CONFERENCE

2023 John P. McGovern Award Address

Jessica Steier, DrPH, PMP, and Andrea C. Love, PhD / Hosts, Unbiased Science Podcast

The John P. McGovern Award is named in honor of John P. McGovern and is presented to a member or nonmember of AMWA to recognize a preeminent contribution to any of the various modes of medical communication. The McGovern Award is presented during AMWA's Medical Writing & Communication Conference.

The McGovern Award address was a back-and-forth conversation between the recipients.

Jessica Steier: We want to start by thanking AMWA from the bottom of our hearts. This award is the highest honor. It still feels like a fever dream, especially since Dr Peter Hotez received it last year. We share this recognition with all of you who truly do lifesaving work that impacts people's everyday lives. Thank you. Thank you all so much.

Andrea C. Love: Yes, it's truly an honor to be here. We've been so warmly welcomed. We're very much looking forward to connecting with everyone for the remainder of the conference.

We begin with an introduction to both of us. I'm an immunologist and microbiologist by training. I previously worked in academic research, but I have been in the biotech industry for the past 9 years. That's my paying job. I develop new immunotherapeutics and oncology drugs, and I conduct vaccine research and development. In addition to my job and my work at Unbiased Science, I also am the executive director of the American Lyme Disease Foundation. I succeeded Phil Baker who unfortunately passed away just a couple of months ago. I step into his very big shoes in the Foundation and in the world of Lyme disease misinformation.

Steier: Love following Andrea's introduction.

I am a completely different type of scientist from Andrea. I'm a public health data scientist. I cofounded and serve as the CEO of Vital Statistics Consulting, which is a public health data science consultancy.

Prior to these roles, I did consulting work for departments of health. I also worked in clinical academia and as an Advanced Analytics team member for the Lewin Group, which is the health policy arm of Optum and United Health. So really, I design evaluations of health policies and

programs to determine whether they do the things that they are intended to do.

Andrea and I met almost 2 decades ago when we were both undergrads at Stony Brook University. Andrea was in Honors College, and I was in the Women in Science and Engineering Program. We were just a couple of nerds hanging out, and we kept in touch over the years. We cheered each other along in our respective careers as scientists.

And then I became a mom in 2016.

Are you familiar with the "mom groups" on Facebook and other forms of social media? I like to say that they are a dumpster fire of misinformation. So, I reached out to Andrea.

Love: Jessica asked, "Have you seen all this stuff about MTHFR [a folate-associated enzyme] and vaccines?" I replied, "Oh yeah, let me tell you about it."

Steier: Parents were advising against giving antibiotics to children. Instead, they were recommending to slice onions, put the pieces on the child's feet, and have the child sleep that way overnight. "Andrea," I said. "We have to do something about this."

But then life happened. Careers. Families. So, as much as we wanted to address the misinformation, we put that dream on hold.

Love: Yeah, until COVID happened.

For 5 to 7 years, we had been thinking about the need to address scientific misinformation. We finally realized

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there was never going to be a good time. We just had to start. People were being inundated with misinformation. They were drinking from the fire hose of preprints. Media outlets were mischaracterizing in vitro studies as being clinically relevant to humans. There was a simultaneous mistrust of governmental agencies and political figureheads. We thought, "Someone's got to try and help to drown out the noise." Being relatively independent scientists in our own respective careers, we determined, "We're going to tackle this."

We started out very small. We hosted Instagram Live events from our own personal pages. And we got really positive feedback. People commented, "You've got this dynamic; you've got this chemistry."

Together, we have the population health level and the biomedical level of science covered. From these 2 perspectives, we are able to explain well why one gets lymphadenopathy after a vaccine injection in the armpit, why getting a low-grade fever after a vaccine should not be a cause for concern, and why putting sliced onions on one's feet does nothing to cure an illness.

Steier: Exactly. In 2020, we found ourselves dispelling these bits of information separately but equally. We realized we should join forces. That's the birth of Unbiased Science.

We initially thought that the social media platforms were going to be ancillary to the podcasts. However, they turned into separate entities. So, we have a weekly podcast, which dives deeply into specific topics. It just hit one million downloads.

