Defining Misinformation and Understanding its Bounded Nature:

Using Expertise and Evidence for Describing Misinformation

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Research on misinformation is growing in volume and scope, but defining "misinformation" in a consistent and coherent way has been a challenge for the field. To address this challenge, we outline competing definitions of misinformation, highlighting a growing scholarly emphasis on misinformation as that which contradicts the best expert evidence available at the time. Implicit in this definition is the inherently *bounded* nature of misinformation, which we consider by drawing on both the nature of expertise and evidence. We question how to best study and define misinformation when the boundaries between accurate and misinformation can and do change. We conclude with a call for transparency, offering suggestions for how to best contextualize definitions of misinformation.

Defining Misinformation

Two of the most commonly cited definitions of misinformation from the early literature place different emphasis on the boundaries of misinformation. One defines misinformation as occurring when "people hold inaccurate beliefs, and do so confidently" (Kuklinski, Quirk, Jerit, Schwieder, & Rich, 2000, p. 792), making an important distinction between *lack of knowledge* (or ignorance) and *confident, yet inaccurate knowledge* (true misinformation). Many later studies have focused on "inaccurate beliefs," without addressing the question of their *confidence* in these beliefs (see Pasek, Sood, & Krosnick, 2015 for a notable exception).

At the same time, this definition could do more to clarify what "inaccurate beliefs" are and how they can best be defined conceptually. Nyhan and Reifler (2010) build on the definition offered by Kuklinski and colleagues in two important ways. First, they distinguish between *misinformation* – regarding the information itself – and *misperceptions* – the beliefs that people

hold. This clarification is critical: while misinformation often generates misperceptions, the two are conceptually separate, and misinformation scholars should distinguish between the two. Here, we focus on the definition of misinformation itself, rather than the misperceptions it can lead to (or the confidence with which those beliefs are held).

Second, Nyhan and Reifler define misperceptions as "cases in which people's beliefs about factual matters are not supported by clear evidence and expert opinion – a definition that includes both false and unsubstantiated beliefs about the world" (p. 305). Importantly, this definition is the first to our knowledge to specify that accuracy is defined by "clear evidence and expert opinion."

Expertise and Evidence

The reliance on "expert consensus" to define misinformation may be particularly powerful when considering the domains of health or science but more difficult for political topics (though a common manifestation of expertise in the latter category is fact checking (Graves, 2016). So long as it exists, relying on *expert consensus* provides clearer boundaries between what is accurate and inaccurate (e.g., Vraga & Bode, 2017). Expert consensus may also resonate with the public, for whom knowledge of expert consensus on a scientific or health topic is persuasive, acting as a gateway belief to other attitudes on the topic (Dixon, 2016; van der Linden, Leiserowitz, & Maibach, 2019; but see Landrum, Hallman, & Jamieson, 2018). Therefore, defining misinformation for health and scientific issues "based on what is considered to be correct or incorrect by expert consensus contemporaneous with the time period of this study" (Tan, Lee, & Chae, 2015, p. 675) seems especially appropriate. However, there are at least two issues with relying on expert consensus to define misinformation.

First, defining who is an expert is easier in some cases rather than others. Even in scientific and health domains where "expert consensus" seems readily identifiable, there are incentives to disrupt and diminish perceptions of that expert consensus. Indeed, a common misinformation technique is using false experts to present a misinformation argument (e.g., Ceccarelli, 2011; Cook, Ellerton, & Kinkead, 2018). A recent example of this is a letter signed by 500 scientists, sent to the United Nations and arguing there is no climate emergency, in an attempt to undermine the true consensus on climate change in the scientific community (Lapointe, 2019).

Moreover, even if people are not actively undermining perceptions of consensus, the public (or the media disseminating the message) may reasonably disagree about who is an expert for what topic. Is a medical doctor an expert on nutrition, or must a nutrition expert be a certified nutritionist? Can a geologist speak with expertise on climate change, or is expertise in that area limited to those who study climate science directly? Determining expertise could differ by issue, country, context, or time period, further complicating this process of relying on expertise.

