"The First Cancer Vaccine" and One of the Most Frequent Targets of Misinformation Campaigns in the Field of Biomedicine

Coffee Beans

Prof. RNDr. Vanda Boštíková, Ph.D.

Faculty of Social Sciences, Charles University

Prof. RNDr. Aleš Macela, DrSc.

Faculty of Military Health Science, University of Defence

Human papillomaviruses are currently the most common sexually transmitted infection. Certain strains of human papillomavirus (HPV) are responsible for more than 90% of cervical cancers, 70% of vaginal and vulvar cancers, and 60% of penis and oropharyngeal cancers. Cervical cancer is the second most common cancer in women under the age of 45 worldwide. More than 85% of cases are currently reported from developing countries. HPV vaccines represent a major advance in the prevention of these cancers.

Unfortunately, the safety and effectiveness of vaccines in general, as well as HPV vaccines in particular, have become the target of many misinformation attacks and social media campaigns. In the first place, the popular social media platform Instagram is being abused in this regard and is a major source of medical misinformation. Twitter is a close second. In the United States alone, these platforms are used by more than 65% of adults aged 30-49 years, which corresponds to a key demographic of parents likely to have children eligible for the HPV vaccine (9-14 years). The safety, as well as the efficacy, of currently available vaccines are most often challenged there. In the Czech Republic, an effective HPV vaccine has been available since 2006.

There is very poor awareness of vaccination against this disease in our population, again associated with a great deal of misinformation. As HPV vaccination is not compulsory, vaccine coverage is woefully low, despite the fact that the vaccine has the potential to protect against malignant neoplasia.

The most common myths in the Czech environment about HPV vaccines are, for example, that:

... the HPV vaccine has not been shown to prevent cervical cancer;

... cervical smears are sufficient to prevent cervical cancer;

... vaccines are not safe and have not been adequately tested;

... vaccines are unnecessary because in most people, the immune system can cope with the   disease, and the disease doesn't break out;

... the recommended age for vaccination is too low.

Health misinformation on social media is very diverse, often with strong emotional undertones. Anti-vaccine groups spread misinformation without presenting evidence, use fictional case studies to affect the public emotionally, and spread distrust of information from health professionals and official sources, often referring to the economic benefits of drugs or vaccines for manufacturers (Figures 1 and 2).

The analysis conducted using Netlytic software looked at publicly available English-language

Instagram posts collected from April to December 2018. In total, 16 607 texts containing the hashtags #HPV, #HPVaccine, or #Gardasil were selected. Content analysis of the relevant posts revealed several levels of misinformation, mostly centred on claims about vaccines' dysfunction, dangers, and complications after vaccination.

This misinformation is a major threat to public health and medicine in general. Tackling misinformation on social media requires a proactive approach, including cultivating reading comprehension and critical thinking. Other recommendations on how the antivaccine movement can be countered include but are not limited to creating official social media accounts for health organisations, modifying the algorithm for finding official information from valid sources, displaying valid sources first in search results, and most importantly, systematically educating people in finding valid sources.

The ability to counter misinformation depends precisely on raising the level of health education. In Western universities and secondary schools, the curriculum is gradually expanding to develop students' ability to distinguish validly between information and misinformation. Within this framework, one of the basic strategies recommended is to use direct and concise explanations of facts when communicating with students, pairing scientific facts with stories or reinforcing positive attitudes towards vaccinations. Increasing the number of positive vaccine advertisements could also have a positive impact. In general, however, there is a need to try to increase respect for scientific work among the general public. Scientists themselves need to be active in this regard.
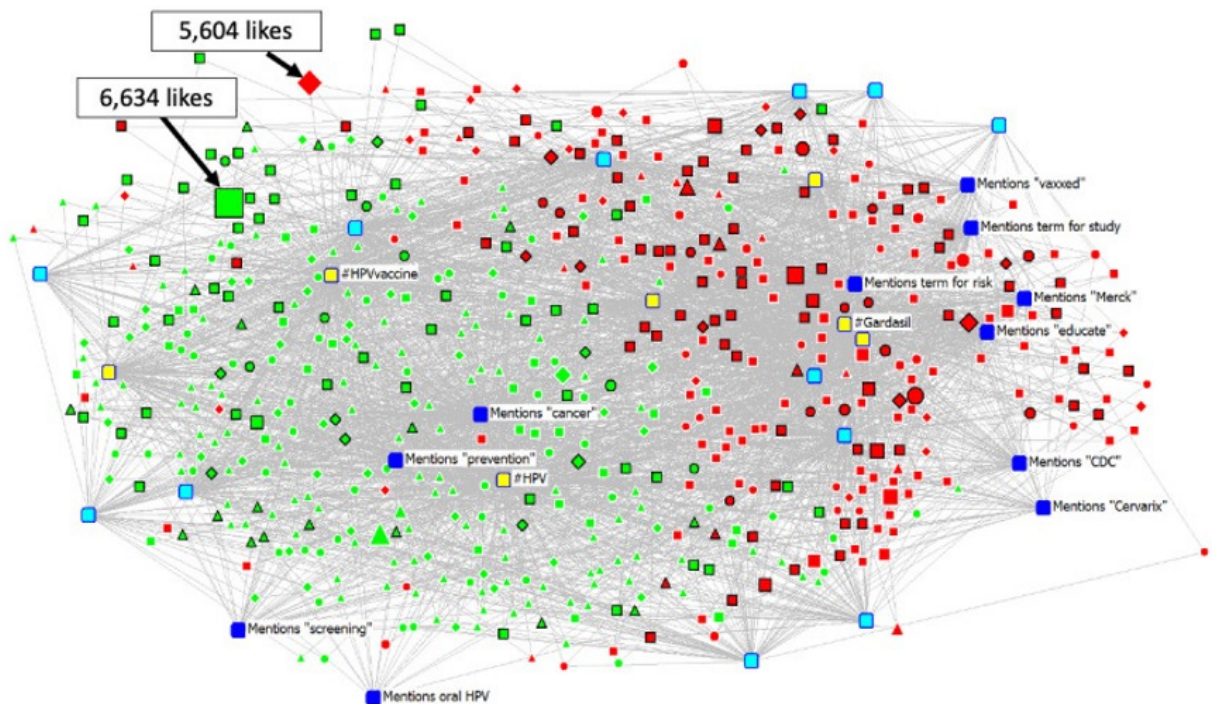
Figure 1