Love: The podcast allows me to get into the granularity of things. That's my wheelhouse. I can talk about data all day long.

In addition to our podcast, we have Instagram pages, Facebook pages, a Threads account, and a Substack. These social media platforms allow us to explore other types of formats, infographics, short videos, long videos, and long-form content. Different audiences are present on these different platforms. So, the variety of platforms allows us to reach more people of different ideologies and different generations who may believe in different types of science misinformation depending on their communities and their upbringings.

Steier: And just to be clear, neither one of us has received any formal training in communication. This has been a lot of learning as we go. We've made mistakes, and we've learned from them.

One of the key takeaways has been that different people consume information and learn in different ways. And so, as Andrea was just saying, different platforms are popular with different demographics. For example, the longform content that is more popular on Facebook skews to an older and politically right-leaning demographic, whereas the graphics and videos of Instagram are more popular among younger-aged parents.

Love: The millennials.

Steier: The millennials. And we're pushing ourselves now to get more involved in TikTok.

Love: For the Gen Z fans.

Steier: For Gen Z, right. The different modalities present different opportunities to connect with different audiences. That is something we keep in mind every time we develop content.

Love: We actually frame things in different ways, and we create different formats to resonate with different audiences, different education levels, and different demographics.

Unbiased Science was born out of COVID misinformation. But it's not just COVID, right? I've been harping on the misinformation about genetic engineering and GMOs [genetically modified organisms] since I was an undergrad. I do gene editing all the time in the lab. So, we also tackle misinformation on GMOs and food ingredients and chemistry. Our ultimate goal is to improve science literacy, because that's really what it all comes down to.

Steier: It helps in our communication efforts that we are different types of scientists with different personalities and from different backgrounds. I grew up in South Brooklyn at the foot of the Coney Island boardwalk. My dad did not graduate from high school. My mom is a first-generation American. Andrea grew up in the woods of rural Connecticut. She enjoyed looking at bugs, and she knew she was going to be a scientist.

Love: Yes, I collected bugs as a young child and grossed out people with whatever critter I happened to find in the woods that day. You know, Giardia was a part of my daily life when I was a kid.

Steier: We're not academics. We're just independent scientists who are looking to connect with the general public. According to feedback we have received, people appreciate our straight talk, real talk. We do not use highly technical language, which is not to say that that language is not appropriate in different settings. But we want to connect with people who have no formal scientific training and are

mistrustful of science in the medical establishment. We have to play around with different forms of communication, and we will share some examples of this.

Andrea and I have completely different backgrounds. Andrea is a biomedical scientist. She starts talking about T cells, and I have no clue what she is talking about. I, on the other hand, can go off talking about regression modeling techniques. These different scientific perspectives really help us give a comprehensive picture of a topic.

Love: That's really the goal of Unbiased Science: to take an interdisciplinary approach.

Our previous work in academic research allows us to understand the ivory tower perception that many people have with academic jargon. Jess now has her own company, and I'm in biotech. I work routinely with regulatory teams, GMP [Good Manufacturing Practice] lab facilities, and cell manufacturing. So, I have an understanding of what goes into an IND [Investigative New Drug] submission or a BLA [Biologics License Application].

We draw from these clinical and industry experiences when we ask questions like, "Why are you mistrusting of these agencies where the goal is to evaluate the safety and the efficacy of a product?" We also use our teaching skills—I taught clinical microbiology to medical students, Jess taught Physician Assistant (PA) students, and we each have worked with kids in high school and younger—as we answer, "What is the message that we are trying to convey, and who is the audience?"

Steier: Something worth noting here, and something we are going to reiterate later on, is that people must begin to talk about science communication early in a child's life. These scientific techniques must be taught to children in elementary school all the way through undergrad and graduate studies. My husband is an ER doctor, and he had no formal training in this area. Communication about science must be incorporated at every stage of education and development. Social media has changed the game completely.