Second, there are many issues for which expert consensus is *not* available. Many scholars have considered misperceptions to include both beliefs that are *false* and beliefs that are *unsubstantiated* (Chou, Oh, & Klein, 2018; Nyhan & Reifler, 2010; Southwell, Thorson, & Sheble, 2018).[1] We argue that treating *false* and *unsubstantiated* beliefs as equivalent confounds two distinct constructs. It is quite different to actively oppose expert consensus (for example, believing climate change is not occurring), as compared to having beliefs that contradict an emerging or unsubstantiated issue (for example, the effects of the Zika virus on fetuses) or which

[1] For example, Chou et al. argue that "a health-related claim of fact that is currently false due to a *lack of scientific evidence*" (2018, p. E1, emphasis added) or Southwell et al. suggest it is defined as "do not actually enjoy *universal or near-universal consensus* as being true at a particular moment in time" (2018, p. 4, emphasis added).

is (or becomes) controversial (for example, whether you should complete your course of antibiotics). A definition of misinformation that is rooted in perceptions that lack "universal or near-universal consensus" – especially when not limited to relevant experts – could call into question issues on which *expert* consensus exists but *public* consensus does not, such as vaccination or climate change. It also allows for a situation in which a majority of the public holds beliefs contrary to the best available expertise and evidence, but their misperceptions are not considered as such, because they have achieved "near-universal consensus."

Therefore, a second criteria for determining misinformation relies not on the experts but on the evidence itself. A definition that emphasizes the "best available evidence" (Garrett, Weeks, & Neo, 2016; p. 333) may be more appropriate when expert consensus does not exist, especially further limited to *information considered incorrect based on the best available evidence from relevant experts at the time.* Such a definition may be more applicable to political domains for which the scientific community has not weighed in or wherein expertise is less readily established and accepted as free from bias. Of course, we acknowledge that "best available evidence" is subjective and may be difficult to operationalize. We suggest the amount of evidence, its concreteness, and its universality should all be considered as indicators of evidence quality.

Challenges to this approach

These definitions foreshadow a challenge with defining and studying misinformation across fields: the "best available evidence" and often the expert consensus is subject to change. This raises several questions for misinformation researchers. The first is a broad question across misinformation domains and studies: how should skeptics without evidence be treated? In other words, if a study participant believes what at the time is *misinformation*, but later becomes

accurate (or at least, contested), should we classify them the same as someone who is on the wrong side of an issue that never changes? On the one hand, we cannot reward those who believe something in the absence (or in contradiction to) the best available evidence; to do so is to reward a conspiracy ideation rooted in skepticism of official accounts or belief that secret groups are plotting against the public (Douglas et al., 2019; Swami et al., 2017). On the other, such skeptics may serve as "canaries in a coal mine," rightfully suspicious of existing evidence, and eventually proven correct.

One concrete example can be drawn from our attempt to study misinformation immediately after the 2016 election. In the week following the election, we fielded a survey that asked people about to rate a variety of information and misinformation circulating at the time as false, mostly false, neither true nor false, mostly true, or true (Bode, Vraga, & Thorson, 2018). While most of the seven statements were relatively straightforward, one stands out as we reflect on these measures: "Donald Trump's secret ties to Russia affected the outcome of the presidential election." The veracity of this statement remains subjective, but at the time we fielded the survey, the best evidence available to the public suggested it was *not* true, whereas later evidence suggested it was at least partially true (Holan, 2017).[2] Leaving aside the veracity of that statement in late 2019, deciding how to classify those who rated the statement as mostly true or true in November of 2016, when there was no public evidence that such a relationship existed, presents a challenge. This is further complicated by the idea that people may also be responding expressively – that is, to communicate a preference or an identity, rather than pure information – to knowledge-based questions (Berinsky, 2017).

[2] Russia does have at least some ties to President Trump, and there is documented evidence that Russia intentionally interfered with the 2016 U.S. Presidential Election (whether or not such interference affected the outcome, as indicated in the statement we tested, is more complicated to discern).

Second, the line between "consensus" and "controversy" is not well defined. If we define misinformation in terms of the best available evidence from experts, as we propose above, what level of certainty or agreement must experts express before we can define what is misinformation or not? For example, in 2014 Pew surveyed a representative sample of scientists from the American Association for the Advancement of Science (AAAS) on a range of scientific issues. 88% of AAAS scientists said it was safe to eat genetically modified foods and 98% said humans have evolved over time, while only 68% agreed that it is safe to eat foods grown with pesticides (Pew, 2015). Does 68% represent an "adequate" level of consensus to say that foods grown with pesticides are safe to eat? Additionally, this survey showcases difficulty in defining "expertise" – according to the full sample of AAAS scientists, 87% of scientists agreed that the earth is getting warmer mostly because of human activity – a substantial level of consensus but well below the 97% consensus in climate science research (Cook et al., 2016).

