

# Behaviorally-informed framework for encouraging COVID-19 vaccinations

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## Abstract

As COVID-19 vaccines become more available vaccination rates are slowing down. As a result, the focus of policy makers switches from ensuring sufficient supply to keeping the demand up to achieve the vaccination rate needed for herd immunity. In this paper we classify the reasons of why individuals are not getting vaccinated into four categories: barriers, information, incentives/disincentives, and psychological biases. We propose a framework to assist policy makers in encourage vaccinations at the national, local, and individual level. We analyze the current efforts by federal and local governments and provide behaviorally-informed recommendations to policy makers for new or improved initiatives.

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## Keywords

COVID-19 — vaccination — psychological biases — nudging — health policy

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## Switching from ‘keeping-up-with-demand’ to keeping demand up

During the past two years, the COVID-19 pandemic has caused significant personal, social, and economic damage. Public health measures, such as masking, social distancing, and limits on gatherings alone are insufficient and lockdowns may be inefficient (Altman, 2020). Furthermore, preventative measures are likely to become less effective as compliance decreases due to behavioral fatigue (Makki et al., 2020). Wide-reaching vaccination might then be the best bet to beat the virus.

In several countries, including the U.S., there is enough supply of vaccines. The emphasis in these countries, therefore, switched from ensuring sufficient supply to increasing demand. A *laissez-faire* approach is unlikely to work due to hesitancy or outright refusal (KFF, 2021b) to get vaccinated.

Given the lack of political will to put into place sweeping mandatory requirements, policy makers need to find ways to improve vaccination intake. The goal of this paper is to analyze the existing efforts and to create a behaviorally-informed framework for improving vaccination rates.

In this paper we first identify and categorize the main reasons for people to not get vaccinated, with a focus on psychological biases. We follow that with a framework to encourage vaccination, provide recommendations for increasing the efficiency of the existing initiatives, and offer new approaches at the national, local, and individual level.

## Reasons for people to (not) get vaccinated

We categorize the major reasons for not vaccinating into four types: barriers, information, incentives/disincentives, and biases.

### Barriers

Barriers refer to obstacles that can make it challenging for individuals to get vaccinated. This includes missing work time and associated pay, the inability to get time off work, as well as difficulties reaching a vaccination site. Language barriers are an additional obstacle faced by immigrants which leads to misinformation about the cost and legal implications of getting the vaccine (KFF, 2021a). Lastly, there can be religious reasons for refusing to vaccinate. For instance, for the U.S. there is a pronounced difference between different religious affiliations in terms of vaccine acceptance, hesitancy, and refusal (PRRI-IFYC, 2021).

### Information

Information is understood in this paper specifically, and narrowly, as information or knowledge about the vaccine, its safety and efficacy, as well as the statistical (rather than perceived) risks faced by an individual of getting a COVID-19 infection and the resulting consequences. Trust in the U.S. federal government is near its historic low (Pew Research Center, 2021) and pharmaceutical companies and the national media aren't faring much better (see Talev & Gallup, 2020). The slow and inconsistent initial response to the pandemic has contributed to further erosion of public trust in government-

tal institutions. Thus, any campaign that attempts to change vaccination behavior of the public needs to content with these very low trust scores.

### Incentives/Disincentives

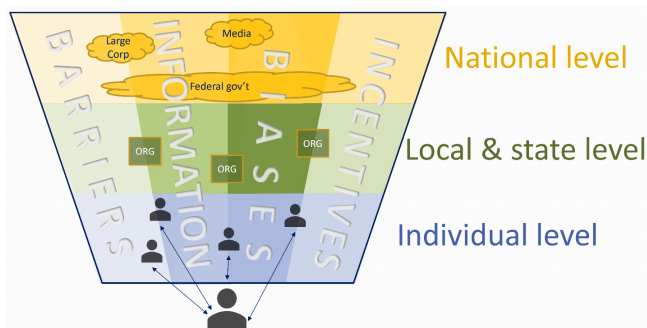
Being immunized against COVID-19 is a direct incentive for vaccination, while side effects, ranging from a mere inconvenience all the way to rare life-threatening conditions, serve as the direct disincentives. Government, businesses, and individuals can create additional incentives (monetary and otherwise).