Love: I want to talk about gaps in science literacy. Civic science literacy is the ability to not only find scientific information, but to understand it and use that understanding to make decisions. Decisions include those related to opting to get vaccines, voting for political policies or legislation, and not being afraid of food ingredients.

Let's begin our discussion of this topic with a poll of the audience. What proportion of Americans are considered civically, scientifically literate? You have 4 options: 13%, 59%, 43%, or 28%.

So, let us have a show of hands for 13%.

Steier: We are all pessimists.

Love: We are not very optimistic. What about 59%? A few optimists. What about 43%? Some people over there. And 28%? Okay.

The answer is 28%. We generally have people either answer 13% or 28%. Unfortunately, that is a dismally low number. We're not going to beat around the bush there. We want to improve that. This 28% is representative of people in our communities, in politics, on social media, and who have families. If these people are unable to make sense of credible science, then they might be guided to make decisions based on false information.

Steier: There is a real disparity between the 28% of people who are scientifically literate and over 50% of people who are interested in scientific matters. They crave scientific information, but they just don't have it. We are trying to bridge this gap and reach those people who fall into that doughnut hole.

Love: A variety of factors form gaps in science literacy. We will talk about 5 of them: the lack of fundamental scientific knowledge, vulnerability to logical fallacies, overconfidence in one's level of scientific knowledge, lack of understanding of research and design, and incorrect understanding of the process of scientific discovery.

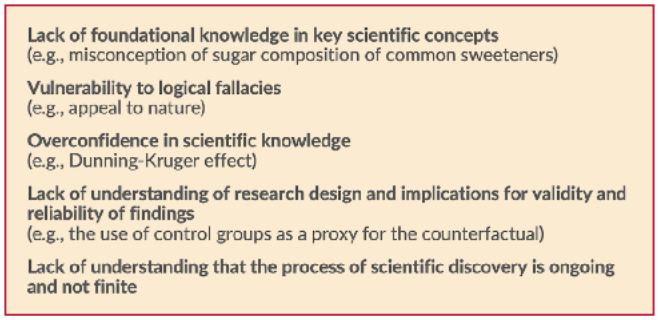

Figure 1. Common gaps in science literacy.

First, the lack of fundamental knowledge. You do know that everything is chemistry, right? However, people think, "I want a chemical-free something" or "I do not want chemicals on my food." But, by eating foods of any kind, these people are ingesting chemicals. Other people worry that mRNA vaccines integrate into our DNA. However, the central dogma of molecular biology explains the reason this cannot happen.

Steier: Or consider something as basic as sugar. We wrote a blog post that ended up being super popular about misconceptions of sugar composition and the idea that honey and maple syrup are so much healthier for us than table sugar.

Love: Honey, cane sugar, high-fructose corn syrup, and sucrose table sugar each have an approximate 50/50 ratio of glucose to fructose. However, 2 of them are perceived as being healthy, and 2 of them are perceived as being evil or toxic or whatever social media is going to tell you. It's the gap in fundamental scientific knowledge and the low literacy that makes one vulnerable to being misled by people who speak very confidently on social media.

Steier: Another contributing factor to the scientific literacy gap is a vulnerability to logical fallacies. There are many fallacies, but the one that we think is especially pervasive right now is the appeal to nature fallacy: the idea that anything natural is inherently better than anything manufactured in a lab or that's synthetic. This fallacy relates to pesticides, supplements, and beauty products. It embeds itself in every industry. We can thank Gwyneth Paltrow for contributing to this fallacy and Kourtney Kardashian for introducing it to the younger generations.

Consider the idea of clean beauty and all-natural products without preservatives. So your lotion is going to become moldy in a week. Congratulations. There is a reason that we have these preservative ingredients in our products. So, we're letting folks know the purposes for these ingredients in our cosmetics and foods and that synthetic products are not necessarily more harmful to people or the environment than some natural products are.

Love: Yes. Arsenic, asbestos, and botulinum toxin are all natural. And every virus that infects you and causes illness is all natural. So, we try to reframe people's approach to these sorts of things.