Similarly, what happens when a new study appears to contradict existing scientific consensus on a topic? For example, the claim that fluoridation in the water can harm the public – for example, by reducing public intelligence or increasing the risk of health conditions like cancer – has existed since at least 1950, but has been debunked across repeated studies (CDC, 1999; Kasprak, 2017). However, a new study published in 2019 suggests a negative relationship between maternal consumption of fluoridated water and the IQ of fetuses (Harris, 2019). This is a single study based on a small sample. Should we update the state of scientific evidence based on such a study, or can (and should) we still claim consensus on this issue?

Likewise, understanding how to treat studies that relate to – but do not directly contradict – the expert consensus can be complicated. In the summer of 2019, a new study suggested that sunscreen is absorbed much more deeply than previously thought, and certain ingredients show

up in the bloodstream (Matta, et al., 2019). The health implications of this absorption are currently untested and unknown, although the official recommendation is still to use sunscreen to lower the risk of skin cancer (Park, 2019). So how should we assess people who indicated in the summer of 2019 that sunscreen poses a risk to one's skin and reported lower intentions to wear sunscreen? Were they misinformed, because the best information indicates no harm, or were they well informed, because they had been exposed to the most recent scientific information indicating a risk where none was previously seen?

A third concern this raises is the ability to study emerging issues, where expert consensus has not yet solidifed and "best evidence" is necessarily evolving. For example, misinformation surrounding the Zika virus has garnered substantial attention since surfacing as a global issue in 2016 (Chou et al., 2018; Wang, McKee, Torbica, & Stuckler, 2019), and misinformation on the issue can deter people from taking appropriate action to protect themselves and others. Yet it also is a case where the science was necessarily evolving – for example, the CDC initially did not report that Zika could be transmitted via sexual intercourse (CDC, 2016a), but later evidence proved it could be sexually transmitted, leading the CDC to update their guidelines (CDC, 2016b). Someone who believed the virus could be transmitted via sexual intercourse in January 2016 would have had little evidence from the scientific community to back up their beliefs (hence, it would be considered a misperception) – but by February 2016, that belief would be considered "accurate," as the scientific evidence was updated on the issue. Misinformation about vaping abounds at the time of publication of this article (Rodu, 2019), but given that knowledge about the risks, dangers, and benefits of the practice are constantly changing, it is extremely difficult to study. While these topics are of particular interest to scholars and practioners hoping to affect public opinion before attitudes solidify, special care is needed to define the boundaries

of misinformation. Researchers should be diligent about recording the state of evidence and expertise at the time of the study, rather than at the time of analysis, or later.

A fourth complication arises when the "best available evidence" at the time is contradictory or speculative. A robust literature has examined how people respond to conflicting health advice. When the public is exposed to contradictory health information – for example, on the health benefits or risks of coffee or carbohydrates – people not only experience confusion about the specific guidelines, but may also decrease trust in the scientific community issuing these competing recommendations (Chang, 2015; Clark, Nagler, & Niederdeppe, 2019). Such contradictions are the inevitable result of the scientific process, but raise questions about how to handle media coverage and public outreach when best evidence does change –whether from settled science, emergent consensus, controversy, or something else entirely.

The question of contradictory or speculative evidence is especially common when studying political misinformation. Within politics, there are clear incentives for promoting a particular argument or viewpoint. While this can occur in opposition to established scientific research (for example, politicians claiming climate change is not man-made), other issues do not have a long history of scientific study to provide clear guideposts. For example, economists often debate economic trends or projections – such as the best size for an economic stimulus package in 2009 or the effects of the Trump tax cuts in 2017. However, their expertise may be more difficult to establish, as both elites and the public may be skeptical of such efforts as driven by motivated reasoning. Indeed, Fuller (2010) critiques the value of expert judgment by suggesting experts may make (and the media repeat) judgments that advance a particular worldview deliberately, rather than making accuracy their only goal (see Tetlock, 2010 for a response), while Tetlock (2005) highlights the difficulties that lead experts to often fail at forecasting.

Therefore, the more "political" an issue and the more distant the horizon, the more fraught defining misinformation and distinguishing it from accurate information becomes.

The implications of these measurement issues pose problems for both academic research and general understandings of the health of the electorate. As Markus Prior puts it, "political knowledge can decline over time, either because people forget what they used to know or *because a particular fact is no longer true*" (2007; p. 28, emphasis added). If we think an informed electorate is an asset, on what basis are we deciding whether it is informed, ignorant, or misinformed?

A call for transparency

We clearly do not have the answers to all of the questions posed here. But we encourage researchers of misinformation to be clear about the assumptions they are making about the state of the 1) evidence and 2) expertise on issues they research.

