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# THE EFFECT OF SOCIAL MEDIA AND THE INTERNET
# ON VACCINATION CONSPIRACY BELIEFS − A PILOT STUDY*

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**Abstract:** Despite the scientific consensus that vaccination against infectious diseases represents one of the most successful medial interventions in the entire human history, recent decades have seen renewed skepticism about vaccination and its effects. Among various reasons for the surge in skepticism, such as postmodern delegitimisation of science and objective knowledge and crisis of institutional trust, the advent of new media (the Internet) and social media are often selected as one of the important causes of the skepticism. The Internet and social media enable the spread of false information and create echo chambers wherein attitudes are strengthened in the interaction with like-minded individuals. By employing structural equation modelling the author attempts to compare the effects of the old (television) and new (social media and the Internet in general) media on vaccination conspiracy beliefs. The direct effects, as well as indirect effect (mediation through institutional and generalised trust) are compared against each other. The pilot study was based on a convenience sample of the general population of the Republic of Croatia, whereas the data were collected through the use of an online questionnaire.

**Keywords:** the Internet, social media, vaccination, institutional trust, generalised trust.

## Introduction

Despite the scientific consensus that vaccination against infectious diseases represents one of the most successful medial interventions in the entire human history, recent decades have seen renewed skepticism about vaccination and its effects

(Dubé *et al.*, 2018; World Health Organization, 2014), even though serious disease outbreaks and mandatory immunisation programmes in some European countries led to the increased public confidence in vaccination (Larson *et al.*, 2018). Vaccine refusal and/or skepticism can be conceived as a significant health risk, bearing in mind that it might lead to the disappearance of the effective herd immunity that provides immunity to those individuals who cannot take vaccines due to age or various conditions related to immunity weaknesses (Barbacariu, 2014). Therefore, in spite of the fact that some infectious diseases are virtually non-existent in Europe, vaccine skepticism and hesitancy can lead to serious public health issues in the future.

Even though it might seem that vaccine refusal and skepticism about vaccines represent a unified phenomenon, it has to be borne in mind that there are different forms of negative attitudes and behaviours related to vaccines, coming from different sources and based on various motivations. Vaccine refusal is sometimes coming from the general opposition to state authority, i.e. to mandatory vaccination. Additionally, a person can be vaccine-hesitant only about particular vaccines, whereas other persons can be generally vaccine-hesitant. Similarly, a person can be vaccine-hesitant only in the case of one's child, leading to the so-called slow-vax movement. In such cases, parents are convinced that they have in-depth knowledge of their children's immune system, i.e. they think that they can design optimal vaccination schedules for their children, as opposed to a one-size-fits-all schedule (Reich, 2016).

According to the data coming from the Joint Reporting Form collected by the WHO/UNICEF (Lane *et al.*, 2018), top three cited reasons given for hesitancy were: (1) risk–benefit (scientific evidence), (2) lack of knowledge and awareness of vaccination and its importance and (3) religion, culture, gender and socioeconomic issues regarding vaccines. In the first case, vaccine hesitance arises from the concerns about vaccine safety and its benefits vs. side-effects. In the second case, hesitance is a consequence of unsatisfactory knowledge about vaccine benefits, while in the third case religious beliefs or cultural values, as well as gender or social related issues, exert an impact on vaccine hesitancy. Based on the above mentioned data source, Lane *et al.* (2018) concluded that risk–benefit reason was the most common one, especially in Europe, even though most country data are based on experts' opinion and not on the objective assessment.

Vaccine refusal and hesitance are not easily predicted on country level, pointing out to the different processes, some of them probably very idiosyncratic, which influence vaccine attitudes. For instance, based on data from 65,819 individuals across 67 countries, Larson *et al.* (2016) determined that seven of the ten least confident countries are located in Europe. Overall, countries with higher levels of educational attainment and economic development (GDP) have a higher level of negative attitudes about vaccines, but these patterns are not valid in many cases. However, on the individual level, more educated persons are more likely to have positive vaccine

attitudes. Interestingly, they also found that average persons older than 65 years and Roman Catholics (when compared to members of other religions) are more likely to have positive attitudes about vaccines.

