



Original article

Predictors of protective behaviour against ticks in the UK: A mixed methods study

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ABSTRACT

The objective of this research was to determine the most appropriate protective behaviours to promote in order to protect members of the public from Lyme borreliosis, to identify the drivers and barriers for these behaviours, and to determine the strongest predictors of tick-protective behaviour. We used a mixed methods study with qualitative interviews and a quantitative web survey. Interviews with topic experts and members of the public suggested that predictors of tick checking included perceived disease likelihood and severity as well as overall awareness of ticks and tick-borne disease. Twenty-four percent of participants regularly checked for ticks after walking in a tick-endemic area. The strongest predictors of checking for ticks were greater levels of knowledge, perceived likelihood of being bitten, self-efficacy about tick removal, and lower levels of disgust about ticks. Barriers to checking included forgetfulness and lacking time. At-risk members of the UK public require information to increase awareness of ticks and protective behaviours, particularly tick checking. Information may be most effective if it focuses on increasing self-efficacy while also reducing disgust.

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Introduction

Lyme borreliosis is the most common tick-borne disease in the UK and generally responds well to antibiotics at all stages of infection. However, more serious problems such as viral-like meningitis, facial palsy, and nerve damage do sometimes occur and can be difficult to diagnose and treat (Rizzoli et al., 2011). Reported cases of Lyme borreliosis in England and Wales have risen from 268 in 2001 to 905 in 2010 (Public Health England (PHE), 2012) and these increases are in line with those documented in Europe over the past decade (Hofhuis et al., 2006). Although this increase is likely to be partly driven by factors such as increased awareness of the disease and better diagnostic methods, it has also been influenced by population increases in those tick species that transmit the involved pathogens and an increase in the popularity of recreation-based holidays that bring people into contact with ticks (PHE, 2012). In addition, there are likely to be climate-driven changes to the geographic distribution, density, and activity of the tick species that acts as a vector for the bacteria that cause Lyme borreliosis

(Medlock et al., 2013). Based on these increases, there has been a greater interest in and request for research surrounding the prevention of tick-borne disease, and this research will be used to directly inform public health communication materials.

Despite the steady rise in cases of Lyme borreliosis, this should be preventable given the extensive knowledge about the tick vector and the effectiveness of early treatment (Corapi et al., 2007). Simple behaviours, such as wearing long trousers or checking for ticks after walking in an affected area, can be highly effective. These can prevent people from being bitten by a tick in the first place and allow them to remove ticks before a bite has occurred or in the relatively lengthy period of time (around 48 h) between a bite occurring and any infection being transmitted (Due et al., 2013). In Europe, the transmission delay may be shorter (Kahl et al., 1998), but there is still enough time to make tick checking worthwhile. Regrettably, uptake of these behaviours by the public is poor. Even in high risk areas such as the north-eastern United States where ticks carrying the Lyme bacteria are present in large numbers uptake of behaviours such as wearing long trousers has been reported to be as low as 23% (Hallman et al., 1995).

The use of both health psychology and behavioural change theories may improve uptake of protection strategies by allowing communicators to target those barriers or motivators known to play a role in predicting engagement with these behaviours (Mowbray et al., 2012). Unfortunately, previous research regarding

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ways to encourage tick-protective behaviours has tended to focus on measuring knowledge rather than behaviour as the key outcome, has often grouped all behaviours together making it difficult to assess the importance of different variables in motivating different behaviours, and has made little use of psychological models when identifying what predictors to measures (Mowbray et al., 2012). Despite these faults, the existing research does provide some idea as to what the behavioural predictors might be. These include: knowledge or awareness about ticks (Bartosik et al., 2008; Gould et al., 2008; Jenks and Trapasso, 2005; Fox, 2009; Stjernberg and Berglund, 2005), self-efficacy for performing specific behaviours (Daltroy et al., 2007; Maher et al., 2004), and the perceived likelihood of contracting Lyme borreliosis (Gould et al., 2008). However, these data all come from American research and are not necessarily generalisable to the UK population and context given differences in disease awareness and treatment.

In this study, we used a mixed-methods approach to (i) identify the most appropriate protective behaviours to promote in a communications campaign aimed at reducing the incidence of Lyme borreliosis, (ii) determine the range of factors that promote or inhibit the uptake of these behaviours among members of the public who are at high risk of contracting Lyme borreliosis, and (iii) identify which of these factors are the strongest predictors of behaviour among the public and hence most important to tackle in a communications campaign.

