public. However, there is potential for changing behaviours and/or knowledge through the use of mass media, and measuring this may be of interest in the evaluation of public engagement for public benefit and impact.

Measuring the benefit of research, or its impact, has been of interest for some time to, in particular, the biomedical and health sciences. There are a number of tools that can be employed, the most popular perhaps being case study and logic modelling methods (Grant, 2006).

Here, we discuss a pragmatic use of a mixed methods approach to evaluating the impact of research broadcast on television, based on a logic model or a theory of change, as outlined in Figure 1. Our case study focuses on the broadcast of a two-part factual entertainment series at prime time, which featured dental research, although the approach illustrates the kind of analysis that may be conducted stemming from any field of research portrayed on TV. With limited funding and time resources, we tried to gather as many types of impact as possible, utilizing quantitative and qualitative methods. Our quantitative approaches allowed for establishment of baseline data via evaluation of existing knowledge, whereas the qualitative data allowed for exploration of themes we had not anticipated and reported behaviour change.

To reiterate, our aim was to evaluate the possibility of gaining evidence of impact, through a mixed methods approach, of a change in knowledge and/or behaviour following the viewing of research incorporated into two factual health-based programmes. We were interested in taking the evaluation beyond uptake of the research, and hoped to incorporate the contribution into a wider assessment of the research impact for this stream of research: could we show the results of researchers becoming involved with TV programme production, beyond just viewing figures?

Figure 1: Logic model and points where activities are required – some data collection may also need to occur before broadcast, for acquisition of baseline knowledge, for example



A mixed methods approach to measuring impact

Our research group was approached by TV programme producers to be involved in programming about dentistry. The initial conversations started some two years before the eventual broadcast, with several iterations of what the final output might be. Our input was finalized as a small segment of ten minutes in the eventual two hours of broadcast, and in the latter stages of filming we planned our evaluation of the content. The broadcast was set up as two one-hour factual health-related programmes (titled *The Truth about Your Teeth*) at prime time (9 p.m.) on a very popular channel (BBC One). The mode of the programmes was a compelling mixture of human stories about specific aspects of health, research segments and group testing of common assumptions or habits, all led by two well-known presenters. Our focus was on the change of knowledge and habits of the viewers as indicators of engagement with our research and that of the wider programme. Not being privy to the content of the rest of the programme more than 24 hours in advance, we devised a tripartite approach to evaluation:

- (1) use of a questionnaire, including specific knowledge-based questions linked to the research we had portrayed in the filming, to record the knowledge of participants before and after broadcast
- (2) focus groups to discuss the programmes and evaluate if habits could be changed by the programme via follow-up conversations
- (3) making use of existing infrastructure, that is Twitter altmetrics, to evaluate the conversation around the broadcast, to see if it could be used to find changes in knowledge or behaviour.

Ethical approval was granted from the University of Birmingham's Science, Technology, Engineering and Mathematics Ethic Review Committee (ERN_15-0385). Participants (n=20) were recruited locally through a professional recruitment company for (1) and (2), and in addition self-selecting participants (n=66 completing all questionnaires) via social media, email lists and leafleting public spaces (such as libraries, shops and recreation centres) for (1). The professional recruitment targeted the demographics of the viewers of the broadcast channel, with a large proportion (29 per cent) over the age of 60, a near gender balance and a mix of socio-economic status. The rest of the

recruitment could not be tailored; however, the questionnaire allowed us to assess the participants' demographics with appropriate questions.

The questionnaire was developed to allow for assessment of the participants' demographics (age, gender, educational status, location), as well as subject-specific habits and knowledge. This allowed us to assess if we were accessing a particular portion of the population who might have a particular interest in the programming, as well as initial knowledge and habits. In this respect, there was a slightly higher than national average reporting that participants regularly visited the dentist (91 per cent in our sample, compared with 72 per cent nationally), potentially suggesting that we had an interested sample. The self-selecting participants and professionally recruited participants were given the questionnaire before the broadcast of the programme and again afterwards. However, they were given it in different settings. The self-selecting participants were sent the questionnaire to complete online, and then could watch the broadcast on the night or via a catch-up service, meaning that they were in a 'natural' setting for viewing the programme (at home, or wherever they usually watch television or catch-up service).