## Internet, social media and vaccine hesitancy

Individuals are increasingly seeking health information on the Internet, probably due to the feelings of competence, autonomy and relatedness that online health information offers to them (Ting Lee and Lin, 2016). Thus, it is no surprise that vaccine related information is also often sought on the Internet (Jones *et al.*, 2012; Mavragani and Ochoa, 2018; Meppelink *et al.*, 2019; Sak *et al.*, 2016). As for the impact of the Internet on vaccination attitudes, it can be noted that this field of research is still in development. Up to this moment, there are some accumulated empirical findings from the research studies, but the level of theoretical integration of the findings is very low. For instance, Kim and Jung (2017) found that the frequency of reading the news on the Internet was negatively linked to vaccination intentions, the association of vaccine intentions with the amount of reading the printed media and listening to the radio was positive, while connection in the case of television viewing is not established. Recent research in the UK has shown that more than 40% of parents receive negative information about vaccination through online social networking sites (Iacobucci, 2019), and an analysis of online media content in India (Kumar Das and Singh, 2018) also showed that almost 30% of all vaccine news is negatively intonated.

Nevertheless, as stated above, there are no encompassing theoretical models that can explain the findings. Generally speaking, a new sense of health empowerment that the Internet provides to the health information seekers might be a positive development. The multitude of information sources, a sense of agency and responsibility for one's health theoretically might lead to better health outcomes. However, there is a growing concern that online health information seeking might have detrimental consequences on health attitudes and decisions. Specific characteristics of the Internet as a communication platform are often blamed for such development. In this sense, two related concepts – echo chambers and filter bubbles – are often evoked as possible explanations. The concept of the so-called echo chambers (Hall Jamieson and Cappella, 2008) implies that persons are living in enclosed spaces wherein they encounter only opinions and attitudes that match their own preconceptions on a particular topic. The echo chambers lead to further group polarization and the impermeability to rational arguments that contradict the existing attitudes. The opposing side is often presented as evil and untrustworthy, which makes impossible any kind of argumentation that can lead to mutual understanding and respect for different opinions. In other words, even though the Internet might provide an open forum for diverging opinions, in practice we often encounter strong preference

for black and white worldviews and unwillingness to even hear opinions that contradict one's own opinion. Inconsequence, open communication can even decay into emotional arguments and verbal aggression. Filter bubbles (Pariser, 2011), sometimes called *epistemic bubbles*, represent a similar, but still a distinct concept. Since the Internet search engines are customizing search results to every individual user, we are faced with personalized information sources that are largely consistent with our own preexisting opinions and attitudes. Namely, if we do not share the information universum that the search engines provide for us, this might lead to further divergence of conflicting opinions.

Based on these theoretical ideas, it can be assumed that the frequency of finding health information on the Internet may lead to vaccine conspiracy beliefs among persons who are already prone to such beliefs. Additionally, media cultivation research that investigated the impact of television on the worldview of its viewers (e.g. Romer, Jamieson and Aday, 2003) often determined that the exposure to media reality alters perception and, as a consequence, led to the decline of generalised trust and trust in specific social institutions. Therefore, the main goal of our study was to integrate these ideas into one model that can test specific mechanisms of assumed causal influence, both direct and indirect ones, and to test it in a pilot study in order to draw conclusions for the further development of the model.

## Research questions and methods

Based on the delineated theoretical framework, the following research questions have been proposed:

*RQ1: Is there a direct influence between the intensity of the Internet and social networking sites usage and vaccine conspiracy beliefs?*
*RQ2: Is the influence of the Internet, social networking sites and television mediated through generalized trust, healthcare trust and the frequency of finding health information on the internet?*
*RQ3: Is the influence of television mediated through generalized trust and healthcare trust?*

In the current study one particular aspect of vaccine hesitancy – vaccine conspiracy – was measured. Vaccine conspiracy is probably one of the most intensive vaccine hesitancy indicators, having in mind that it not only involves higher level of doubt about vaccine efficiency and rationale for vaccination, but it also implicates that there is some sort of intentional cover-up of vaccine side-effects and true motives for vaccination as a public health intervention. In other words, persons who believe in vaccine conspiracy assume that there are background material interests which push for more vaccination even though there are no objective and justifiable reasons for doing so. The scale of vaccine conspiracy beliefs (VCS) (Shapiro *et al.*,

2016) comprising seven items was used in the study. Some of the items were: *Vaccine safety data is often fabricated; Immunizing children is harmful and this fact is covered up*; *Pharmaceutical companies cover up the dangers of vaccines.*

Generalized trust (GTR) was measured by employing three items comprising the so-called Mean World Syndrome Index (Gerbner *et al.*, 1980b). The items are as follows: (1) *most people are just looking out for themselves*, (2) you can't be too careful in dealing with people, and (3) *most people would take advantage of you if they got a chance.* The scale had satisfying reliability (Cronbach's alpha amounted to 0.81). Trust in healthcare system measurement scale (HTR) was measured with a revised nine-item scale constructed by Shea *et al.* (2008). Some of the items comprising the scale were as follows: *The Health Care System does its best to make patients' health better* and *The Health Care System gives excellent medical care.* The scale reliability was satisfactory as well (Cronbach's alpha equalled 0.91). The frequency of obtaining health information on the Internet was measured on a 1 (never) to 5 (very often) scale.

