

Marketing SARS-CoV-2 Vaccines: an Opportunity to Test a Nobel Prize–Winning Theory



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The rapid development of vaccines against SARS-CoV-2 is a dazzling achievement. Yet, widespread vaccination of the world's population is a feat that is no less daunting. Along with overcoming significant logistical hurdles, gaining public acceptance is crucial. Nearly 150 million adults in the USA had received at least one dose of SARS-CoV-2 vaccine by the end of April 2021.¹ Yet, surveys show that as many as 30 to 40% of adults may refuse to be vaccinated in some states.^{2,3} Hesitancy is rooted in doubt about the need for vaccination or its effectiveness, fear of vaccine safety, and belief in freedom of choice.⁴ Underlying these concerns is a mistrust of vaccine manufacturers and promoters, exacerbated in some countries by politicization of the pandemic. Solutions must address a broad range of issues, including organizational logistics, equitable access, cultural and social factors, and systemic racism. Strategic public health messaging can be informed by insights from behavioural economics that people's decisions may be affected by the way choices are framed.

Tversky and Kahneman⁵ demonstrated how framing influences the choices we make. The following scenario is adapted from one of their seminal studies. Imagine a flood where 600 people are expected to die. Study participants must choose between two rescue options: Build a boat that holds and will save 200 people, or build a dam that has a 33.3% chance of holding back the flood and saving all 600 people. In the original experiment, 72% of participants chose the equivalent of the boat. The second group was presented the same options, framed differently: build a boat that ensures 400 people will die, or build a dam that offers a 33.3% chance that no one will die. Here, 78% of study participants preferred to gamble, opting for the equivalent of the dam. In this case, where the

probability of either gain or loss was relatively high, framing choices as “gains” (lives saved) made people risk averse, while framing them as “losses” (deaths) induced people to take risks. Perhaps even more fascinating is that the tendency to be risk averse or risk seeking is flipped when the probability of an outcome is low⁵ (see Table). People seek risks for low probability gains (like buying lottery tickets) and are risk averse for low probability losses (which is why they buy property insurance).⁶ These observations are a central component of prospect theory,⁷ for which Kahneman was awarded the Nobel Prize in 2002.

Both gain and loss frame messaging have been used to promote vaccination. The CDC's influenza vaccine campaigns have used slogans like “get a flu vaccine to protect yourself, your family, and your community” (gain frame) and “each year, millions of children get sick with seasonal flu and thousands of children are hospitalized, #fightflu” (loss frame).⁸ Prospect theory suggests that gain and loss frame messages could be deployed strategically to promote SARS-CoV-2 vaccination depending on how the target audience perceives the relative risks and benefits of vaccines, as well as their self-perceived risk of suffering severe consequences of COVID-19 (Table 1).

The powerful effects of framing are evident in politics and marketing. Two famous loss frame messages have shaped recent history (“Make America Great Again” (Trump) and “Take Back Control” (Brexit)) by reminding their audiences of all they believe they have lost. However, randomized controlled trials of framing incentives⁹ and framing communication^{10,11} to promote health behaviour have been underwhelming.¹² There remains little definitive empirical demonstration that framing works in health; the jury is still out on whether this theory really works. This may be because prospect theory is sometimes misapplied or misunderstood.¹³ For example, the term “risk” as considered by Tversky, Kahneman, and their collaborators refers to uncertainty but has frequently been misinterpreted to mean the potential for a bad outcome. To be truly based on prospect theory, framing interventions must consider perceptions of uncertainty related to either positive or negative outcomes, not just the chance of negative outcomes occurring (see Table 1). SARS-CoV-2

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Table 1 Predicted Risk Perceptions Associated with High and Low Probability of Gains and Losses, applied to SARS-CoV-2 Vaccination