Figure 1: A network analysis of 580 social media posts containing the hashtags #Gardasil, #HPVvaccine, #HPV. The term #Gardasil was the centre of antivaccine opinions focused on vaccine risks. In contrast, the hashtags #HPVvaccine and #HPV were the centre of much more numerous pro-vaccine posts focused on cancer prevention issues. Antivaccine posts contained many more nodes with a black border, indicating that the post was a personal narrative as opposed to information/sources with a white border (see explanatory notes). The size of the posts was proportional to the number of 'likes' received - the most 'liked' post (6634 likes) was a positive personal narrative post created by a non-healthcare professional.

Explanatory notes:

circle - post was written by a group of non-health professionals

square - post came from an individual outside the health profession

triangle - post from a group of health professionals

diamond - post from an individual health professional

The black edge of the node indicates a personal narrative, and the white edge represents classically given embellished information. Red indicates antivaccine content of the contribution, and green indicates a positive attitude towards vaccination and vaccines. Light blue represents the source of the posts gathered from social media images, dark blue draws data from the headlines, and yellow represents social media elements. The size of the nodes depends on the number of posts.
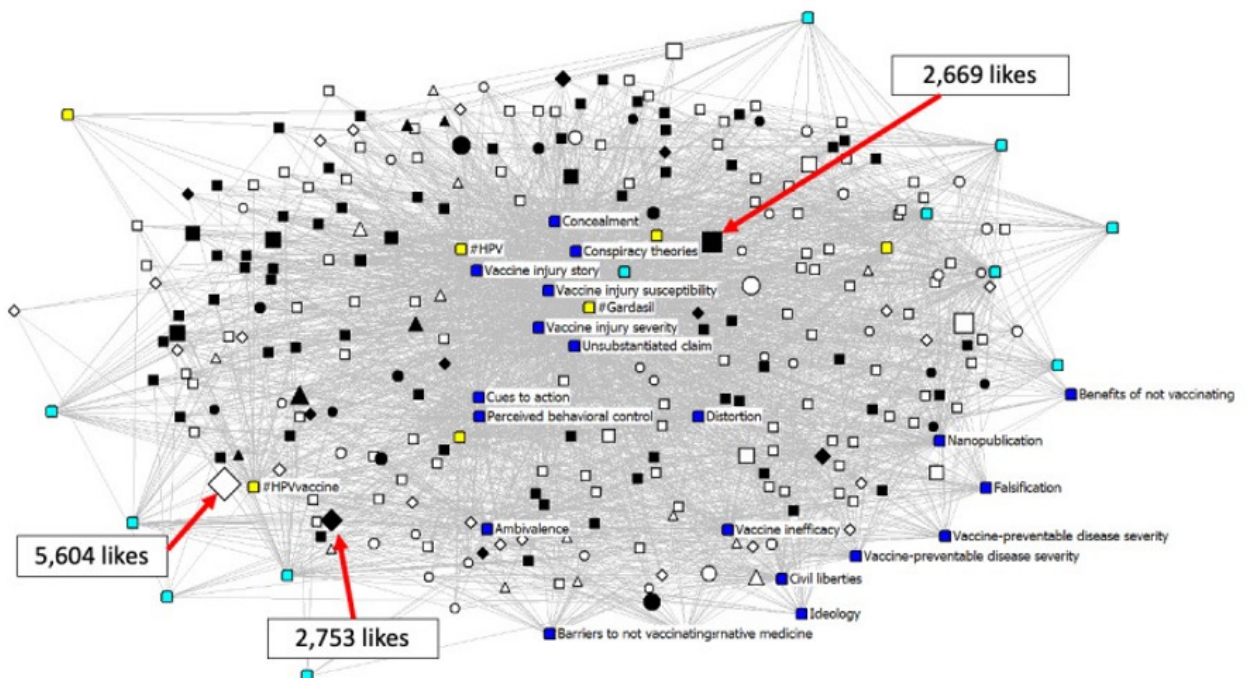
Figure 2

Figure 2: *Visualization of the anti-vaccination network based on the analysis of a total of 256 posts. At the centre of the network are information withholding, unsubstantiated claims and stories of harm to the human body from vaccines. Misrepresentation, falsification and ambivalence stand more on the periphery. Similarly, posts touching on conspiracy theories and vaccine ineffectiveness stand at the centre of the network, while posts on debates about vaccination, ideology, alternative medicine, and civil liberties remain on the periphery. Social media elements (in yellow), such as the use of hashtags, links and mentions of other users, were also at the centre of the network. Posts with information/sources (white) clustered around domains of misinformation, including falsification, while posts with personal narratives (black) clustered around various domains of misinformation, including concealment and conspiracy theories. The colour and shape codes are identical to Figure 1 (Massey, PM et al., Dimensions of Misinformation About the HPV Vaccine on Instagram: Content and Network Analysis of Social Media Characteristics, J Med Internet Res. 2020 Dec; 22(12): e21451).*