Internet (INT), social networking (SNS) and television (TEL) activity were measured by asking how many hours a person spends on these activities on average daily. Religious identification was measured from 1 – non religious to 6 – very religious, while education was measured on a scale ranging from 1 – elementary education to 6 – university education. Age in years was also measured, while gender was coded as female and male.

Data were collected in 2018 by means of an online survey, wherein a convenience sample from Croatia (N = 822) was used. Female respondents (62%) and university educated persons (43%) were overrepresented. The average age of the respondents was 41 yrs, while the average religiosity was 3.06.

## Results

In Figure 1 the hypothesized theoretical model, i.e. the model of examined possible causal influences is shown. As can be discerned from the stated research questions, it was hypothesized that the influence of the Internet and social networking sites usage was mediated through generalized trust, trust in the healthcare system and the frequency of obtaining health information on the internet. Covariances between some of the exogenous variables had been added to the model as well. In Figure 1 standardized regression weights are shown, while in Table 1 both unstandardized estimates and standardized regression weights of selected variables are included, in addition to their standard errors and significance levels.

First, we can note that searching for health information on the Internet (INF) is not directly connected to vaccine conspiracy beliefs (VCS). However, there is a strong path that connects the frequency of searching for health information on the Internet (INF) and trust in the healthcare system (HTR) (standardized regression

weight is − 0,14) and trust in the healthcare system and vaccine conspiracy beliefs (VCS) (standardized regression weight is − 0,66). In other words, the frequency of searching for health information on the Internet (INF) exerts a significant indirect influence (standardized regression weight is 0.09) on the vaccine conspiracy beliefs (VCS).
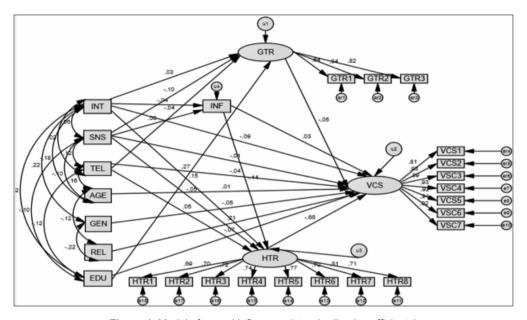


**Figure 1**. Model of causal influences (standardised coefficients)

From Figure 1 can also be noted that religiosity is connected to vaccine conspiracy beliefs (coefficients amounted to 0.21), and this path is statistically significant. There is also, albeit smaller (-0.07) a negative association between level of education and vaccination conspiracy beliefs. The other two demographic variables did not prove to be significantly associated with vaccination conspiracy beliefs.

As for the model fit indices, they could be divided into two groups: the ones that make comparisons against the null model (no parameters estimated), and the ones that assess covariance similarity (sample and model-implied). In the first group of indices, we selected NFI (normed fit index) which was 0.91 (close to 0.95 indicates good model fit) and TLI (Tucker Lewis index) which amounted to 0.91 (close to 0.95 indicates good model fit as well). When it comes to the second group of indices, the most common one is RMSEA (root-mean-square error of approximation) which equalled 0.07, indicating a reasonably good model fit. Overall, model fit indices point to the fact that the model can be further improved by adding new theoretical constructs which would help explaining influences of the Internet and the Internet social networking sites on vaccination conspiracy beliefs (Table 1).

**Table 1**. Selected regression weights

| Coefficient | Estimate | Standardized weight | Standard error | p |
|---|---|---|---|---|
| GTR > VCS | - 0.09 | - 0.05 | 0.05 | 0.07 |
| INF > VCS | 0.03 | 0.03 | 0.03 | 0.22 |
| HTR > VCS | - 0.81 | - 0.66 | 0.05 | 0.00 |
| INT > VCS | - 0.04 | - 0.09 | 0.01 | 0.01 |
| SNS > VCS | - 0.01 | - 0.01 | 0.02 | 0.80 |
| TEL > VCS | - 0.03 | - 0.04 | 0.02 | 0.13 |
| AGE > VCS | 0.00 | 0.01 | 0.00 | 0.64 |
| GEN > VCS | - 0.10 | - 0.05 | 0.00 | 0.09 |
| REL > VCS | 0.14 | 0.21 | 0.02 | 0.00 |
| EDU > VCS | - 0.05 | - 0.07 | 0.02 | 0.01 |
| INT > GTR | 0.01 | 0.03 | 0.01 | 0.44 |
| SNS > GTR | - 0.03 | - 0.10 | 0.02 | 0.03 |
| TEL > GTR | - 0.02 | - 0.04 | 0.02 | 0.33 |
| INT > INF | - 0.01 | - 0.04 | 0.02 | 0.37 |
| SNS > INF | 0.04 | 0.08 | 0.02 | 0.05 |
| INF > HTR | - 0.12 | - 0.14 | 0.03 | 0.00 |
| INT > HTR | 0.05 | 0.15 | 0.01 | 0.00 |
| SNS > HTR | - 0.02 | - 0.05 | 0.02 | 0.29 |
| TEL > HTR | 0.03 | 0.05 | 0.02 | 0.17 |

