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Agent based model of anti-vaccination movements: simulations and comparison with empirical data

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A realistic description of the social processes leading to the increasing reluctance to various vaccination forms is a very challenging task. This is due to the complexity of the psychological and social mechanisms determining the individual and group positioning versus vaccination and the associated activities. Understanding the role played by social media and the Internet in the current spread of the anti-vaccination (AV) movement is of crucial importance. We present long-term Big Data analyses of the Internet activity connected with the AV movement for such different societies as the US and Poland.

The datasets we analyzed cover multiyear periods preceding the COVID-19 pandemic, documenting the vaccine-related Internet activity with high temporal resolution.

These activities show the presence of short-lived interest peaks, much higher than the low activity background. To understand the empirical observations we propose an Agent Based Model (ABM) of the AV movement including complex interactions between various types of agents and processes. The model reproduces the observed temporal behavior of the AV interest very closely.

The model allows studying strategies combating the AV propaganda. The increase of intensity of standard pro-vaccination communications by the government agencies and medical personnel is found to have little effect. On the other hand, focused campaigns using the Internet and copying the highly emotional and narrative format used by the anti-vaccination activists or censoring and taking down anti-vaccination communications by social media platforms can diminish the AV influence. The benefit of such tactics might, however, be offset by their social cost, for example, the increased polarization and increased persecution and martyrdom tropes.

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