The professionally recruited participants were also to take part in focus group discussions, so they were shown the programming in an artificial group situation so that the discussions could take place afterwards. Each group was given the same questionnaire afterwards to assess any changes in knowledge. Both groups gave very similar answers to the questions on knowledge beforehand, suggesting that the groups were superficially comparable. Afterwards, the groups both improved in their knowledge, that is higher proportions of the respondents gave the correct answer (90 per cent, compared with 25 per cent before watching the programme), to the same extent. Questions relating to how participants might change their habits suggested that they would take on board some of the suggestions in the programmes (such as brushing teeth for longer and preventing enamel erosion). Overall, the questionnaire-based approach could shed some light on a potential change in knowledge, both in person and remotely. The only difference was the dropout rate: nearly twice as many self-selecting participants completed the first questionnaire than completed the second one, whereas all the professionally recruited participants completed both.

Following the completion of the questionnaire, the professionally recruited participants took part in a guided discussion about the programme in an attempt to seek greater insight into how the content could change knowledge and habits. It had been possible for the researchers to view the overall content 24 hours before screening it for the participants, and therefore the themes (human stories about specific aspects of health, research segments and group testing of common assumptions or habits) of the programme had been distilled.

The human stories portrayed were of particular interest, and took up a large proportion of the discussion. However, the participants discussed all the themes, and added extra ones not discussed in the programme (for example, attitudes towards dentists and barriers to attending dental surgeries). Comments about our research demonstrated more prior knowledge than we anticipated and illustrated a fatigue associated with fear-linked mass advertising that we were not expecting. While 'fear appeals' have been shown to have less effect in the real world than in psychological experiments (Hastings *et al.*, 2004), this suggests that some of the participants may not have been particularly ready for change associated with some aspects of the broadcast. This was an added bonus and could form the basis for future collaborative research through patient groups. Specific discussion about how the participants would change their habits framed the end of the session.

We contacted this group of participants again after nine weeks to follow up and assess if any habits had been reportedly changed. They had been informed that this would happen at time of consent into the study. Seven of the twenty contacted did not respond to telephone calls. However, 30 per cent (6/20) reported changing their behaviour to habits that will be beneficial to their health.

Lastly, we took advantage of the existing infrastructure of social media, specifically by analysing the Twitter hashtags and searchable title associated with the broadcast. This elicited nearly 1,300 tweets by 812 different accounts, which were read and categorized according to the programme content, as well as newly arising topics (for example, disgust and anxiety about dentistry). Few tweets (1 per cent) were found to be associated with research themes: most (12 per cent) were associated with the human stories. We took the analysis one step further, having noticed that many of the Twitter handles contained vocation or subject-specific (dentally) relevant words. Many of these accounts appeared to be associated with dental practices and dentists, so we categorized the tweets into those from accounts with a vested interest in the programme and those seemingly from the non-dentally trained public. This demonstrated that the majority of our research-themed tweets had come from a community with a particular interest in the broadcast.

Additional information about the programmes was gleaned by interaction with the industry surrounding the broadcast. Viewing figures per night were purchased from the Broadcasters' Audience Research Board (BARB), and showed that 11 per cent (2 million viewers) of the total TV viewers watched the broadcasts, which is broadly in line with other factual programmes on that channel at that time.