## Discussion and conclusion

As can be seen from Figure 1, the frequency of Internet use is negatively correlated with vaccine conspiracy beliefs, and positively correlated with healthcare trust. Since main demographic variables that are connected to the Internet use, such as age, gender and education, are included in the model, the possible explanation of the finding might be the higher level of social integration that might follow from the Internet use. On the other hand, the frequency of SNS use is not directly correlated with vaccine conspiracy beliefs, however, there is a small effect that comes from mediation through generalised trust. In other words, SNS use leads to lower generalised trust and, in turn, to higher vaccine conspiracy beliefs. Thus, the tentative conclusion coming from these results would be that general Internet use and social networking sites use should be investigated separately. In addition, even though healthcare trust was significantly associated with vaccine conspiracy beliefs in the model, which is in line with previous research (e.g., Betsch and Sachse 2012; Mesch and Schwirian, 2014), healthcare trust was not associated with SNS and the Internet usage, and thus did not prove to be significant mediator of the possible Internet effects on vaccination conspiracy beliefs.

The finding of the current study that showed that there was a significant positive correlation between the frequency of searching health information on the Internet and vaccine conspiracy beliefs is in line with the results obtained by Vrdelja *et al.* (2018). Namely, they determined that active searching for vaccine-related issues is strongly connected to vaccine hesitance, while passive searching is weakly connected to vaccine hesitance. Vrdelja *et al.* (2018) study showed insignificance of vaccine related information found on television, both actively and passively obtained, with regards to vaccination beliefs. We cannot directly compare this particular finding with the results of our study since we didn't measure health information found on the television, but only the overall intensity of television viewing. However, both studies indicate that television might be of decreasing importance when it comes to vaccination attitudes and decisions.

The most important general lesson from the findings related to the Internet and social networking effects, that will be used in subsequent revisions of the model, is that the Internet can be used in different ways and that specific usage types must be accounted for since they bring about different effects (e.g., Ying-Chao Lin *et al.*, 2012). More concretely, both platforms can be used for obtaining scientifically sound information, but they could also be used for misinformation and the spread of pseudoscience.

On the other hand, television use was unrelated to any of the measured constructs in the model. Therefore, it seems that television does not have any effect on vaccine conspiracy beliefs. In other words, the findings of the cultivation research from the „golden age" of television (e.g. Gerbner *et al.*, 1980a) may not be valid today given the number of media outlets and multiplicity of various information sources. However, a word of caution is also warranted here. Namely, in line with the conclusion stated in the last paragraph, we have to bear in mind that we measured only the hours of television viewing, i.e. we did not measure specific forms of television usage, especially the ones regarding searching and finding health information in television content.

As for the demographics, we can note that the more religious persons were the more likely they expressed vaccine conspiracy beliefs. This is mostly in line with the previous research (Fournet *et al.*, 2018), even though in most cases doctrinal opposition to vaccination can be related only to Christian denominations that put a strong emphasis on faith healing (Grabenstein, 2013). The same applies to less educated persons, i.e. they are more prone to endorse vaccination conspiracy beliefs. In this case as well, it can be noted that most researches confirm association between higher education levels and positive vaccination attitudes (Yousif *et al.*, 2013), even though there are researches which found opposite association or no association at all (Pottinger *et al.*, 2018). On the other hand, the impact of gender was on the edge of statistical significance, i.e. we could not confirm the association in this causal model. In most cas-

es, previous research determined that women are more often vaccine-hesitant than men (e.g., Elbur *et al.*, 2014), although the opposite findings can also be encountered (Rozbroj, Lyons and Lucke, 2019). Overall, the results of the current study confirmed that the impact of demographics on vaccination attitudes is highly context-dependent, which is visible from the short overview of the previous studies.

Out general conclusion is that the proposed model needs to be improved, since the average to low fit indices pose the need for theoretical and/or measurements improvements. Additionally, it can also be concluded that the idea of general Internet cultivation effects may be too broad and needs to be related to specific Internet contents. The impacts of the Internet and SNS should be also separately investigated since their effects on vaccination conspiracy beliefs and the mediating variables were completely different in both direction and scale.

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