

# Learning from failures in vaccines promotion

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Whether considering number of lives saved or health economic resources retained per year, vaccines are amongst the greatest public health achievements of the 20th century. Because of their use, the horrors of many dangerous diseases are today a distant memory. Yet, ironically, vaccines have become victims of their own remarkable success. Prompted by a deluge of misinformation and by a spreading distrust in science, fear of diseases has been replaced by fear of vaccines, resulting in diminished uptake worldwide and frequent outbreaks of vaccine-preventable diseases. Strategies intended to promote vaccination have been numerous, yet they are often poorly informed by the cognitive mechanisms influencing human behaviour and decision making—hence they may be ineffective, or worse backfire, reinforcing ill-founded beliefs about vaccination and reducing intentions to vaccinate. A key challenge for public health policies is to understand the reasons behind vaccination strategies' ineffectiveness. This paper provides an overview of the interventions that have been attempted to address vaccine hesitancy, examining what can go wrong when trying to debunk vaccination myths and what can be learned from past failures in vaccines promotion.

Keywords: Vaccination strategies; misinformation; myths; backfire effects; trust.

## **Background**

Scientists are well aware that the experiments they conduct may have a high failure rate, alongside the occasional success. In the pharmaceutical field for instance, researchers have a stunningly high attrition rate, as the 90 percent of the drugs and therapies they develop are never approved for clinical use (Hay et al. 2014). Yet, scientists may also experience innovation stemming from a failed experiment or serendipitous discoveries, such as in the case of penicillin, lithium, or Viagra (Ban 2006; Marletta 2017). They know, ultimately, that failures are a crucial part of the scientific progress because every failed experiment may help them to

reframe their perspectives or experimental designs, leading to a more precise understanding of the problems they are studying (Loscalzo 2014). After all, as suggested by London and Kimmelman (2015, p. 1), “the failure of well-designed studies benefits both researchers and healthcare systems by, for example, generating evidence about disease theories and demonstrating the limits of proven drugs”.

While the wisdom of learning from failure is incontrovertible, Samuel Beckett’s motto “*Ever tried. Ever failed. No matter. Try again. Fail again. Fail better*”<sup>1</sup> would hardly promote success on sensitive topics such as vaccine misinformation and the communication strategies intended to debunk it. It may indeed be harder to recognize the intrinsic value of failure when pro-vaccination strategies, despite the best intentions, end to fail, or worse provoke unintended, opposite repercussions. But why does it seem so difficult to convince some people that vaccines, whether considering number of lives saved or health economic resources retained per year, are amongst the greatest public health achievements of the 20th century (Dubè et al. 2015; Sadaf et al. 2013)?

In this paper, I will consider how pro-vaccination strategies often fail and provide suggestions for alternative ways of communicating the scientific consensus around vaccines. As Beckett suggested, one can at the very least try to improve his failing, and we should certainly do that when dealing with public health and the possibility to save lives.

### **The perils of vaccine misinformation**

In the contemporary information environment, as the potential for fake news to circulate as facts has become greater than ever, finding reliable information is extremely difficult and placing the onus on the individual to detect blatant fake news and avoid being fooled (Pennycook et al. 2015). Faced with a deluge of (mis)information today, people turn to a large repertoire of mental shortcuts or fast-and-frugal heuristics to make decisions about the veracity and credibility of a statement, often based on very little information and with short time (Gigerenzer 2008, 2015). Unfortunately, no matter how blatant it seems, misinformation is hard to spot and quickly disregard. For instance, hoax sites detailing the “first male pregnancy in history” or the “use of small hamster-like rodents in the production of cheese” could be easily believed by children and young adults, even though individuals report having been exposed to online credibility evaluation training and should therefore be quite familiar with analytic evaluation strategies (Metzger et al. 2015). If the ones above are relatively benign examples of

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<sup>1</sup> The quotation is from Samuel Beckett’s novella *Worstward Ho* (1983).

something that was deliberately constructed absent of any concern for the truth (Frankfurt 2005), the ramifications of the sheer amount of more malignant misinformation that we encounter everyday – either deliberately disseminated or accidentally shared – may have real-world implications in disparate areas such as education, health, and economy.

