

Attention for Lyme prevention

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Valorization addendum

The studies presented in this thesis have implications for society and the economy, in addition to its scientific relevance. As is explained in this thesis, Lyme borreliosis (LB) is the most commonly reported tick-borne disease in North Eastern USA and Europe. In 2014, Dutch general practitioners (GPs) assessed approximately 82,000 patients with tick bites and erythema migrans (EM) was diagnosed in 23,500 of them. LB has the 12th highest disease burden when compared to the comprehensive disability-adjusted life years (DALY) estimates for 32 other infectious diseases. This disease burden attributed to LB demonstrates the need for continued prevention and control efforts. Furthermore, preventive measures like avoiding tick areas, wearing protective clothing, using insect repellent are effective, cheap, safe, and easy to apply. These measures to reduce the risk of tick exposure (primary prevention measures) or checking the body for ticks (secondary prevention) are well-known, but universally the uptake is poor. We therefore investigated the social-cognitive variables associated with people's motivation to take preventive measures against ticks. Based on these results we developed four new intervention tools to inform about ticks and LB and to promote preventive measures: a leaflet, a movie, an online educational video game, and a mobile app. This has led to intervention tools that are well appreciated by the public and also effective to improve their (intention to engage in) preventive behavior. The leaflet and the movie are free and available for anyone on www.rivm.nl/tekenbeet, the game via www.teekcontrol.nl, and the app in the Google Play Store and the App Store. The site www.rivm.nl/tekenbeet attracts around 220,000 unique visitors annually. It appears that the game and the app are very popular, since the game has been played more than 35,000 times since the launch in 2012 and the app has been downloaded more than 60,000 times since 2014.

The developed intervention tools can be called innovative, as these are the first theory- and evidence-based online educational video game and mobile app on ticks and LB in the Netherlands. Since the daily use of these tools is transparent via Google Analytics, the effects of the media-attention you pay to these tools on the use of it is also transparent. This is in contrast with a leaflet for example; once it is downloaded you don't have insight in the use and dissemination of it anymore. This impact assessment of media attention is very motivating and



stimulating to the employees of the internal department of communication of the RIVM.

To disseminate the findings of the studies included in this thesis among professionals and the public at large, the results are presented at several (inter-)national congresses, published in (inter-)national scientific and public journals and discussed on national radio and television broadcastings (e.g. www.nporadio1.nl/vroege-vogels/onderwerpen/188262-teken-vroeg-dit-jaar and jeugdjournaal.nl/artikel/356039-game-over-teken-gemaakt.html). Furthermore, Chapter 1 (Introduction) and Chapter 10 (Discussion) of this thesis are compiled as Chapter 22: 'Evidence-based health promotion programmes and tools to prevent tick bites and Lyme borreliosis' in volume 4 of the Ecology and Control of Vector-borne diseases series 'Ecology and prevention of Lyme borreliosis'. And last but not least, each year around springtime, the national awareness week on tick bites (www.weekvandeteek.nl) is organized to mark the onset of the tick bite season. The RIVM and Wageningen University, together with other stakeholders distribute public health education about the relevance of body checking, prompt tick removal, and when to visit a physician. The results of the studies in this thesis are incorporated in this campaign yearly.

Between 2009 and 2014, the analyses of the average annual number of ticks per square metre per month conducted by the tick monitoring programme of Wageningen University did not indicate a significant change in tick abundance in the Netherlands. However, for the first time since the start of the identical GP surveys in 1994 in the Netherlands, there has been observed a decreased incidence in tick bite GP consultations in 2014. Whether people decide not to consult a physician for a tick bite, may be influenced by public health education and media attention. Possibly, the decrease in GP consultations for tick bites may reflect the impact of the four newly developed intervention tools. The studies in this thesis demonstrate that all newly developed interventions are effective. Public Health Services (PHS), GPs, national nature organisations, Scouting Netherlands and the Dutch Foundation for Lyme patients are advised to promote this mix of interventions to reach as many people as possible to encourage them to take part in prevention programmes on ticks and LB. These programmes should not only focus on adults, but also on school children. For example, by integrating the game 'Teekcontrol' in a school education programme on ticks and LB, both children and their parents can be reached. The development of effective interventions on tick bites and LB is a challenge in itself, but the implementation of the interventions is even more important. The development of these interventions was made possible by a one-off subsidy from the Ministry of Health, Welfare and Sport (VWS). However, developing these interventions without any options for their structural implementation is not likely to achieve a sustained impact on public health. In particular, when a prevention programme is aimed at specific measures to prevent a 'seasonal risk' that is only present for a number of months per year, and the interventions have no long lasting effects, intermittent attention is needed. We recommend that the RIVM and PHS maintain



ongoing advertising campaigns throughout the entire tick season, every year. On-line interventions like online games, movies and apps, are particularly in need of advertising as they are not tangible products like a leaflet or a poster, which you can easily, even inadvertently encounter. Therefore, we recommend that online social media (Twitter, Facebook, Instagram etc.) be used, as well as traditional media (newspapers, radio, television) to repeatedly draw attention to these on-line interventions. Furthermore, governments and research funds are advised to fund above all the systematic development of prevention programmes based on the principals of intervention mapping. Besides, the provisional funding of the development of a systematically positive developed prevention programme should be followed by the structural funding of an implementation programme and a cost- and effect evaluation of this implementation.

Finally, it is very important that evidence based guidelines on the prevention of tick bites and LB are available for professionals in public health. These guidelines should focus on measures which are practical and achievable for individuals. As measures like applying pesticides and reducing tick habitat cannot be performed by an individual, and vaccines are not available yet, they should not be included in guidelines, like the CBO guideline. This guideline should focus primarily on educating the public to avoid tick areas, wear protective clothing, use insect repellent, check for ticks and remove ticks promptly. Moreover, it should be considered to complement the CBO guideline with the four newly developed effective intervention tools to change preventive behavior: the app 'Tekenbeet' (Tick bite), the online serious game 'Teekcontrol', the movie and the leaflet.



