Title: Intervening in vaccine hesitancy and ideological polarization appendix for "Disagreement as a way to study misinformation and its effects"
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Note: The material contained herein is supplementary to the article named in the title and published in the Harvard Kennedy School (HKS) Misinformation Review.

Appendix A: Intervening in vaccine hesitancy and ideological polarization

Conceptual Contribution A1: Intervening in vaccine hesitancy.

In case of vaccine hesitancy, there is strong scientific consensus on the safety and efficacy of vaccines. Misinformation conceptualizes vaccine hesitancy as a result of misinformation about vaccines. In contrast, our proposed framework reframes it as a disagreement about whether one should get vaccinated, between the majority who follow governmental recommendations based on scientific findings and individuals who disagree, for a range of possible reasons, see Table A1. Consequently, the main focus should be on minimizing disagreements on this matter. Viewing vaccine hesitancy as an issue of disagreement prompts a variety of analysis questions that allow to test new intervention tactics.

Table A1 lists potential questions for the analysis. Examples include: "What are the reasons for individuals to disagree with governmental recommendations to get vaccinated?"; "How can individuals be motivated to get vaccinated while accepting their disagreement with governmental recommendations?"; and "What are the common values and shared goals among both communities?" Addressing and correcting misinformation on the individual level is just one of several potential strategies. If individuals hesitate to get vaccinated due to distrust in science and government, publicly calling out misinformation is unlikely to decrease disagreement. Conversely, if hesitation is due to misinterpretation of data (epistemology), media literacy tips may be the right tool. If the primary issue is access to scientific information about vaccines, information campaigns could be the most effective approach. In cases of false dissensus, bolstering the credibility of scientists by showcasing consensus within the scientific community and informing about social norms may be beneficial.

Regardless of individuals' reasons for refraining from vaccination, fostering agreement between different groups by highlighting shared values and objectives, such as saving lives, can be a useful strategy. For example, social media platforms could append conflicting posts (identified using the disagreement measurement approach; see Figure 6) with notes emphasizing shared health goals and values among users (Friedman & Hendry, 2019). An example message could be: "We observe the circulation of rumors about vaccines. We all want to save lives." There is no definitive answer to the optimal strategy. The key point is that a variety of strategies must be carefully balanced, with a disagreement measurement as shown the next section could assist in evaluating newly identified interventions against vaccine hesitancy.

Conceptual Contribution A2: Intervening in ideological polarization.

Analogous to vaccine hesitancy, the misinformation framework conceptualizes polarization as a cause of misinformation, hence misleading information about factual matters. However, this concept is somewhat misguided, since polarization is defined as strongly opposed opinions (Au et al., 2022). In contrast, disagreement views ideological polarization as an extreme form of disagreement about any type of matter, as shown in Table A1.

The main goal of decreasing polarization is to ease tensions between opposing groups. Topic analysis, both online and offline, can help identify the matters of disagreement and the involved communities. One approach to counter online polarization could involve modifying the structure of platforms to decrease

disagreement (Musco et al., 2018). Alternatively, posting notes stating, "We observe conflicting information on this topic, please be respectful to each other," may slow down the propagation of conflicting information and decrease polarization. The evaluation of such disagreement-based interventions is left for future research.

***Table A1**. Disagreement framework applied to ideological polarization and vaccine hesitancy.*

	Applying Disagreement to Ideological Polarization	**Applying Disagreement to Vaccine Hesitancy**
Conceptualization	Polarization is an extreme form of disagreement.	Vaccine hesitancy corresponds to the disagreement about whether one should get vaccinated, while the government, scientific community, and the majority endorse vaccination.
Analysis	• At what strength does disagreement become harmful? • Between which communities do we see extreme disagreement? • About what matter do they disagree the most? • What disagreement factors are the main drivers of extreme disagreement?	• Who are the communities that disagree with the majority backed by science and government? • Why do they disagree? (e.g., distrust in mainstream institutions, agreement with alternative medicine, fear, identity, misinformation) • What is the strength of disagreement? (numbers, confidence levels, experts, fake experts) • Who are the communities that agree with scientific recommendations and why do they agree? (trust, obedience, etc.) • Is it acceptable to disagree with recommendations from science and government (from scientific, moral, and political perspectives)?
Intervention	• How can the main disagreement factors be controlled? • What policies and social media designs can promote agreement? • How to disagree better?	• How can individuals be encouraged to get vaccinated despite disagreement with government and science? • How to increase trust in government and science? • What are the agreements among different medical approaches? • What are the shared goals and values among disagreeing communities? (e.g., preventing deaths) • What other factors drive disagreement and how can they be controlled? (e.g., preventing the spread of misinformation)