In terms of expertise, information accuracy is most readily recognized when the relevant experts are clear, there is consensus among those experts, and public perceptions of expert bias are low. Expertise, however, intersects with the nature of the evidence being offered. Information accuracy is also linked to the amount of evidence that exists, whether that evidence is concrete and observable, and its conditionality versus universality – or whether the evidence depends on particular conditions being met. Notably, these bases echo Tetlock (2005)'s definition of expert judgment as dependent on the *correspondence* between the judgment and reality and the *coherence* of the rationale for making the judgment.

Using these two criteria –expertise and evidence – can clarify how misinformation is being defined (see Figure 1). At the top of Figure 1, the lines between accurate information and misinformation are relatively clear: the information either aligns with the experts and the

evidence (and is thus considered accurate) or does not (and is thus misinformation). Unfortunately the issues for which the expertise and evidence are both clear and settled – like vaccination or climate change – are relatively rare. Contentious issues – like coffee's health benefits or the effects of Russian interference in the 2016 election – are more common, and the boundaries between accurate and inaccurate information are also less clear for these issues.

We are not arguing that researchers only choose misinformation issues from the top of the hierarchy, but rather that they are more transparent in how settled the issues used are, and what criteria for selection are being used. This might include answering some of the following questions: What expert consensus exists, if any? Who are the experts in question and based on what criteria can we validate their expertise? How time-sensitive is the study – that is, how much in flux is expert consensus or evidence on the subject? And, of course, how are misinformation and thus individual misperceptions defined in relation to all of these criteria?

Science and the state of knowledge are necessarily in flux. We often assume that misinformation is related to a fundamental underlying truth – something is either true or not – but to some extent, misinformation as a measured concept is dependent on the state of evidence, expert beliefs, and the information environment in which they occur. By addressing these concerns head on, we ensure that our own knowledge production is able to adjust to the changing context in which it exists.

References

Berinsky, A. J. (2018). Telling the truth about believing the lies? Evidence for the limited prevalence of expressive survey responding. *The Journal of Politics, 80*(1), 211-224.

Bode, L., Vraga, E.K., & Thorson, K. (2018). Fake News. In *Electoral Integrity in America: Securing Democracy*, Pippa Norris, Sarah Cameron, & Thomas Wynter, eds. Oxford: Oxford University Press.

Ceccarelli, L. (2011). Manufactured scientific controversy: Science, rhetoric, and public debate. *Rhetoric & Public Affairs*, *14*(2), 195-228.

CDC. (1999). Achievements in public health, 1900-1999: Fluoridation of drinking water to prevent dental caries. *MMWR Weekly.* Retrieved from: https://www.cdc.gov/mmwr/preview/mmwrhtml/mm4841a1.htm

CDC. (2016a, Jan. 23). Zika virus: Prevention. Retrieved from: https://web.archive.org/web/20160124045839/http://www.cdc.gov/zika/prevention/index.html

CDC. (2016b, Feb. 5). Questions and answers: Zika and sexual transmission. Retrieved from: https://web.archive.org/web/20160216134843/http://www.cdc.gov/zika/hc-providers/qa-sexual-transmission.html

Chang, C. (2015). Motivated processing: How people perceive news covering novel or contradictory health research findings. *Science Communication*, *37*(5), 602-634.

Chou, W. Y. S., Oh, A., & Klein, W. M. (2018). Addressing health-related misinformation on social media. *JAMA*, *320*, 2417-2418.

Clark, D., Nagler, R. H., & Niederdeppe, J. (2019). Confusion and nutritional backlash from news media exposure to contradictory information about carbohydrates and dietary

fats. *Public Health Nutrition*, 1-13.

Cook, J., Ellerton, P., & Kinkead, D. (2018). Deconstructing climate misinformation to identify reasoning errors. *Environmental Research Letters*, *13*(2), 024018.

Cook, J., Oreskes, N., Doran, P. T., Anderegg, W. R., Verheggen, B., Maibach, E. W., ... & Nuccitelli, D. (2016). Consensus on consensus: a synthesis of consensus estimates on human-caused global warming. *Environmental Research Letters*, *11*(4), 048002.

Dixon, G. (2016). Applying the gateway belief model to genetically modified food perceptions: New insights and additional questions. *Journal of Communication*, *66*(6), 888-908.

Douglas, K. M., Uscinski, J. E., Sutton, R. M., Cichocka, A., Nefes, T., Ang, C. S., & Deravi, F. (2019). Understanding conspiracy theories. *Political Psychology, 40,* 3-35.

Fuller, S. (2010). Thinking the unthinkable as a radical scientific project. *Critical Review, 22*, 397-413.

