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Knowing less but presuming more: Dunning-Kruger effects and the endorsement of anti-vaccine policy attitudes

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ABSTRACT

Objective: Although the benefits of vaccines are widely recognized by medical experts, public opinion about vaccination policies is mixed. We analyze public opinion about vaccination policies to assess whether Dunning-Kruger effects can help to explain anti-vaccination policy attitudes.

Rationale: People low in autism awareness – that is, the knowledge of basic facts and dismissal of misinformation about autism – should be the most likely to think that they are better informed than medical experts about the causes of autism (a Dunning-Kruger effect). This "overconfidence" should be associated with decreased support for mandatory vaccination policies and skepticism about the role that medical professionals play in the policymaking process.

Method: In an original survey of U.S. adults (N = 1310), we modeled self-reported overconfidence as a function of responses to a knowledge test about the causes of autism, and the endorsement of misinformation about a link between vaccines and autism. We then modeled anti-vaccination policy support and attitudes toward the role that experts play in the policymaking process as a function of overconfidence and the autism awareness indicators while controlling for potential confounding factors.

Results: More than a third of respondents in our sample thought that they knew as much or more than doctors (36%) and scientists (34%) about the causes of autism. Our analysis indicates that this overconfidence is highest among those with low levels of knowledge about the causes of autism and those with high levels of misinformation endorsement. Further, our results suggest that this overconfidence is associated with opposition to mandatory vaccination policy. Overconfidence is also associated with increased support for the role that non-experts (e.g., celebrities) play in the policymaking process.

Conclusion: Dunning-Kruger effects can help to explain public opposition to vaccination policies and should be carefully considered in future research on anti-vaccine policy attitudes.

1. Introduction

In early 2017, President Trump tapped vaccine skeptic Robert Kennedy Jr. to chair an administrative panel on the safety of vaccines. According to Kennedy, the president – who is an outspoken critic of vaccine science – is critical of "current vaccine policies" (Kaplan, 2017). Although we do not yet know which specific policies have piqued the president's suspicions, we do know that a fair number of people share his skepticism. Nearly one in three U.S. adults oppose mandatory vaccine requirements for attending public schools (Joslyn and Sylvester, 2017), and less than half believe that scientists understand the health effects of the MMR vaccine "very well" (Funk et al., 2017). Misinformation about the link between vaccines (like MMR) and autism have been shown to contribute to this phenomenon (Joslyn and Sylvester, 2017; see also Lewandowsky et al., 2017).

The prevalence of anti-vaccine ("*anti*-vax") policy attitudes in both the public and the White House is a troubling development. Vaccines prevent the outbreak of diseases that used to be widespread, saving millions of lives. However, while vaccination rates for measles, mumps, and rubella (MMR) and other diseases have remained uniformly high – at around 90% – in recent years (CDC, 2017; CDC, 2011), *anti*-vax policy positions and expert skepticism might encourage support for policy proposals that could reduce this rate. Understanding why the public holds *anti*-vax policy attitudes – despite scientific consensus for their importance – is therefore an important research question.

In this article, we propose and put to the test a novel theoretical

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framework for making sense of why individuals hold *anti*-vax policy attitudes. First, drawing on recent work in social psychology, we argue that individuals low in autism awareness – which includes not only the knowledge of basic facts about autism, but the dismissal of misinformation about the link between vaccines (like MMR) and autism – should be the most likely to think that they know *more* about the causes of autism than medical and scientific experts. This "overconfidence" can be thought about as a type of Dunning-Kruger effect (Dunning, 2011), in which individuals who lack expertise fail to accurately appraise their own knowledge *vis-a-vis* experts on the subject.

Second, we suspect that people who think they know more than medical experts will take issue with experts' role in the policymaking process related to vaccination. Specifically, we argue that overconfidence about the causes of autism will be associated with increased opposition to mandatory vaccination policy (which is endorsed by most medical professionals; CDC, 2017), with decreased support for the role that medical experts play in informing the public and crafting vaccine-relevant policy. Notably, while a link between Dunning-Kruger effects and *anti*-vax policy attitudes has been theorized to exist in the recent past (Camarago and Grant, 2015), we are not aware of any research testing this claim. We conclude by noting that insights from social psychology – including the study of Dunning-Kruger effects – can be useful in understanding why U.S. adults oppose vaccination policies endorsed by medical professionals.

1.1. Explaining anti-vax policy attitudes in the american mass public

Why do large segments of the American public hold *anti*-vax policy attitudes despite consensus in the medical community that vaccines prevent the development and spread of disease? Public attitudes towards vaccinations are complex and driven by a mix of scientific, psychological, sociocultural, and political factors (Larson et al., 2011; Carpiano and Fitz, 2017). Research suggests that limited knowledge and misinformation about vaccines play a vital role in public attitudes. U.S. adults are generally uninformed or misinformed about the safety of vaccines, particularly concerning their rumored link to autism. A wide range of sources, internet blogs, celebrity activism, and various media point to this link despite no validated scientific evidence supporting this link (Bean, 2011; Brown et al., 2010; Kata, 2010, 2012). The ease of access to misinformation increases skepticism about science and an outright disregard of scientific evidence. For example, research has shown that misinformation has led to a perception among some that mandatory vaccinations are a result of influence from the pharmaceutical industry and pushed many to pay more attention to the "risks" of vaccines instead of their vital role to public health (Larson et al., 2011, 2014; Jolley and Douglas, 2014). Critically, people who endorse misinformation like this have been shown to be more likely to hold *anti*-vax policy attitudes (Joslyn and Sylvester, 2017).

