

# Mitigating Map Misinformation through Prebunking

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## Abstract:

Over the past quarter of a century, a number of changes have had a significant impact on mapping in our modern world. Today, it is relatively easy to make maps. Mapmaking tools are widely available and even free. The tools can be used to create sophisticated-looking results. The skills to use the tools are minimal, and instructions and tutorials are often available. The data used for mapping is becoming easier to access and is often free. And it is easy to share maps on the web and through social media.

These changes have led to what some call the “democratization of cartography” which in turn has led to some changes in what and how things are being mapped and how the maps are being used. More maps are made by individuals for subjects of personal interest. Many people making maps are not cartographers trained through education or practice. The audiences for maps are often larger and more diverse. And many map users have not been taught to read maps.

In many ways, the democratization of cartography is a good thing. As then-ICA president, Tim Trainor, wrote, “The pervasiveness of maps and increasing interest in cartography are helping humans address many of the challenges that communities and nations around the world are facing” (Trainor 2023). At the same time, it can potentially be a bad thing. As Michael Goodchild noted at the 2024 annual meeting of the American Association of Geographers, “We’ve made it so easy to do things with the technology that we’ve also made it so easy to make mistakes.”

As mapping becomes even more open, it will be more accessible to more people who can create even more believable maps. This becomes a concern if maps are used as a way to spread misinformation and disinformation, joining such methods as deep-fakes (images and videos manipulated using AI technology), cheapfakes (videos, audio, and images manipulated with basic editing software), and AI-fabrication of images and videos. In January of this year, the World Economic Forum ranked the spread of misinformation as most severe global risk to humanity over the next two years, and the fifth highest risk in the next ten years (WEF 2024).

While the stage is now set for professional-looking map-like objects whose reliability may be hard to discern to be spread quickly and widely, today’s mapmakers do not seem intent on making and sharing maps for nefarious purposes. However, that could change. For example, maps are often used to share information about the progress and results of elections. With almost three billion people expected to head to the polls over the next two years, the WEF warns that “the widespread use of misinformation and disinformation, and tools to disseminate it, may undermine the legitimacy of newly elected governments. Resulting unrest could range from violent protests and hate crimes to civil confrontation and terrorism.” (WEF, 2024, p. 8). It is not difficult to imagine how maps could be used to undermine election (and other) truths, particularly since maps are still seen as trustworthy (Cheshire N.D.).

This trust in maps is something that the International Cartographic Association and cartographic community worldwide are currently focussed on learning more about and, certainly, retaining. Thus, one of the issues we should be addressing is to determine the methods that can be used to thwart the use of maps to spread misinformation and disinformation, which would erode the legitimacy that maps currently have as a reliable source of information.

Some of the same methods that relate to detecting and exposing misinformation and disinformation in social media could be applied to maps. For example, AI technology could be used to detect unintentionally deceptive or intentionally deceitful maps. Map readers could be encouraged and taught how to fact-check the map—they could be shown how to seek out multiple sources, check the metadata, and do reverse image searching. They could also be taught how to evaluate the map (the basic geography, labels, legends, other marginalia, etc.) And, as with all misinformation and disinformation, they could be cautioned to curb their impulse to share the map, so that they and others can detect problems with the map.

But cartographers could also take a more proactive approach by using techniques that misinformation scientists and scholars have developed, tested, and found to be successful as interventions. “Misinformation researchers have identified

novel ways to make people more resistant to being misled without risk of censorship or interfering with anyone’s freedom of speech” (Lewandowsky et al. 2024). One such method is prebunking, which can be thought of as an inoculation against the spread of misinformation. As Sander van der Linden explains (Yugas, 2024), “I was going through journals and found models from epidemiology and public health that are used to understand how information propagates across a system. Instead of a virus spreading, you have an information pathogen. Somebody shares something with you, and you then spread it to other people. That led me to wonder: If it’s true that misinformation spreads like a virus, is it possible to inoculate people?” This then led him to the 1960s research by psychologist Bill Maguire in which he studied ways that people could be protected against brainwashing.

The solution that van der Linden and his research team developed is based on prebunking, which has two steps. The first is analogous to waking up peoples’ immune system—by telling them that they may try to be fooled, they become more skeptical and vigilant. The second step is like giving people a vaccine—by exposing them to manipulation methods commonly used in misinformation, their resistance to misinformation is boosted. Misinformation scientists have also found that there are a small set of commonly used techniques to manipulate the spread of a wide range of misinformation. If cartographers can identify the commonly used techniques to manipulate maps, then we can use prebunking to build peoples’ resistance to manipulation by maps. And if we can do this before misinformation in maps becomes prevalent, then we can protect against the use of maps to deceive and thus allow people to retain a healthy trust in maps.

Focusing on misinformation manipulation techniques, such as emotionally manipulative language, incoherence, false dichotomies, scapegoating, and ad hominem attacks, rather than a specific misinformation attack improves the scalability of the prebunking intervention (Roozenbeek 2022). For maps, if people are taught to identify the signs of misinformation rather than the truth or lies in a particular map, then they will be more discerning about all maps, regardless of the subject.