Discussion

There is a long history of the use of mass media (including television) to educate and persuade the public to change behaviour in favour of healthy lifestyles through preventative and empowerment strategies. Bandura's social cognitive theory suggests that the viewers of TV programmes can learn vicariously (Bandura, 1986). Theories have been developed (Rosenstock, 1966; Fishbein and Ajzen, 1975; Ajzen, 1985) that suggest a gain of knowledge is just one factor in the motivation to change behaviour. Other factors are a readiness to act, a perception of what is the norm, what control a person has over their behaviour and having the time or opportunity to effect the change. The use of human stories, along with celebrity presenters, in TV programmes (as in this case) are good vehicles to convey a message of what is the norm. Additionally, the advantage of using television programmes is that people will talk about them and thus raise issues between themselves, driving towards a greater level of processing. A study examining the efficacy of a health message delivered through a popular hospital drama demonstrated that viewers were significantly better at correctly answering questions about the content than those who did not watch the programme (Bouman *et al.*, 1998). However, retention of the knowledge decreased with time: the authors showed that correct answers to repeated questions were significantly fewer after five weeks compared with after one week. It is noteworthy that coupling the delivery of information with additional strategies during stages of the change process can have greater influence and efficacy.

As a three-pronged approach to evaluate the impact of the TV programming, we could not find indisputable evidence of a change in behaviour or knowledge. However, each approach could show limited indicators of such changes. The questionnaire approach allowed for questioning of very specific aspects of knowledge, and could

deliver a change in the proportion of participants' responses. How long this knowledge could be retained and used to the benefit of the viewers is debatable. The questionnaire measured knowledge one week after the broadcast of the second programme.

The focus group participants experienced an extended discussion about the programme, with the group sharing their own insights, and this experience could potentially artificially enhance the impact. Additionally, it was possible to demonstrate reported changes in behaviour. However, it is not possible to measure the actual change without a full-scale clinical study. Indeed, merely inviting participants to attend a dental check-up will additionally change their dental behaviour, so there are many confounding issues associated with such an approach. Lastly, the analysis of Twitter, where there was no contact between the researchers and the public, found a very small amount of potential change in knowledge and behaviours. This approach also identified a portion of the viewers who were particularly engaged in the broadcast, and this gave a greater insight into the analysis and potential beneficiaries. Currently, there are few tools that can be used to assess social media impact for science communication. Measurement of the reach of messages – usually the number of times a hashtag is used – and the engagement – the number of retweets or replies – is geared towards advertising campaigns rather than towards defining tangible impacts.

Along with the different levels of outcome, the three different approaches had implications for the cost of research through time commitments (for example, study design, data analysis) and resources (for example, room bookings and travel reimbursement for participants in the focus groups). Each of the three approaches alone would produce only a small amount of impact evidence, with limitations (see below) for each. Using all three together can help minimize these disadvantages and gain a better view of the impact that participating in a TV programme can yield.

Limitations

Limitations are inevitable with this type of study, and are outlined below. Table 1 reports some of the advantages and disadvantages of each approach. First, it is important to note that research used in the programmes evaluated only contributed 10 minutes to the overall 2 x 60-minute broadcasts. This approach, taking small areas of research from a number of research sources (universities or research groups), is quite common in the creation of TV science programmes. Thus the attribution to the change in knowledge and/or behaviour is difficult: untangling our research element from the human stories and other research aspects across the course of the programming is only possible for very specific points that might not be covered in other aspects. Our approach sought to target these areas through specific questions in the questionnaires. However, attribution is a complex and difficult subject and, as Kitzinger (2006: 44) writes, 'public engagement does not, therefore, take place in a vacuum'.

Indeed, the interaction with the programme producers was largely unanticipated in the general research stream, and the series was not designed to alter the knowledge or habits of the viewers. This made the analysis somewhat ad hoc, even though it was planned before broadcast. This meant that the research was portrayed as advances in the field and to demonstrate why the research was important for human health, although it should be noted that it was surrounded by reinforcing content featuring advice and demonstrations of what happens for those with poor outcomes, rather than as a medium for education.