Related to misinformation, the endorsement of anti-vaccine conspiracy theories may also sour public opinion toward vaccine safety and expert research on the subject (Jolley and Douglas, 2014). Conspiracy theories can be thought about as a special type of misinformation – unverified (and potentially un-falsifiable) claims of malfeasance on behalf of powerful people (Flynn et al., 2017). As Jolley and Douglas (2014) review, prominent anti-vaccine conspiracy theories allege that governments and pharmaceutical industries purposefully "cover up" research demonstrating the hazards of vaccines in order to accomplish various political and financial goals. Individuals who exhibit low levels of generalized interpersonal trust and domain-specific knowledge (Miller et al., 2016) may be especially likely to endorse conspiracy theories about vaccines. Media consumption habits also likely play a role, with online blogs and other resources influencing the dissemination of anti-vaccine information (Kata, 2012).

While limited knowledge and misinformation about vaccines (and their potential link with autism) are associated with vaccine attitudes, research has also pointed to the roles of ideology, religiosity, and education in this process. For example, Rabinowitz et al. (2016) found that liberals were more likely than conservatives to support pro-vaccine statements (also see Joslyn and Sylvester (2017) who find that a related concept, Republican partisan identification, is associated with increased opposition to vaccines). While ideology is correlated with attitudes toward vaccines and vaccine-related issues in the aggregate, we offer the caveat that ideology is not grounded in issue positions for most *individuals* (Kinder and Kalmoe, 2017) and may better be thought about as a form of social identity (Mason, 2018). Lower levels of education (Prislin et al., 1998) and increased religious service attendance (Pelcic et al., 2016; Ruijs et al., 2011, 2013; Shelton et al., 2013) are also associated with increased vaccine skepticism. These findings suggest that both ideology and education influence attitudes towards vaccinations, which appears to be consistent with the research on public attitudes towards science more broadly (Blank and Shaw, 2015).

1.2. A new direction: expert skepticism and Dunning-Kruger effects

Largely absent from the research on attitudes towards vaccinations is the possibility that citizens' attitudes toward medical experts also shape the endorsement of *anti*-vax policy positions. We believe that this omission is notable for two reasons. First, expert opinion tends to be featured prominently in debates about vaccine safety. While the scientific community in the United States has authoritatively concluded that vaccines like MMR do not cause autism (Nelson and Bauman, 2003), norms of journalistic balance have lead news outlets to give roughly equal coverage to expert-endorsed "pro-vax" stances and non-expert endorsed *anti*-vax stances (Clarke, 2008; Dixon and Clarke, 2013). This strategy suggests the potential for a link between how people think about medical experts and *anti*-vax policy attitudes.

Second, an important line of research details the complications experts face when attempting to communicate pro-vaccine messages with the public. People who hold negative attitudes toward scientific experts – a sentiment that has become increasingly common on the ideological right (Gauchat, 2012; Motta, 2018) – tend to be less accepting of scientific consensus on a variety of matters of scientific and political importance (Motta, 2018). This general phenomenon has important implications for vaccines. In a series of experimental studies, Nyhan, Reifler, and colleagues found that information about vaccine safety from the Center for Disease Control (CDC) successfully reduced misperception endorsement about potential hazards of the flu (Nyhan and Reifler, 2015) and MMR vaccines (Nyhan et al., 2014), but *failed* to improve vaccination intention amongst individuals concerned about vaccine safety. How people think about medical experts has the potential to influence anti-vaccine attitudes and behavior, further underscoring the potential policy relevance of anti-expert attitudes.

We build on this research by suggesting that U.S. adults might also endorse *anti*-vax policy positions because they believe that they are comparatively more knowledgeable than medical experts, which we label the *Overconfidence Thesis*. According to this perspective, people who view themselves as comparatively more expert than medical professionals should be more likely to oppose the role experts play in the policymaking process, and the policies they support such as vaccination.

This theory has received some conceptual attention in previous literature. For example, Camarago and Grant (2015) note that vaccine safety skeptics often lack medical expertise themselves and argue that the "inability of anti-vaccine enthusiasts to correctly gauge their own skills" may help explain why people adopt *anti*-vax policy positions. This argument draws on the social psychological concept of meta-ignorance – or the "ignorance of ignorance" (Dunning, 2011) – to suggest that poorly informed or misinformed individuals lack the information necessary to accurately appraise their own knowledge of the subject.

The *Overconfidence Thesis* can be thought about as a type of Dunning-Kruger effect (Kruger and Dunning, 1999). The term "Dunning-Kruger effect" is a label given to observations of meta-ignorance