The societal costs of misinformation can literally be deadly serious because, if people stubbornly consider false information to be true and act on that false information, this can form the basis for decisions that run counter to a society's best interest, including, as in the case of vaccine misinformation, a marked increase in vaccine-preventable diseases and hence preventable hospitalizations and even deaths (Lewandowsky et al. 2012). One noticeable example is the widespread misconception that childhood vaccinations cause autism, a falsehood that has been repeatedly confirmed by the scientific community over the years with diverse public-information campaigns aimed at rectifying Andrew Wakefield's 1998 false paper that disseminated the original myth (Swire and Ecker 2018). Despite these debunking efforts, the revelations about Wakefield's secret agenda, and the retraction of his fraudulent paper, many continue to believe in the unfounded and discredited vaccine-autism link and decide to not immunise their children. This has had alarming consequences for both individuals and societies, such as a marked decrease in vaccination rates and the associated emergence of vaccine-preventable diseases (Owens 2002). For instance, like other European countries, Italy has recently recorded a dangerous decrease in childhood vaccination coverage rates, which dangerously disrupted herd immunity and led to a widespread measles epidemic in 2017 (WHO 2018).

The problem is that misinformation is “sticky” as it can survive in the face of updated records; people can continue to rely on invalidated information even if they remember and understand a subsequent retraction (Cook and Lewandowsky 2011; Seifert 2002). The lingering phenomenon by which misinformation continues to influence memory, reasoning, and decision making even after sophisticated attempts of corrections is known as “continued influence effect” (Johnson and Seifert 1994). This effect has been widely demonstrated in the realm of vaccination; a number of studies have shown a relationship between vaccine misinformation and vaccine hesitancy, documenting the alarming paucity of significant findings of pro-vaccination interventions on vaccine uptake (Nyhan et al. 2014; Pluviano et al. 2017; Pluviano et al. 2019). Regrettably, the problem applies nearly to all types of vaccines: for example, individuals who believe that the flu vaccine can make them sick may be less likely to vaccinate themselves (Nyhan and Reifler 2015), as well as those who are convinced that the MMR vaccine against measles, mumps, and rubella is associated with autism are less likely to vaccinate their children (Pluviano et al. 2017; Pluviano et al. 2019). Furthermore, recent research reports the possibility of dangerous spill-over effects from misbeliefs about one

vaccine on intention to use another; for instance, people might base their intentions to use a novel vaccine on their prior misbeliefs in the MMR vaccine causing autism (Ophir and Jamieson 2018).

Now that I have highlighted the social importance of vaccine misinformation, I will review the most common pro-vaccination strategies, trying to understand the reasons behind their inefficacy and exploring new ways to overcome past failures.

### **Analysing failures: why do corrective efforts fail?**

Extensive literature exists on corrective attempts failing to persuade vaccine-hesitant parents (Dubè et al. 2015; Sadaf et al. 2013). However, pointing the finger of blame at researchers and professionals attempting to correct vaccine misinformation may be unfair as debunking misinformation is certainly no easy job (Cook and Lewandowsky 2011). The process of correcting misinformation is complex and remains incompletely understood (Chan et al. 2017). Despite the best intentions and efforts, corrective attempts can even trigger backfire effects for individuals deeply entrenched in vaccine rejection, so that they not only fail to change their minds when confronted with facts, but may come to hold their ill-founded beliefs more tenaciously than ever (Nyhan et al. 2014; Nyhan and Reifler 2015). Even if the corrective attempt succeeds (that is reduces vaccine hesitancy and/or increases vaccine uptake) or at the very least is ineffective (bringing no significant result in terms of healthy behaviours), its positive or non-harmful effects may not last a very long time. The lasting effect of misinformation in memory can occur after a delay, so that even those for whom the correction worked in the beginning may return to hold the initial, misinformed opinion after a while (Appel and Richter 2007; Zhu et al. 2012). Furthermore, it should be noted that vaccine hesitancy is a multi-layered phenomenon, involving—amongst others—emotional, social, cultural, and political factors, as well as several other factors that need to be identified and further explored (Larson et al. 2014).