Gaps in scientific literacy are also caused by overconfidence in one's level of scientific knowledge. For example, individuals' perception of the healthfulness and/or safety of foods typically relates to their perspective on biotechnologies such as GMOs. Those people most opposed to GMOs often know the least about the topic but have a high self-perception of knowledge. This inverse relationship between the level of opposition to a scientific issue and the level of actual understanding about the topic may lead to policy decisions that are not aligned with science. The inaccurately high level of self-perceived knowledge may also cause one to resist learning new information.

Steier: The fourth factor of science literacy gaps is near and dear to my heart as a data scientist: it is a lack of understanding of research, design, and implications for the validity and reliability of studies. People send us a link to one PubMed article that has an n of 10 and improper controls for a million confounding variables that undoubtedly cloud the relationship between the 2 variables of interest. Other people incorrectly assume that an in vitro study or a preclinical study that was conducted in rats automatically translates to humans.

The example we give is aspartame, which has been splashed all over the news lately. People are terrified to take a sip of Diet Coke. However, the supposed risk associated with aspartame is based on preclinical and *in vitro* studies. People do not realize that unless they drink approximately 70 cans of Diet Coke, their risk is incredibly low. In this situation, a lack of knowledge about the research design is definitely a limitation.

Love: The final gap in scientific literacy is caused by a lack of understanding of the scientific process. People tend to think of things in black and white, especially on social media platforms like Instagram and TikTok. Sites like FlavCity and Food Babe are notorious for spreading misinformation about ingredients and things. These sites claim that certain ingredients cause cancer, are toxic, or disrupt endocrine function. However, the sites fail to mention the doses and exposures that were used in the research studies. Were the studies conducted in animals? If so, what animal? Were they conducted in humans? There is a lack of nuance.

People do not realize that science is an accrual of information over time. Scientists' statements are well based on data, based on the information available right now. We as scientists may be timid to make a particular statement because we recognize that we constantly learn new information. From such a perspective, it's hard to compete with someone who makes very bold, matter of fact, confident statements that elicit emotions.

Jessica and I want people to understand that just because things change over time does not mean it was wrong and now it is right. It means that we learned more things. That is how science happens.

Steier: Science needs a new PR person. Andrea and I consider ourselves part of that PR team.

Love: I want to revisit the topic of logical fallacies as a source of misinformation in Science and Health Communication. Anecdotes are used instead of evidence. People appeal to false authorities. The appeal to nature fallacy causes responses such as chemophobia. Everybody is scared of only certain chemicals and not of other chemicals, not realizing that everything is chemicals. So, we try to explain to them that just because one cannot pronounce the chemical's name does not mean the chemical is harmful. Chemicals are named according to a systematic method related to their structure.

False balances also exist. Construction of a false balance portrays 2 inequivalent entities as equivalent. One example is the proposition for Peter Hotez to debate R.F.K., Jr on the topic of vaccines. This proposition suggests that these men's arguments will be equivalent, despite one man drawing from decades and decades and decades worth of scientific data and the other man using cherry-picked in vitro data and conspiracy theories.

Two other contributors to misinformation within science and health communication are the oversimplification of science often perpetuated by clickbait headlines and the use of correlative data instead of causality.

People often ask Jessica and me why we care so much about correcting scientific misinformation. We care so much because of the harms that may result if people fall prey to such misinformation. We see direct harm to individuals. For example, some people don't believe in cancer therapies, but they get an IV of 5,000 mg of vitamin C. They subject themselves to a potentially acute toxic level of vitamin C, but they forego real medical treatment.

Harms may not be limited to a single individual opting out of a vaccine, for example. Harms may be community wide or global in scope.

Steier: Andrea, another good example to give here relates to organic foods. People have built up organic foods as being superior to conventional foods. Of course, we know that organic food comes with a much higher price tag, which means that a lot of people cannot access those foods. Therefore, people who fall into lower SES [socioeconomic status] categories simply go without eating fruits and vegetables altogether because they think that conventional produce is going to be harmful to them.

Love: Right.

Steier: This exacerbates food deserts and reduces access to healthy foods.