### Psychological Biases

Behavioral research has shown that human behavior and decisions are consistently affected by psychological biases and decision errors and the vaccination decision is no different. A central feature of the decision to vaccinate is uncertainty in terms of outcomes and probabilities. Biases can hence be categorized as either biases that are related to the evaluation of outcomes or how probabilities are judged. Table 1 presents the most applicable biases and summarizes how they influence the decision to (not) vaccinate (2<sup>nd</sup> and 3<sup>rd</sup> column). While most of these biases can be addressed (4<sup>th</sup> column) by providing information and debiasing, others require application of behavioral insights to overcome.

### Conceptual framework to aid policy makers

We designed a conceptual framework (Figure 1) for behavioral interventions and other strategies aimed at increasing vaccination rates. At the bottom of Figure 1 is the as-of-yet unvaccinated individual. The vertical beams are the four reasons for why the individual is not yet vaccinated. The horizontal layers show the three levels of behavioral interventions, ranging from the national level on top to the individual level at the bottom.



**Figure 1.** Conceptual framework for encouraging COVID-19 vaccinations

This framework provides a tool to practitioners on all levels to assess whether the current policy addresses all factors that prevent people from getting vaccinated. For instance,

there is no point for pushing for further dissemination of information or to address biases if the reason for people to not get vaccinated is that they face physical or monetary barriers that prevent them from making it to vaccination sites. Similarly, removing such barriers, while the population is under- or misinformed about the benefits of the vaccine will also be ineffective. Given the interconnectedness and linkages, policy makers need to take a more holistic view addressing all of the factors at all levels of society for a comprehensive and effective strategy to combat COVID-19 and other public health crises of similar nature in the future.

The following sections provide a detailed discussion of possible policy interventions at the various levels.

### Behavioral interventions and strategies on the national level

Agents on the national level (Figure 1) are the federal government, national media, celebrities and influencers, and big corporations.

#### Barriers and information

In the U.S., the government’s role in reducing barriers on the national level is mostly limited to ensuring the availability of vaccines. To facilitate vaccinations the federal government (White House, 2021) in collaboration with private businesses has taken several steps, such as providing free childcare for people getting vaccinated, extended hours in pharmacies, and free rides to vaccination sites.

Messaging by the U.S. Food and Drug Administration and the Federal Government should emphasize that the vaccines are based on decades of previous research and vigorous testing, as part of the public is apprehensive about the vaccines having been developed “too fast”. The national media can play a supporting role by covering stories of how the vaccine was developed and tested, featuring the heroes - individual researchers, teams, and volunteers participating in tests. Similarly, prominent and trusted public figures, influencers and celebrities should be emphasizing the safety of the vaccines and rigor in testing. Lastly, policy makers should harness the power of the markets by encouraging pharmaceutical companies to air infomercials about their vaccines.

A special role falls to social media, which can be both a source of information as well as misinformation. Social media spans across all levels of the framework (Figure 1) as posts are done by individuals, local, state, and federal government, and corporations, and algorithms used by the platform monitor what kind of content is being posted. Increasingly, social media has come under public and political scrutiny for the role it has played in the spreading of misinformation (Gallo & Cho, 2021).