Perhaps the simplest way to correct vaccine misinformation is to present accurate facts, trying to educate people about vaccines and the severity of the diseases they prevent. However, when trying to debunk health misinformation, it has been demonstrated that people who are merely presented with factual information may end up having less knowledge about the topic at hand than those exposed to other corrective strategies (Cameron et al. 2013). Providing more information may have limited effectiveness for a variety of reasons. First, our mind does not work as a camera and requires more subtle processes than record, rewind, and playback (De Vito and Della Sala 2011). Human memory is entirely reconstructive, meaning that it is vulnerable to what people have already stored in memory, their own expectations, needs, beliefs

and emotional state (Schacter et al. 1998). Second, precisely because people are not blank slates, they already have pre-existing beliefs that dictate how they gather information and what they choose to accept. Under certain circumstances, people may even choose to believe only what they want to believe, trying to avoid opposite claims and incompatible information, which represents a typical “confirmation bias” (Festinger 1957; Nickerson 1998). Confirmation bias is particularly strong among those with stronger underlying beliefs or attitudes on the issue in question, as it may happen in the context of vaccination (Nyhan and Reifler 2012). Mounting evidence suggests that confirmation bias may explain variation into vaccination coverage and portrays vaccine hesitancy as a problem of biased reasoning, with vaccine refusers ignoring the rational findings of science and engaging in all types of tactics and tropes to favour their cherished and fundamental beliefs about vaccines (Kata 2012; Voinson et al. 2015). Therefore, providing evidence about vaccine safety may not be enough as people may have heard or read somewhere that, for example, vaccines are unnatural, not necessary, that they cause autism or contain dangerous chemicals, and may have become convinced of that and will try to stubbornly defend and reinforce their strongly held beliefs. What is worse is that no one, no matter how brilliant or how educated, is immune from irrational convictions. From Nobel Prize winners to respected scientists, nearly everyone can have a hard time changing their own mind.<sup>2</sup>

Another strategy that is often utilized to correct vaccine misinformation involves reiterating the myths (such as repeating the misinformation about the flu vaccine causing flu illness) and then discrediting them with a number of facts (such as explaining that flu shots are made with flu viruses that have been inactivated and that therefore are not infectious). This approach can be problematic because repeating myths might contribute to increasing their acceptance due to their perceived familiarity. After some time passes from the debunking attempt, people are more likely to remember the myth itself, rather than the information which disproves it (Dechêne et al. 2010; Peter and Koch 2016). This may happen because we may judge repeated information as true because it feels more familiar, as opposed to novel information (Unkelbach et al. 2019). However, some studies have found that if a myth is not repeated when corrected, the associated negative effects may be equally or even more detrimental to belief updating than the boost of the myth’s familiarity, and therefore suggest that repeating myths is a necessary precondition for memory updating (Swire et al. 2017). That, however, is yet to be proven in the context of immunisation.

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<sup>2</sup> For instance, Linus Pauling, a chemist who won two Nobel Prizes, became convinced that high dose of vitamin C was a highly effective treatment for common cold and even for cancer, spending many years pushing his outlandish ideas despite being totally unsupported by medical evidence.

A third technique to counter anti-vaccination attitudes is to appeal to the power that fear exerts on people, by highlighting grave risks from diseases. For instance, to motivate smokers to quit their behaviour, anti-smoking messages often stress the negative health effects of smoking via resonant texts and vivid pictures. This may make people more aware of the diseases they may get and so induce behaviour changes, at least as long as the individuals believe that they are able to protect themselves and avert the threat (Witte and Allen 2000). However, recent studies using emotive manipulation, such as images of unvaccinated and sick children to make risks more salient, paradoxically increased ill-founded beliefs about vaccination (Nyhan et al. 2014; Pluviano et al. 2017).

Where does this leave us? Given that vaccines misperceptions are so difficult to correct, is there no reason for optimism? Considering that correcting misinformation is absolutely important and finding the best way to do so is much needed, in the next section I will consider new insights into the development of effective messages to counter attitudes and beliefs based on misinformation.