Love: Yes. Misinformation surrounding dietary fiber also causes harm. Some people who are already at higher risk for poor health outcomes because of their economic status adhere to the carnivore diet or a fad diet; they avoid eating fiber. However, a lack of fiber in one's diet causes additional health consequences, such as cardiovascular disease and diabetes. Health problems of at-risk populations increase as a result of misinformation.

Scientific misinformation also causes psychological harm. We get messages every single day from people who are scared to go to the grocery store because they have been convinced that ingredients and preservatives like sodium benzoate are toxic, are killing their kids, are harming them, and are causing premature puberty. People have health anxiety all the time due to this huge risk perception gap.

In addition to physical and psychological affects, misinformation leads to economic consequences. The health care burden increases when people do not opt into preventive health treatments and vaccines. The promotion of glorified snake oils increases the amount of money being spent on these items.

Misinformation may cause people to reject expertise, reject science on the whole, and mistrust regulatory and scientific agencies. Therefore, Jessica and I want people to realize that individuals who promote these alternatives that are often ineffective have a profit motive. Are they selling their quick fix? Are they selling their supplements? Are they selling a course you can take? Are they selling a book? You always want to look at that as well.

Steier: They're not working for hugs, right?

Love: Yes.

Steier: Before we go on, we need to acknowledge that the American health care system is not perfect. There are some very real issues that are systemic in our country and in others that are contributing to this. For instance, when I tried to make an appointment with a specialist, I was told, "Oh sure, no problem. It will just be 8 months from now." That is not helpful; I am dealing with a health issue now.

When people receive such a response, what happens? They go to the emergency room or urgent care. This behavior pressures the ER doctors to see as many patients as possible as quickly as possible. So, doctors have 30-second encounters with the patients. As a result, patients do not feel heard. A lot of these patients, especially those who are dealing with chronic illness or chronic pain, then switch to alternatives. While we understand why some people think they have no other options besides alternatives, we know that this turn toward alternatives is contributing to a general sentiment of mistrust and distrust of the scientific and medical establishment.

Love: Jessica and I created a toolkit of tips that allows us to effectively frame and communicate our message. First, we meet people where they are. We seek to understand people's objection to a particular piece of information and why they have this objection. We try to find out their educational limit or the amount of fundamental scientific knowledge that they have. We always want to listen to people. We listen with empathy and without judgment. We listen in a way that allows us to collect and source information. We then

reframe our message or find a path on common ground. We want the person to be open to the information we provide to them.

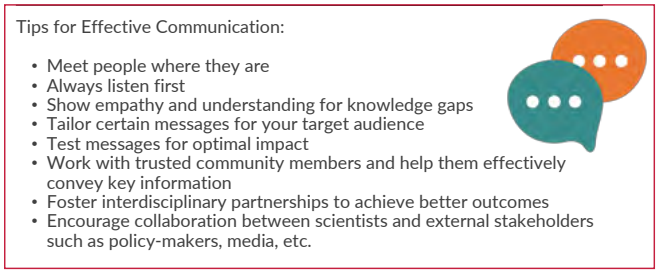

Figure 2. The unbiased science toolkit.

Steier: Another tip of effective communication is "show empathy." If we approach people from a place of judgment, those people are going to shut down immediately. We must be mindful that people come from different cultures and have different backgrounds and different levels of scientific education. So, there should be no judgment. The fact that we both have doctorates does not make us better than anyone; it makes us experts in our respective fields and gives us the authority to speak on certain topics. If one were to build a house, they would call an architect and a carpenter, experts in that line of work. Similarly, we want people to see us as helpful experts, not as threatening scientists who weaponize our credentials or talk down to people. That would be a very ineffective communication strategy.

Love: And of course, we need to tailor our messages to our target audiences. We're going to illustrate this in a moment. If you're in a regulatory field, you write for regulatory agencies. If you're in a publication area, you write articles for scientific peer review. Others of you write for the general public or for health care providers. Health care providers are often incorrectly conflated with scientists. Often, gaps exist between what health care providers communicate to their patients and what the science says. So, we science communicators must seek to bridge this information gap between scientists and health care providers.