Our focus groups were adequately sized (two groups of ten) to make the approach as practicable as possible, both in terms of time and cost. Both gave similar

discussions, suggesting a saturation point had been met. We maximized the amount of time spent with these participants and invested in follow-up conversations with them to bring a longitudinal and time-lag element to the analysis. That there was a large proportion who did not respond at follow-up was disappointing, and could be potentially remedied by withholding of reimbursement until all aspects are completed. The follow-up period was nine weeks, by which time the participants could have embedded any new habits. Additionally, the focus groups watched the programming in an artificial situation alongside other participants, likely influencing their behaviour. On being asked, some focus group participants admitted that it was not likely they would have watched the programmes out of choice had they not been involved in this study. Thus it may not be correct to assume that the impact of the programme on this group reflects that of the programme's audience as a whole, as the audience viewing at home had all opted to watch voluntarily.

Table 1: Advantages and disadvantages of the approaches used

Method	Advantages	Disadvantages
(1) Questionnaires	<ul style="list-style-type: none"> • Free • Quantitative 	<ul style="list-style-type: none"> • Remote recruitment meant a high degree of dropouts and low certainty as to the actual identities of participants • Participants probably skewed towards those closest to the university through the reach of our advertising, which may be the reason for higher socio-economic indicators among this group than the general population
(2) Focus groups with follow-up	<ul style="list-style-type: none"> • Qualitative • Participants recruited were similar to the demographics of the channel • Unanticipated, fresh insights can be gained as process not limited to pre-decided questions 	<ul style="list-style-type: none"> • Expensive • Time consuming • Taking part in itself may heighten impact
(3) Social media (Twitter) analysis	<ul style="list-style-type: none"> • Free • Hashtag use made finding tweets very easy • Participants are not aware that their tweets are being analysed, therefore being involved in a study has no influence on results 	<ul style="list-style-type: none"> • Small return of tweets about research • Very hard for any tweet to provide real evidence of impact/change

The questionnaires, while providing greater quantitative evidence, could only report on potential for change, as we did not seek to administer a further questionnaire at a later time to ask whether the intended reported changes had been implemented. This was to limit the burden of time on the respondents. As half of the respondents dropped out after the first questionnaire, this response rate would likely have decreased further at a more distant time after the broadcast. Improvements in the study could be made by recruitment of larger numbers of participants for the questionnaires, potentially using purposeful recruitment via an agency.

The analysis of Twitter has the limitation that it is not evenly taken up across the population: 30 per cent of the viewers of the programme were over 60 years old, whereas only 6 per cent of this age group have Twitter accounts. This means that it was likely that the comments of younger viewers were being analysed; however, reported impacts were similar in terms of change in knowledge and behaviour.

Lastly, there are hints that our questionnaire sample contained individuals with an interest in oral health: the participants reported more registration at dental surgeries than the population as a whole and additionally appeared to have more dental knowledge than we expected. This may add to an underestimation of the effect of the broadcasts.

Conclusions

As a pragmatic approach to an unusual event in research output this study was successful for measuring impact of research on the viewing public. The analysis can demonstrate a reach that expands across the UK, through the Twitter analysis and post codes on the questionnaires, and also a high level of significance, if the potential change in knowledge and habits, found via the questionnaires and focus groups, is extrapolated to the 2 million viewers of the programmes. So, will the results of the study here become part of an impact case study? Yes, they will. We also believe that the approach outlined may be useful for other researchers to realize some benefit to the ongoing capture of impact.

Notes on the contributors

Melissa Grant is a senior lecturer at the University of Birmingham's School of Dentistry using quantitative methods, such as mass spectrometry of saliva, to study oral health, particularly associated with gum disease (periodontitis).

Lucy Vernall works at the interface of broadcast and research, helping to simulate new TV and radio programmes based on research, and to capture evidence of resulting impact.

Kirsty Hill is a senior lecturer at the University of Birmingham's School of Dentistry using quantitative and qualitative methods to study oral health and its impact on the general population.

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