Methods

Design

Our research involved 3 stages. First, we used a series of qualitative interviews with topic experts to identify effective methods for preventing tick bites and tick-borne disease (study aim one). Second, we used qualitative interviews with members of the public to identify the range of factors that motivate people to engage in protective behaviours or that serve as barriers to their uptake (aim two). Third, we used an online survey to quantify tick-protective behaviours among members of the public particularly at risk of contracting Lyme borreliosis and to assess the strength of influence of these motivators and barriers (aim three). Each stage of our research was informed by the preceding stage.

Participants

For our first study, a round of in-depth, one-to-one interviews was held with 13 topic experts. All interviews were conducted from February to April 2011. The participants were chosen so as to provide a varied sample of UK tick experts and were recruited through Public Health England colleague contact lists. Given the nature of qualitative research, there was no specific sample size set, and interviews were run until the point of data saturation for the key question under consideration. Of the 17 people contacted, 13 agreed to participate. Participants were included as long as they had professional expertise with regards to ticks, so they were not necessarily formally trained in tick prevention, but they were fully aware of it and engaged in it as part of their profession. As a result, experts were from a broad range of tick-related professions including clinical epidemiology ($n = 1$), parasitology ($n = 1$), psychiatry ($n = 1$), tick surveillance ($n = 1$), wildlife and land management ($n = 2$), medical entomology ($n = 3$), and university-based professors or researchers specialising in ticks ($n = 4$).

For our second study, we interviewed 25 members of the public aged 18 or over who were residents of an urban area, but who travelled to affected areas of the UK to engage in outdoor activities that could result in their exposure to ticks (Shadick et al., 1997). We

chose to target a population who live in an urban environment, but who engage in outdoor activities in tick-affected locations because we expect this group to be at risk for contracting a tick-borne disease due to their low levels of knowledge about the topic. By choosing people with lower levels of knowledge, we hoped that we could be able to influence behaviour more effectively. All participants were from one London-based outdoor group (out of 7 groups that we initially contacted). The group administrator sent details to approximately 750 group members who then contacted our research team to express interest. Interviews were conducted over the telephone from August to October 2011 until data saturation was reached, which was considered to be when several interviews had been conducted with no new themes being discussed.

For our third study, an online survey, we recruited participants from the same London-based outdoor group. In addition, we recruited through an advertisement sent to university staff and students. Participants who had previously taken part in the second study were made aware that they were ineligible for this study. Because recruitment from outdoor groups and the university was run in parallel and participants may also have forwarded the survey link to family and friends, it is difficult to determine how many participants came from each source. However, based on e-mail addresses, we estimate that approximately two-thirds were university staff or students. All participants were required to be 18 or over and to have been walking or rambling in an area with a known tick population such as the New Forest or Richmond Park. A minimum sample size of 200 participants was set based on previous research (Brown et al., 1992; Hallman et al., 1995; McKenna et al., 2004). The survey was conducted online, and data collection occurred between 15 March 2012 and 26 May 2012.

All three studies received full ethical approval.

Discussion topics for expert interviews

Interviews with topic experts were approximately 45–60 min in length. These interviews were designed to identify the protective behaviours that the general public in the UK could engage in to most effectively avoid ticks and tick-borne disease and what factors might determine the uptake of these behaviours. The development of the interview schedule was based on a review of existing literature on the topic and covered 4 broad areas relating to ticks and tick-borne disease. First, experts were asked about the risk posed by ticks, how people come into contact with ticks, and the possible tick control methods and protective behaviours that one could adopt. Second, we asked questions about how someone can contract Lyme borreliosis, what to do if bitten by a tick, and appropriate and inappropriate removal strategies. Third, more specific questions asked about the nature of Lyme borreliosis, such as how severe it can be, what symptoms it has, and what difficulties exist regarding treatment. Finally, we asked experts what they perceived as potential barriers to practicing tick-protective behaviours and which public health messages they felt the public needed to hear regarding ticks and tick-borne disease. Topics could be discussed in any order, and the interviewer was free to prompt for additional information in areas that appeared particularly relevant or which needed clarification. All interviews were audio-recorded and were later transcribed for analysis.

Discussion topics for public interviews

Having determined the recommended behaviours by speaking with topic experts, the public interviews provided an opportunity to examine the factors that influence whether or not people engage in each of these behaviours, and why. An interview schedule was developed based on existing literature and the results from the interviews with topic experts. It was designed to cover the

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