Steier: It is also important for an effective communicator to test the message. Time and resources are not always available to do this, but this testing practice helps one to predict what the impact of their message will be.

Love: A lot of times, objections to our scientific messages are based on systemic or cultural differences, particularly with regard to certain communities. We cannot just enter as an outsider with the mindset of "I am a scientist. I am going to tell you what's what." We have to get buy-in from entities that are trusted by our target communities. Get them to be the conduit of our information. Therefore, we must convey our information to these trusted sources in a way that resonates with them so that they in turn are able to communicate it with others.

We have to work together across all segments, with organizations, governmental entities, private industry companies, the general public, and media outlets. The communication effort has to be interdisciplinary. We want the trusted entities to be the conduit of our information. Collaboration is really essential. Without it, we have the content, but we do not have the delivery method.

Steier: In the interest of time, we share with you just 3 examples of our more playful graphics. Sometimes we are technical, scientific, and didactic. But that does not always resonate with folks, especially people who are not scientifically minded.

The first example is a post encouraging people to eat fruits and veggies regardless of whether they are conventional or organic. Just eat them. I hope that everyone appreciates the pop culture reference to Schitt's Creek in the infographic. We say we're into the produce, not the labels.

Figure 3. Playing with messaging styles, techniques. and modalities. Example 1.

The second infographic (on next page) is a play on the Got Milk campaign, which was very popular. We used it to kick off a series on dairy and health implications, environmental implications, animal welfare, and more.

The third infographic is a comedic example of our snarky side. It illustrates that we should not conflate correlation with causation. The rise in ice cream sales does not cause a rise in shark attacks. Instead, the hot summer is the most

Figure 4. Playing with messaging styles, techniques, and modalities. Example 2.

popular time for people to eat ice cream and to go swimming in the ocean. So there you go. We get a little playful sometimes.

Figure 5. Playing with messaging styles, techniques, and modalities. Example 3.

Love: On a more serious note, last year we implemented a social media campaign related to the flu vaccine. The goal was to educate people and dispel misconceptions related to flu vaccines, because unfortunately the uptick in the number of flu vaccinations every single year is much lower than we and public health agencies would like.

Steier: I'll be pretty brief because I know we are short on time. We conducted surveys, hosted focus groups, and interviewed key informants within the public and among health care providers. We sought to identify the information gaps and the groups who are the most hesitant to get their flu vaccines. Two main groups emerged. One group was Black Americans of any age and gender, and the other group was young White males living in rural areas, particularly in the South and Midwest regions of the US.

These groups' reasons for hesitancy were completely different from each other. Among the Black Americans, it was a very understandable mistrust of the scientific and medical establishment based on historical events. They were scared. They feared chemicals, needles, and what was being injected into them. Whereas for the young white men, it was more about autonomy and distrust of the government. They refused to take something that was FDA-approved.

So, we developed a campaign with 2 different types of messaging that was tailored to these 2 audiences. We did some message testing: could we improve the messages?

Love: We created podcast episodes. We made infographics. We produced some video reels. We even conducted a live Q&A with a pediatrician.

Steier: The takeaway is that we reached an audience of 1.3 million individuals, which was amazing. A huge chunk of those individuals—over 300,000 of them—were clinicians, because HCPs [health care professionals] comprise a big chunk of our audience. This is great, because physicians are often our conduit for getting information directly to the public.

Amazingly, when we evaluated the impact of our flu vaccine campaign, we discovered that over 11,000 people changed their minds to get vaccinated based solely on the information that they received from our education campaign.

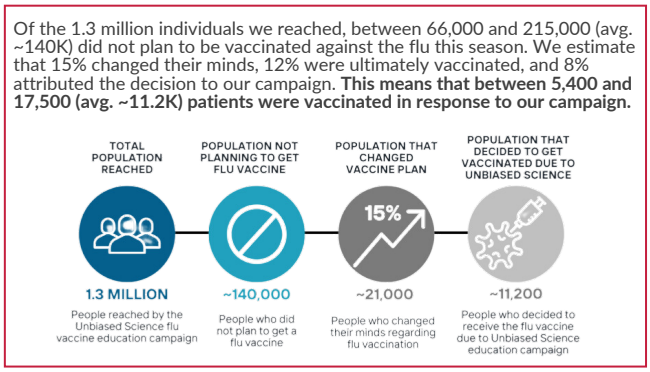

Figure 6. Reach and impact.