Probability	Perception of Vaccination	
	Loss	Gain
High	<p>Risk Preference: Risk seeking</p> <p><i>Underlying belief:</i> SARS-CoV-2 vaccination carries a high probability of side effects</p> <p><i>Vaccination preference:</i> Prefer to take the chance of getting COVID-19 rather than accepting side effects from vaccine</p> <p><i>Framing intervention:</i> Use loss frame messages to highlight the certainty of prolonged pandemic and resulting death and restrictions on activities. Reframe the choice to be between the certainty of an ongoing pandemic and the uncertainty of taking a vaccine, so risk seeking favors vaccination.</p>	<p>Risk Preference: Risk averse</p> <p><i>Underlying belief:</i> SARS-CoV-2 vaccination carries a high probability of benefit</p> <p><i>Vaccination preference:</i> Prefer the certainty of benefit offered by the vaccine rather than the chance of getting COVID-19</p> <p><i>Framing intervention:</i> Use gain frame messages to emphasize safety and certain benefits of vaccination. Reinforce risk averse preference, which favors vaccination.</p>
Low	<p>Risk Preference: Risk averse</p> <p><i>Underlying belief:</i> SARS-CoV-2 vaccination carries a low probability of side effects</p> <p><i>Vaccination preference:</i> Prefer the certainty of benefit offered by the vaccine and undeterred by low probability of side effects.</p> <p><i>Framing intervention:</i> Use gain frame messages to emphasize safety and certain benefits of vaccination. Reinforce risk averse preference, which favors vaccination.</p>	<p>Risk Preference: Risk seeking</p> <p><i>Underlying belief:</i> SARS-CoV-2 vaccination carries a low probability of benefit</p> <p><i>Vaccination preference:</i> Prefer to take the chance of getting COVID-19 rather than accepting vaccine</p> <p><i>Framing intervention:</i> Use loss frame messages to emphasize that the benefits of SARS-CoV-2 vaccination extend beyond individual protection and highlight the social and economic losses from a prolonged pandemic. Reframe the choice to be between the certainty of an ongoing pandemic and the uncertainty of taking a vaccine, so risk seeking favors vaccination.</p>

This table is adapted from Tversky and Fox (1995)⁶ to illustrate attitudes toward risk based on the probability and framing of different outcomes. The term "risk" in this context refers to the uncertainty in outcomes, rather than to the probability of a negative outcome. Greater uncertainty of either positive or negative outcomes is considered to be greater "risk". Risk seeking refers to a willingness to gamble on an uncertain outcome, whereas risk aversion refers to a preference for certainty. We present simplified vignettes of preferences regarding vaccination as an illustration, acknowledging that real-world attitudes toward vaccination are more complex

vaccination campaigns offer an important opportunity to test message framing strategies under real-world conditions.

Most people perceive that SARS-CoV-2 vaccination carries a high probability of benefit and a low probability of side effects. Prospect theory predicts that these people will be more risk averse (see Table 1), so public health messages aimed at

them should use gain frame messages to emphasize the safety and benefits of vaccination.

However, other people perceive SARS-CoV-2 vaccination to carry a high probability of serious side effects, in part due to sensational media coverage of rare reactions. Many of these same people believe their chance of suffering severe illness from COVID-19 is low. In this circumstance, prospect theory predicts that people will be risk seeking (see Table 1), preferring to take a risk if the alternative is a certain loss. For these groups, campaigns could use loss frame messages to highlight the certainty of accumulating fatalities and prolonged restrictions on economic and social activity in an ongoing pandemic.

While loss frame messages may be powerful, negatively oriented messages may also have undesirable consequences where trust is already tenuous. Vaccine communication must be sensitive to the history of scientific abuses in racialized and other minority communities. People need to believe that those encouraging vaccination are acting in their best interests. Hesitancy and confidence related to vaccination are complicated issues that are influenced by many factors. Framing interventions represent only one potential component of a multi-faceted strategy to encourage vaccine uptake. Employing trusted advocates from within communities, using linguistically and culturally specific media and social platforms, and ensuring diverse representation are all important to ensuring vaccine uptake.