#### Incentives/Disincentives

Incentives at the national level are typically based on restrictions imposed on unvaccinated people. Vaccine passports and associated domestic and/or international advantages, as

Bias	How it affects getting vaccinated	How it affects NOT getting vaccinated	How it can be addressed
<b>Evaluation of Outcomes</b>			
Status quo / default bias	Default is to vaccinate because COVID-19 vaccine is just “part of what one does to stay healthy” along with other vaccines (against flu, measles, tetanus, etc.).	Default is not to vaccinate because COVID-19 vaccine is new and is not something that one typically does; plus, general opposition to vaccinations.	Social norms; information provision and debiasing.
Loss aversion	Not getting a vaccine is perceived as a loss due to the potential of getting sick.	Getting a vaccine is perceived as a loss due to the possible side effects.	Changing the narrative; increase the gains from vaccination.
Framing effect	Vaccination is framed as a gain: “I am getting immunity”.	Vaccination is framed as a loss: “I am getting a shot in my arm”.	Changing the frame from vaccination to immunity.
Bracketing	Wider bracketing: the benefits of feeling “safe”, being able to see vulnerable friends and family members outweigh immediate discomforts.	Narrow bracketing: focus on the immediate/short-term discomfort, effort, and perceived risk.	Information provision to change from narrow to wider bracketing.
Anchoring effect	COVID-19 is a life-threatening disease; vaccine is an astounding success of human ingenuity and the result of years of prior research.	COVID-19 is flu-like and not dangerous; vaccines were developed “too quickly”.	Information provision and debiasing.
<b>Judging of Probabilities</b>			
Naïve realism and false consensus effect.	Perception that majority of people are/want to be vaccinated	Perception that objections to vaccinations are more widespread than they in fact are.	Social comparison; information provision and debiasing.
Overestimation of low probabilities	Overestimation of the relatively low probability of dying or experiencing a severe case of COVID-19.	Overestimation of the very low probability of severe side effects from the vaccine.	Information provision and debiasing.
Overoptimism	With vaccines being highly effective, individuals believing that the vaccine is a panacea may or may not be overly optimistic.	Overly optimistic about not getting the disease or successfully fighting it off.	Information provision and debiasing.

**Table 1.** Biases affecting vaccination behavior

for example put in place by Israel, are one way on how to enact such a policy. For other countries, like, for example, the U.S. and Germany, most of the incentive structure lies with the states, but the central government still has authority over some aspects of the COVID-19 response, for instance as it pertains to international travel.

**Biases**

There are several approaches to address and harness biases on the national level. One approach, already alluded to above, is to harness the *framing effect* by (a) emphasizing that the

vaccine is the result of a deliberative and sound scientific process, and (b) to switch from a negative (“getting a shot”) to a positive frame of “receiving immunity”. This will also reduce the *loss aversion* associated with getting a shot. It is also important to switch the *anchor* from vaccines being developed too fast to vaccines being based on decades of previous research.

To utilize *social influence* (Baddeley, 2010) national media as well as influencers or celebrities on their social platforms should report and share success stories, for example of individuals that got vaccinated and experienced little side effects,

or communities with high rates of vaccination who enjoy low levels of COVID-19 cases and deaths and greater freedoms. This will create *availability bias* through increased salience of such examples. This can be combined by harnessing an *identifiable victim effect* through sharing negative experiences of a vulnerable person, someone's grandparent perhaps, catching COVID-19 from an unvaccinated person. Furthermore, popular entertainment such as movies or music could be utilized, to create an availability cascade.

Public messaging should focus on getting vaccinated as being a *social norm* by emphasizing that the majority of people is receiving their vaccines. This will help to counter the *false consensus effect* of some unvaccinated individuals that vaccine refusal and hesitancy is more widespread than it actually is.

### Strategies on the local level

On the local level (Figure 1) we consider entities and organizations that have a regional or statewide reach, such as state and county governments, local media, hospital systems, pharmacies, large employers, locally active non-profits, and public school districts.

### Barriers and information

The shift from large vaccination sites and hospitals to smaller, local sites, such as grocery stores, neighborhood pharmacies, mobile clinics, etc. and the switch to walk-ins instead of advance scheduling has already significantly reduced barriers. The states should also provide additional information targeting immigrants, in multiple languages, explaining that the vaccination is free, and that identification documentation is not required, in order to alleviate their concerns (KFF, 2021a) regarding costs and immigration status.