At this point, the manipulation techniques for misinformation in maps have not been identified. A number of approaches could be used to determine what these are. For example, a literature review or content analysis of selected maps could help reveal some of the techniques. Recent research on trust in maps (for example, Prestby 2023 and Griffin 2020, among others) may help us identify some map manipulation techniques. Research targeted at identifying the methods may also be undertaken (Phoebly Ly, pers.comm.) A 100+ person survey to identify the ten tell-tale signs of novice cartography might also help to pinpoint some of the methods (Buckley 2018).

Once the techniques are identified, they can be shared with people to increase their resilience to being misled by map misinformation. One intervention approach used very successfully by prebunkers is to show people videos that teach about the manipulation techniques. Short inoculation videos shared as YouTube ad campaigns teach people how to recognize when they are trying to be misled. The misinformation scientists who implemented this approach showed a significant impact on peoples’ ability to recognize misinformation, and since the videos were shown on a popular viewing platform, they were able to reach over 2 million views (over million people) (Jigsaw 2023).

A series of videos for map manipulation that are made available now could circumvent the need for map misinformation mitigation later. One example that comes to mind is a commercial featuring Ted Danson “debunking” a purple and an orange map that look virtually the same but are advertised as different, with one showing the coverage for a premium platinum cell phone plan and the other showing Consumer Cellular’s coverage. Short, catchy videos like these could be rolled out on social media sites to teach users how to spot map misinformation.

Cartographers are in the unique position of being able to pre-emptively address misinformation in maps. By proactively inoculating people against map manipulation techniques, we may be able to avoid the potential deterioration of trust in maps and prevent some of the risks of misinformation and disinformation that concerns the likes of the World Economic Forum.

## References

- Buckley, Aileen. 2019. Ten Telltale Signs of Novice Cartography, *Abstracts of the ICA*, 2019 International Cartographic Conference, Tokyo, Japan. DOI: <https://doi.org/10.5194/ica-abs-1-32-2019>.
- Cheshire, J. N.D. In Maps We Trust, blog post, <https://jcheshire.com/visualisation/mapstrust/>, accessed 28 May 2024.
- Griffin, A. 2020. Trustworthy Maps, *Journal of Spatial Information Science*, 20, 5–19. DOI: [10.5311/JOSIS.2020.20.654](https://doi.org/10.5311/JOSIS.2020.20.654).
- Jigsaw. 2023. Prebunking to Build Defences Against Online Manipulation Techniques. *Medium*, 25 October 2023, <https://medium.com/jigsaw/prebunking-to-build-defenses-against-online-manipulation-tactics-in-germany-a1dbfbc67a1a>, accessed 28 May 2024.

- Lewandowsky, S., S. van der Linden, and A. Norman. 2024. Disinformation is the Real Threat to Democracy and Public Health. *Scientific American*, 30 January 2024, <https://www.scientificamerican.com/article/disinformation-is-the-real-threat-to-democracy-and-public-health/>, accessed 28 May 2024.
- Mattmiller, B. 2006. Technology helps foster ‘democratization of cartography’, *University of Wisconsin Madison News*, 20 September 2006, <https://news.wisc.edu/technology-helps-foster-democratization-of-cartography/>, accessed 28 May 2024.
- Prestby, T. 2023. Trust in maps: what we know and what we need to know. *Cartography and Geographic Information Science*, 1–18. DOI: [10.1080/15230406.2023.2281306](https://doi.org/10.1080/15230406.2023.2281306).
- Roozenbeek, J., S. van der Linden, B. Goldberg, S. Rathje, and S. Lewandowsky. 2022. Psychological inoculation improves resilience against misinformation on social media. *Science Advances*, 8, 24 August 2022. DOI: [10.1126/sciadv.abo6254](https://doi.org/10.1126/sciadv.abo6254).
- Trainor, T. 2023. Cartography Remains Critical in the Digital Mapping Age, *ArcNews*, winter 2023, <https://www.esri.com/about/newsroom/arcnews/cartography-remains-critical-in-the-digital-mapping-age/>, accessed 28 May 2024.
- World Economic Forum (WEF). 2024. *The Global Risks Report 2024: 19<sup>th</sup> Edition, Insight Report*, [https://www3.weforum.org/docs/WEF\\_The\\_Global\\_Risks\\_Report\\_2024.pdf](https://www3.weforum.org/docs/WEF_The_Global_Risks_Report_2024.pdf), accessed 28 May 2024. ISBN: 978-2-940631-64-3.
- Yuhas, D. 2023. There’s a Psychological ‘Vaccine’ against Misinformation. *Scientific American*, 13 March 2023, <https://www.scientificamerican.com/article/theres-a-psychological-vaccine-against-misinformation/>, accessed 28 May 2024.