#### **Learning from failures: new insights into effective debunking**

Two useful guides, the Debunking Handbook (Cook and Lewandowsky 2011) and the Uncertainty Handbook (Corner et al. 2015), provide some recommendations that can serve as guidelines for mass communication as how best to counteract the fallouts from misinformation in the public sphere. First, given the difficulties of improving human cognition, a more effective way of dealing with misinformation would be not spreading it in the first place. For instance, it has been shown that Republicans who believed Saddam Hussein was linked to the 9/11 terrorist attacks—a false belief that was the result of a campaign of false information and innuendo from the Bush administration—did not change their mind even after being presented with a direct quote from George Bush denying any connection between the two (Prasad et al. 2009). Therefore, one should avoid the unnecessary repetitions of misinformation that may lead people to more easily remember the very false claims (Nyhan and Reifler 2012; Trembath et al. 2016). Instead, communicators should focus on the facts they are trying to convey, facilitating their understanding through the use of “simple clear messages, repeated often, by a variety of trusted sources” (Cook et al. 2018, p. 14) and, ultimately, encouraging the public to employ scientific skepticism, “approaching claims with an open mind, and a willingness to accept only those claims that have survived scrutiny in rigorous scientific tests” (Schmaltz and Lilienfeld 2014, p. 1).

Another practical recommendation concerns the perceived credibility of the source of information delivering the corrective message, which represents an important component of a sound pro-vaccination campaign. Trust is a key element in vaccination decision-making policies (Benin et al. 2006; Mills et al. 2005). Unfortunately, when it comes to sensitive topics such as vaccination, the public may rely on judgments of the source's trustworthiness rather than assessments of the source's technical knowledge or credentials to determine which experts to believe and whose advice to follow (Benegal 2018; Fiske and Dupree 2014). For instance, celebrity Jenny McCarthy has become a key spokesperson of "parents as experts" advocacy groups perpetuating the debate about childhood vaccination linked to autism despite the scientific evidence to the contrary. Leveraging on her "mommy instinct" providing her with the necessary knowledge to make complex decisions regarding her son's safety, she persuaded the audience of her credibility because, at the end of the day, no parent would ever do something bad for their child (Archer 2014).<sup>3</sup> This validates the existing literature proving that the misinformation is particularly difficult to correct if it comes from a trusted source (Swire et al. 2017; Swire-Thompson et al. 2019). Likewise, corrections should come from diverse trusted sources.

Furthermore, corrections of misinformation seem to be more effective when they do not directly challenge people's worldviews. As discussed above about confirmation bias, strong believers may reject incongruent beliefs in order to maintain a pervasive worldview, whose dismissal would be too threatening for their identity (Cook and Lewandowsky 2011; Nyhan and Reifler 2010). To prevent that, it could be useful to affirm individuals' self-worth, which could make recipients of the corrective message more willing to acknowledge uncomfortable facts, or make the correction more pervasive through graphical representation of accurate information (Lewandowsky et al. 2017; Nyhan and Reifler 2019). Also, corrections should not be solely informational, rather they should provide alternative explanations to misleading information, or at least, explain why the misinformation came to be (Seifert 2002). The reason behind this suggestion is that people tend to build mental models of the world and they want these models to be complete. The problem here arises because any retraction leaves a gap in people's understanding and, as people do not like gaps, they will continue to accept information that may not be very reliable or valid, so they have what feels like a complete, though not accurate, understanding (Ecker 2017).

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<sup>3</sup> See, for example, Karl Taro Greenfeld, "*The Autism Debate: Who's Afraid of Jenny McCarthy?*" Time, February 25, 2010, Available at: <http://content.time.com/time/magazine/article/0,9171,1968100,00.html>.

Ultimately, to achieve long-term beliefs change, an effective debunking should rely on repeated and varied refutational interventions. Tailoring different, simultaneous, and frequent interventions is pivotal to increase the likelihood of corrective messages' dissemination and acceptance (Jarrett et al. 2015). However, in the case of immunisation, the inter-relationship of multi-level factors contributing to vaccine hesitancy, which include individual, social, cultural, and political factors, seems somewhat difficult to disentangle in order to make such targeted approach successful. Consider, for example, how factors like mandatory vaccination policies, social norms pushing individuals to conform to the majority's behaviour, or standards for vaccine uptake in a specific population may influence vaccination behaviour. Nonetheless, as the possibility for vaccine misinformation multiply, the only candle in the dark to raise the odds of success remains the continuous experimentation and optimisation of appropriately designed, well-executed, and rigorously evaluated interventions to address parental vaccine refusal and hesitancy (Sadaf et al. 2013).

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