The information outreach in the U.S. was pushed to new levels with the “National Month of Action” (White House, 2021). As part of this initiative, a large number of TV and radio stations have been airing information on the vaccines, vaccination sites, and common concerns and questions. Local public health officials should continue to educate the public, by providing factual information about the vaccines on public health announcements and banners in large stores and malls as well as social networking sites not just with the global reach mentioned above, but also with more local reach (e.g., Nextdoor), as well as by distributing informational brochures and flyers in public places.

### Incentives/Disincentives

Some localities used to offer monetary incentives (e.g., West Virginia and Maryland) to get vaccinated or help others to get vaccinated (e.g., Michigan). A report by the New York Times (2021) on the UCLA COVID-19 Health and Politics Project shows that a payment of \$100 may be quite effective as 34% of respondents indicated that they would be more likely to get vaccinated. However, this type of approach is not without risks, as it may lead to a crowding out of moral

considerations and people may associate the cash incentive with a higher-than-expected risk, making them more reluctant to take the vaccine. For instance, 15% of respondent in the same poll indicated that they were in fact less likely to get vaccinated if offered a cash payment of \$100.

Instead of offering outright monetary payments, some U.S. states (e.g., California, Michigan, Ohio) have offered lotteries or raffles, drawing from the pool of vaccinated people and attempt to entice people with prizes ranging from more than \$1 million, to scholarships, and vacations. Based on behavioral insights, in particular the *overestimation of small probabilities*, this should be more effective than outright cash payments for the same total spending. The experience in the U.S., however, does not seem to support this conjecture, as there was no statistically significant correlation between the lotteries and vaccination rates (Dave et al., 2021). The reason may be that, similarly to cash payments, a lottery with cash prizes may lead to crowding out. Offering non-monetary gifts (e.g. free beer, pizza, tickets for sporting events, and even marijuana), as done by some states, may partially address crowding out as well as lead to a positive association through bundling of the gift with getting the shot.

Lastly, states and other localities can also put in place regulations that favor people that have received their vaccination, including rescinding mask mandates, social distancing, and gathering rules for vaccinated individuals. While such rules are very difficult to enforce, displaying them in public places will remind individuals that the COVID-19 danger is still present.

### Biases

Vaccination-lotteries can be made more effective by including every vaccination-eligible person in the state into the lottery drawings to harness *regret aversion* but pay only those who got vaccinated. Volpp et al. (2008) & Husain et al. (2019) have shown such a design to be quite effective in the context of weight loss and study adherence, respectively.

The effectiveness of gifts can be increased by sending vouchers to receive a gift in advance of vaccinations with a condition that the voucher can be used only once an individual gets vaccinated, harnessing the *endowment effect*. For instance, one could send gift cards that only get activated after vaccination.

A method that has been shown to be effective in many contexts such as electricity consumption (Alcott, 2011) and water consumption (e.g., Ferraro et al., 2011) is to use comparisons to peers to *appeal to social norms*. For example, public health departments can display current community vaccination rates on billboards along busy roads. Another strategy is to create competition between communities to achieve the highest vaccination rates. On the federal level this has been done through the “Mayors Challenge” (White House, 2021). A similar competition can be designed on the state level as well and in partnership with the private sector. This can be further enhanced by providing a prize to the winner, either to

the community as a whole or to individuals.

Research has consistently shown that individuals procrastinate on following through on good intentions (Shu & Gneezy, 2010) or simply forget (Karlan et al., 2016). Doctors' offices and pharmacies can send text messages to their unvaccinated clients offering a vaccine appointment in the next few days and then follow up with reminders. Dai et al (2021) show that sending two reminders boosts appointment and vaccination rates by 84% and 26% respectively. The impact of the messages can be further strengthened by phrasing text messages so that they invoke *endowment effect* and *loss aversion* (see Milkman et al., 2021, for examples).

Enabling people to get vaccinated where people shop removes barriers by making the vaccination eminently convenient. Shopping locations (grocery and department stores and malls) can harness *present bias* by offering gifts (e.g., discounts to those getting vaccinated within the next hour) and *overestimation of low probability* by enrolling shoppers who vaccinated within a specific time period in a lottery to have their shopping receipt reimbursed.