Vaccine hesitancy does not exist only in racialized or minority communities and it must not be used as an excuse to ignore structural and systemic factors that hinder vaccination.¹⁴ Studies show loss framing is effective when people have self-efficacy, confidence in their ability to undertake the healthy behaviour.^{15,16} For example, negative messaging regarding the health consequences of smoking may not be effective in people who have unsuccessfully tried quitting multiple times. Two small randomized trials^{17,18} showed that tetanus vaccination was increased by loss frame messages only when they were coupled with specific messages promoting the ease of vaccination. Similarly, loss frame messaging that emphasizes the importance of SARS-CoV-2 vaccination must be paired with free and equitable access to vaccines, which is conveyed to the public with empowering messages and specific instructions about how to be vaccinated. Vaccination efforts must remove systemic barriers, such as online-only appointment booking which disadvantages those without ready access to broadband internet, computers, and time to navigate web services to find an appointment.¹⁴ Without equitable access, loss frame messaging risks further alienating marginalized and vulnerable groups.

Framing of risk may have also influenced the debate about delaying the second dose of SARS-Cov-2 vaccines.¹⁹ This departure from the randomized trial protocols and regulatory body-approved dosing schedule was proposed to maximize early vaccination with limited vaccine supply. Those who argued for the off-label strategies focused on avoiding as many deaths as possible (loss framing).²⁰ When faced with a high

probability of loss, they were willing to accept the risk that vaccines won't work as well for individual people as in clinical trials. The other side was focused on the individual benefit of vaccination (among other concerns like possible mutation and ultimate public acceptance).²⁰ When contemplating a high probability of individual gain, they were risk averse and did not want to take the chance that vaccines would be less effective if not administered per protocol. The power of loss frame messaging, which often evokes fear of missing an opportunity, may help explain in part why the proponents of delayed dose persuaded some policy-makers. Ultimately, vaccine supply constraints led to many jurisdictions opting for a "first dose" strategy and delaying the second dose beyond the trial protocols.

The world is embarking on the largest single vaccination effort in human history. We should not miss out on a unique chance to learn how to effectively frame health messages—to complement the basic science efforts that produced the vaccines with behavioural science studies that tell us how to get those vaccines from freezers into arms. Amidst the fourth pandemic in the past century, we are reminded that this will not be the last time we will need to engage the public in a campaign to restore health and a normal way of life. While studies of human behaviour may seem to pale in comparison to the overwhelming issues health care workers are facing now, we should not lose sight of the long game; it's really the interaction of virus evolution and human behaviour that produces pandemics in the first place.

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Declarations:

Conflict of Interest: Dr. Detsky is member of the Telus Medical Advisory Council for pandemic planning, a member of the Scientific Advisory Body of Bindle, and owns equities in Pfizer, Astra-Zeneca and Johnson and Johnson.

REFERENCES

- Centers for Disease Control and Prevention (CDC). COVID-19 Vaccinations in the United States. Accessed April 28, 2021. <https://covid.cdc.gov/covid-data-tracker/#vaccinations>
- Fisher KA, Bloomstone SJ, Walder J, Crawford S, Fouayzi H, Mazor KM. Attitudes Toward a Potential SARS-CoV-2 Vaccine: A Survey of U.S.