Love: We are working on writing up these campaign results and submitting them for publication, because I think there

needs to be more peer-reviewed data that underscores the importance of using social media for altering health outcomes. And of course, we have a lot of quotes that we included as well.

We conducted a similar study and educational campaign on menstrual hygiene misconceptions. There's a lot of fear-mongering within the menstrual health world around hormones, menstrual bleeding, and menstrual products. One theme that emerged from our study is that women routinely score lower than men on tests of one's baseline scientific knowledge. A lot of systemic reasons explain this finding.

In this campaign, we focused on 2 buckets of information: those related to medicine and health, and those related to chemophobia. We addressed medical and health topics by answering questions such as "Why do I poop more on my period?", "Why does the color of menstrual blood change over time?", and "Is it safe to sleep in a tampon overnight?" We approached the chemophobia-geared topics by answering questions like "Is titanium dioxide safe in my tampon?" and "Why are all these chemicals in my tampons?" Again, we tried to keep our communication playful but informative. We dissected the anatomy of different menstrual products, including tampons and pads. We explained the purpose of each ingredient in them, and we addressed common misconceptions about those ingredients. And of course, we talked about period poop.

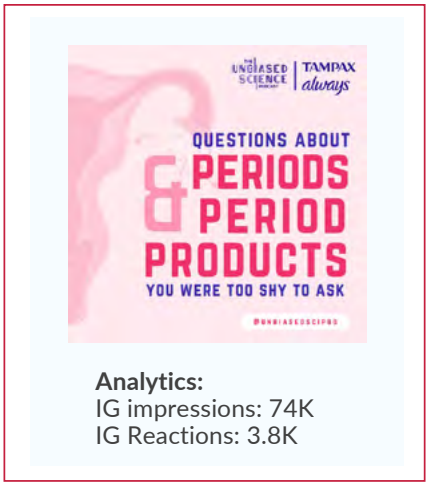

Figure 7. Reach and impact (IG only).

Love: People love to talk about poop. In our infographics, we included an image of a little wombat, because it has cube-shaped poop. I don't know if you knew that, but now you do.

We sought a similar reach to the flu vaccine campaign for our menstrual hygiene campaign. We created podcast episodes on menstrual myths and hygiene, made infographics, and produced additional reels. And we had a lot of reach.

So, what's next for us?

Steier: We want to grow. Science communication is more important than ever. We are all, everyone in this room, fighting an uphill battle. In the age of social media, misinformation supposedly travels 6 times faster than factual information travels. Everyone in this room is doing such meaningful work. We need more of it.

We want to expand our reach and our brand recognition. We want to make sure that this type of scientific information is being integrated into childhood education, undergraduate and graduate education, professional medical education, and scientific education.

Love: We want to create a kind of brain hub of interdisciplinary experts: not just scientists, not just health care providers, not just writers, not just media outlets, not just regulatory individuals. Cross-pollination is important, because if we do not communicate across different sectors, the messages will not reach the necessary audiences. We want to work with community leaders in order to understand why certain communities have poor health outcomes. We want to be a conduit of information that can be delivered through a trusted source. We also want to work with legislators to help them make policy decisions informed by science rather than by personal opinions or biases. Red dye no. 3 in California, I'm looking at you right now.

Steier: We would like to grow Unbiased Science and make it our main gig because "science is not finished until it is communicated." We are trying to figure out how to make science communication sustainable for us. Unfortunately, we have bills to pay, and running Unbiased Science takes a lot of time, energy, and expertise. We are open to ideas and collaborations and hope to speak with some of you after this talk.

Love: It's hard to have 2 full-time jobs.

Thank you all for your attention. Thank you so much for this honor. We will treasure this McGovern Award. Again, thank you so much.

Steier: Thank you. Thank you all.

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