Another approach is to harness the *context effect* during the shopping experience, by playing background music that is thematically connected to vaccination. Research has shown that background music can have an effect on consumers' choices and perceptions (see for example Biswas et al., 2019).

Finally, just as was discussed for the national level interventions, all of the above strategies would likely be more effective if the vaccination is referred to/framed as gaining immunity rather than getting a shot.

### Strategies on the individual level

On the individual level (Figure 1), agents are individuals that the unvaccinated person knows and trusts, such as family and friends, local religious and community leaders, school nurses, family doctors, barbers, beauty stylists and bartenders.

#### Barriers and information

Trusted individuals can serve as a credible source of information on the vaccination *process*, including reassurances that the shots are free, and that documentation is not required. In addition, local business and community spaces are often more convenient locations for vaccination. Instead of requiring individuals to go where vaccines are, vaccines should be brought to people. One example is the “Shots at the Shop” policy initiative (White House, 2021), which aims to “engage 1,000 Black-owned barbershops and beauty salons across the country to support local vaccine education and outreach efforts”.

#### Addressing and harnessing biases

Doctors can make the vaccination a perceived *default option* when patients visit the doctor for routine check-ups, similar to a flu or routine children's vaccinations. Similarly, pharmacists can offer the same when filling regular prescriptions. A doctor, or other trusted individual, may convince the

individual to think more broadly, looking beyond the vaccination only and looking at the future benefits accruing from immunization, i.e., switch from *narrow* to *wide bracketing*. *Temptation bundling* (Milkman et al., 2014), i.e. bundling vaccinations with small gifts, such as donuts, free pizza or coffee, has a potential to make the benefits more salient and immediate, leading individuals to perceive the shot as a much less unpleasant process, thereby gratifying “guilt-inducing” want behaviors while also increasing beneficial “should” behavior.

Furthermore, doctors' offices can harness the *decoy effect*. For instance, patients coming for a routine visit can be offered two options: to get vaccinated right now plus a gift or to schedule an appointment for later (without a gift). The implicit third option is to not get the shot at all. Assigning a gift for getting the shot right away, or a cost to getting the shot later, would make getting the shot right away more attractive, not only as compared to the decoy, but also relative to not getting a shot at all. A study by Maltz & Sarid (2020) showed that such an approach in the context of the flu shot had a significant impact on vaccination rates.

Another approach is for the doctors to present a patient with a *decision aid* (similar to the existing medication and treatment choice DAs) on each of the authorized vaccines and allow them to choose a vaccine that they will receive right away. This will switch the decision from vaccinate/not vaccinate to which vaccine is better for that patient.

## Conclusion and final thoughts

In this paper we outlined the most important factors that cause people to not get vaccinated. We classified the various reasons into four categories: objective barriers, information/misinformation, (dis)incentives, biases and decision errors.

There is a host of policies and approaches that are already utilized in the U.S. and other countries. However, more needs to be done to deal with the pandemic. Current efforts are suboptimal because they neither address all reasons of why people are not getting vaccinated (Figure 1) nor do they fully harness and address biases. There is, however, no one silver bullet – a mix of strategies and approaches is needed on the national, local, and individual level.

One of the most important functions on the national and local level is to coordinate policies and approaches, because they can be complementary, if designed based on behavioral insights. We also need a more complete understanding of what factors prevent individuals from vaccinating and how they are connected.

Policy makers must be mindful of ethics of nudging when designing behavioral interventions and consider them in light of ethical frameworks such as “Nudge FORGOOD” (Lades & Delaney, 2020). Nudging, harnessing biases, and providing traditional monetary incentives to get vaccinated all may be perceived as governmental overreach and could even backfire, both for current vaccination, but also in terms of eroded trust in institutions with associated long-term consequences.

Thus, a careful consideration of the ethical and unintended consequences of behavioral interventions is paramount.

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