- Adults. *Ann Intern Med*. Published online September 4, 2020. <https://doi.org/10.7326/M20-3569>
- Centers for Disease Control and Prevention (CDC). Estimates of vaccine hesitancy for COVID-19. Published 2021. Accessed April 28, 2021. <https://data.cdc.gov/stories/s/Vaccine-Hesitancy-for-COVID-19/cnd2-a6zw>
- Schaffer Deroo S, Pudalov NJ, Fu LY. Planning for a COVID-19 Vaccination Program. *JAMA*. 2020;323(24):2458-2459. doi:<https://doi.org/10.1001/jama.2020.8711>
- Tversky A, Kahneman D. The framing of decisions and the psychology of choice. *Science* (80). 1981;211(4481):453-458. <https://doi.org/10.1126/science.7455683>
- Tversky A, Fox CR. Weighing risk and uncertainty. *Psychol Rev*. 1995;102(2):269-283. doi:<https://doi.org/10.1037//0033-295x.102.2.269>
- Kahneman D, Tversky A. Prospect Theory: An Analysis of Decision under Risk. *Econometrica*. 1979;47(2):263.
- Centers for Disease Control and Prevention (CDC). Social Media Toolkit. 2020. Accessed December 13, 2020. <https://www.cdc.gov/flu/resource-center/toolkit/social-media-toolkit.htm>
- Thirumurthy H, Asch DA, Volpp KG. The Uncertain Effect of Financial Incentives to Improve Health Behaviors. *JAMA*. 2019;321(15):1451-1452. doi:<https://doi.org/10.1001/jama.2019.2560>
- O'Keefe DJ, Nan X. The Relative Persuasiveness of Gain- and Loss-Framed Messages for Promoting Vaccination: A Meta-Analytic Review. *Health Commun*. 2012;27(8):776-783. doi:<https://doi.org/10.1080/10410236.2011.640974>
- Kasting ML, Head KJ, Cox D, Cox AD, Zimet GD. The effects of message framing and healthcare provider recommendation on adult hepatitis B vaccination: A randomized controlled trial. *Prev Med (Baltim)*. 2019;127:105798. <https://doi.org/10.1016/j.ypmed.2019.105798>
- Van 't Riet J, Cox AD, Cox D, et al. Does perceived risk influence the effects of message framing? A new investigation of a widely held notion. *Psychol Health*. 2014;29(8):933-949. doi:<https://doi.org/10.1080/08870446.2014.896916>
- Van 't Riet J, Cox AD, Cox D, et al. Does perceived risk influence the effects of message framing? Revisiting the link between prospect theory and message framing. *Health Psychol Rev*. 2016;10(4):447-459. doi:<https://doi.org/10.1080/17437199.2016.1176865>
- Corbie-Smith G. Vaccine Hesitancy Is a Scapegoat for Structural Racism. *JAMA Heal Forum*. 2021;2(3):e210434-e210434. doi:<https://doi.org/10.1001/jamahealthforum.2021.0434>
- Peters GJY, Ruiter RAC, Kok G. Threatening communication: A critical re-analysis and a revised meta-analytic test of fear appeal theory. *Health Psychol Rev*. 2013;7(SUPPL1). <https://doi.org/10.1080/17437199.2012.703527>
- Kok G, Peters GJY, Kessels LTE, ten Hoor GA, Ruiter RAC. Ignoring theory and misinterpreting evidence: the false belief in fear appeals. *Health Psychol Rev*. 2018;12(2):111-125. doi:<https://doi.org/10.1080/17437199.2017.1415767>
- Leventhal H, Singer R, Jones S. Effects of fear and specificity of recommendation upon attitudes and behavior. *J Pers Soc Psychol*. 1965;2(1):20-29. doi:<https://doi.org/10.1037/h0022089>
- Ordoñana JR, González-Javier F, Espín-López L, Gómez-Amor J. Self-report and psychophysiological responses to fear appeals. *Hum Commun Res*. 2009;35(2):195-220. doi:<https://doi.org/10.1111/j.1468-2958.2009.01344.x>
- Tuite AR, Fisman DN, Zhu L, Salomon JA. Alternative Dose Allocation Strategies to Increase Benefits from Constrained COVID-19 Vaccine Supply. *Ann Intern Med*. 2021;174(4):570-572. doi:<https://doi.org/10.7326/M20-8137>
- Kadire SR, Wachter RM, Lurie N. Delayed Second Dose versus Standard Regimen for Covid-19 Vaccination. *N Engl J Med*. 2021;384(9):e28. doi:<https://doi.org/10.1056/NEJMcide2101987>

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