Garrett, R. K., Weeks, B. E., & Neo, R. L. (2016). Driving a wedge between evidence and beliefs: How online ideological news exposure promotes political misperceptions. *Journal of Computer-Mediated Communication*, *21*, 331-348.

Graves, L. (2016). *Deciding what's true: The rise of political fact-checking in American journalism.* Columbia University Press.

Holan, Angie. 2017. "2017 Lie of the Year: Russian Election Interference Is a 'Made- up Story.'" Politifact, December 12. http:// www.politifact.com/ truth- o- meter/ article/ 2017/ dec/ 12/ 2017- lie- year- russian- election- interference- made- s/ .

Kasprak, A. (2017, Sept. 22). Water fluoridation reduces IQ? *Snopes.com.* Retrieved from: https://www.snopes.com/fact-check/water-fluoridation-reduces-iq/

Kuklinski, J. H., Quirk, P. J., Jerit, J., Schwieder, D., & Rich, R. F. (2000). Misinformation and

the currency of democratic citizenship. *Journal of Politics*, *62*, 790-816.

Landrum, A. R., Hallman, W. K., & Jamieson, K. H. (2019). Examining the impact of expert voices: communicating the scientific consensus on genetically-modified organisms. *Environmental Communication*, *13*, 51-70.

Lapointe, P. (2019). Consensus scientifique et climat: ce qu'il faut savoir. *Agence Science Presse.* https://www.sciencepresse.qc.ca/actualite/detecteur-rumeurs/2019/09/24/consensus-scientifique-climat-faut-savoir

Matta, M. K., Zusterzeel, R., & Pilli, N. R. (2019). Effect of sunscreen application under maximal use conditions on plasma concentration of sunscreen active ingredients: A randomized clinical trial. *JAMA, 321,* 2082-2091.

Nyhan, B., & Reifler, J. (2010). When corrections fail: The persistence of political misperceptions. *Political Behavior, 32*, 303-330. DOI: 10.1007/s11109-010-9112-2

Park, A. (2019, May 6). Sunscreen ingredients are absorbed into your blood. Here's what that could mean. *Time.com.* Retrieved from: https://time.com/5583991/sunscreen-ingredients-absorbed-blood/

Pasek, J., Sood, G., & Krosnick, J. A. (2015). Misinformed about the affordable care act? Leveraging certainty to assess the prevalence of misperceptions. *Journal of Communication*, *65*, 660-673.

Pew. (2015, Jan. 29). Public and scientists' views on science and society. *Pew Research Center.* Retrieved from: https://www.pewresearch.org/internet/wp-content/uploads/sites/9/2015/01/PI_ScienceandSociety_Report_012915.pdf

Prior, M. (2007). *Post-broadcast democracy: How media choice increases inequality in political involvement and polarizes elections*. Cambridge: Cambridge University Press.

Rodu, B. (2019, May 10). It's time to stop confusing the public with sensationalist rhetoric on e-cigarettes. *Courier Journal.* Retrieved from: https://www.courier-journal.com/story/opinion/2019/05/10/vaping-e-cigarette-debate-has-been-plagued-misinformation/1152202001/

Southwell, B. G., Thorson, E. A., & Sheble, L. (Eds.). (2018). *Misinformation and Mass Audiences*. Austin, TX: University of Texas Press.

Swami, V., Barron, D., Weis, L., Voracek, M., Stieger, S., & Furnham, A. (2017). An examination of the factorial and convergent validity of four measures of conspiracist ideation, with recommendations for researchers. *PloS one*, *12*(2), e0172617.

Tan, A. S., Lee, C. J., & Chae, J. (2015). Exposure to health (mis) information: Lagged effects on young adults' health behaviors and potential pathways. *Journal of Communication*, *65*, 674-698.

Tetlock, P. E. (2005). *Expert Political Judgment: How Good Is It? How Can We Know?* Princeton University Press.

Tetlock, P. E. (2010). Second thoughts about expert political judgment: Reply to the symposium. *Critical Review, 22*(4), 467-488.

van der Linden, S., Leiserowitz, A., & Maibach, E. (2019). The gateway belief model: A large-scale replication. *Journal of Environmental Psychology*, *62*, 49-58.

Vraga, E. K., & Bode, L. (2017). Using expert sources to correct health misinformation in social media. *Science Communication*, *39*, 621-645.

Wang, Y., McKee, M., Torbica, A., & Stuckler, D. (2019). Systematic literature review on the spread of health-related misinformation on social media. *Social Science & Medicine*, online first.

Figure 1: Describing Misinformation Using Evidence and Expertise