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# Financial Incentives in the Path to Recovery from the COVID-19 Pandemic

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## 1 Introduction

This opinion piece aims to discuss the role of financial incentives in increasing the uptake of COVID-19 vaccines and paving the way for recovery from the COVID-19 pandemic. In economics, vaccination serves as a classic example of a positive externality, as it protects not only the vaccinated but also their close contacts. Vaccination can also contribute to herd immunity, although in the current situation of the COVID-19 pandemic, herd immunity may be difficult to achieve by vaccination [1]. Financial incentives may take the form of tangible rewards, such as cash (more precisely, conditional cash transfers), lotteries, and vouchers (i.e., cash or discount for future purchases). These methods have already been employed in the USA, Canada, and a few other countries to overcome COVID-19 vaccine hesitancy [2].

It is possible to draw on theoretical models and empirical evidence to predict the impact of financial incentives on vaccination uptake. While real-world evidence can be collected from the aforementioned countries, generating higher-quality evidence necessitates creating a counterfactual scenario that reflects the absence of financial incentives. If the vaccination rate in the state or country of interest differs from its neighboring states or countries prior to announcing the incentive, a simple average across the other states or countries serves as a poor counterfactual [3]. Empirical evidence from laboratory experiments exists in addition to real-world evidence. Laboratory experiments are able to overcome the limitations of pre-post comparisons as they are carried out under controlled conditions. Nevertheless, laboratory evidence captures vaccination intention in the first place and thus has limited validity. Although intention usually predicts behavior, there may be a mismatch

between the two, especially if receiving compensation for vaccination is not socially desirable [4]. Furthermore, the experimental evidence on the impact of financial incentives for COVID-19 vaccinations is conflicting and may not be transferable between countries, for example, due to cultural variations and uneven income distribution. This also applies to the evidence collected before the COVID-19 pandemic on the impact of financial incentives on vaccination. For example, the diseases against which vaccination provides protection may not be comparable due to difference in trade-offs between vaccine efficacy and adverse effects on one hand and disease transmissibility and clinical severity on the other. For these reasons, it is critical to continue drawing on the theoretical literature, particularly economic theory, and behavioral economics, to make predictions about the impact of financial incentives.

## 2 Reasons for Vaccine Hesitancy

According to a survey conducted in the German general population in July 2021 [5], a low willingness to vaccinate (among the unvaccinated) is mainly the result of mistrust towards vaccination safety, the perception that one does not have to be vaccinated if others do so (free-riding), the perception that vaccination is unnecessary, and perceived practical barriers. Furthermore, unvaccinated individuals grossly underestimated the efficacy of available vaccinations. Ten percent of all respondents stated that they would never consent to vaccination under any circumstances; this group accounted for up to 41% of the unvaccinated in this survey.

Based on a summary of the general literature on vaccination and a behavioral economic framework, Guo et al [6] reported that individuals who were less likely to be vaccinated displayed less risk aversion, a higher time preference, and overconfidence. Risk aversion refers to the extent to which one dislikes uncertainty and would turn away from

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uncertainty if possible; hesitant individuals try to avoid the uncertainty associated with natural infection. Individuals with a high time preference discount the long-term benefits of vaccination and place a premium on the short-term adverse effects associated with vaccination. Finally, overconfident individuals underestimate the risk of infection and the severity of the disease and overestimate the probability of staying healthy.

Vaccine hesitancy may also be explained by loss aversion. Vaccination entails both a gain (particularly by reducing the severity of COVID-19) and loss (by causing adverse events). A choice not to vaccinate when the magnitude of the latter outcome is about half the size of the former implies that losses are larger than gains [7]. On the other hand, it has been argued that the distinction between gains and losses appears to be less influential on health outcomes than money [8].

### 3 Addressing Vaccine Hesitancy

There are two fundamental approaches to overcoming vaccine hesitancy and its underlying reasons (that is, risk attitude, time preference, overconfidence, and perhaps loss aversion). One is to change the underlying reasons by using an educational approach. For example, the overconfidence that the virus does not pose a threat could be curbed by individual feedback [9]. The alternative approach, based on principles of behavioral economics, would be to exploit the reasons for vaccine hesitancy by providing targeted incentives.

### 4 Financial Versus Non-financial Incentives

Relatively little theoretical and empirical literature has been published on how financial incentives compare with non-financial incentives. According to Kevin Volpp [10], non-monetary incentives, which include in-kind gifts such as food handouts during immunization campaigns, may appeal to some people but not others. In contrast, monetary incentives have a universal appeal and typically work better [10]. Nevertheless, while their effectiveness may be larger, they may also cause greater harm by undermining intrinsic motivation.

### 5 Cash Versus Lotteries

Cash and lotteries provide an incentive that can assist individuals in overcoming both time-consistent and present-biased time preferences. In the vaccination context, this means that the “costs” of vaccination could potentially be

offset by a reward or incentive, encouraging the individual to get vaccinated regardless of the perceived costs [11].

Lotteries are more attractive to those willing to take monetary risks. Overall, individuals appear to be more risk-averse with respect to health than with respect to money [12]. Hence, individuals who are not risk-averse with respect to health (because they delay or refuse vaccination) may be expected to be risk-prone with respect to money. Thus, lottery incentives may be able to address those who delay or refuse vaccination specifically.

Another reason why lotteries may be preferred over cash is embedded in prospect theory [13]. As individuals tend to overweight small percentages [13], they prefer a small probability of winning a large reward over the surety of a small reward, despite the same expected value [14]. If this is the case, the perceived return from gambling (lottery) is higher than the return from an incentive program that guarantees the expected return [15]. A similar argument favoring lotteries is based on an overestimation of small probabilities (in the presence of overconfidence), which differs from overweighting small probabilities.

In addition, the use of lotteries also has practical advantages because the administrative costs associated with a lottery program are likely to be lower than those of a cash program. This is because only winners need to be paid [15].

Finally, a lottery could capitalize on loss aversion with respect to money by drawing a winner from the entire vaccine-eligible population but requires the winner to give up the earnings if they have not been vaccinated [16, 17].

A lottery appears to be more useful towards the end of the vaccination campaign. This is because the average degree of risk aversion among unvaccinated individuals may be lower, and overconfidence may be higher. Conversely, it may be useful to provide cash incentives to ramp up vaccination rates at the beginning of a campaign.

As a word of caution, for individuals or communities experiencing mistrust towards vaccination safety, the association between vaccination and the availability of monetary compensation may further exacerbate reservations about vaccines and vaccination [18]. This group includes individuals who would never consent to vaccination under any circumstances.

### 6 Rewards Versus Losses

A perhaps even more effective way to capitalize on loss aversion with respect to money is the introduction of a user fee for coronavirus tests when proof of a negative test is necessary to enter restaurants, cafes, and other indoor venues. According to prospect theory, the threat of losing money

is more powerful than the incentive of gaining money in motivating people to get vaccinated.

## 7 One-time Versus Repeated Rewards

In general, increasing the monetary incentive size can improve performance [19]. In contrast, small monetary incentives can have a detrimental effect on performance because they weaken intrinsic motivation [19]. Nevertheless, it has been argued that the undermining effect of rewards has been reported only for behaviors with high levels of initial intrinsic motivation and initial behavior [20]. Furthermore, surprise rewards introduced following the task completion do not affect intrinsic motivation [21].

Repeated rewards can help incentivize booster shots, which may be necessary on an annual basis owing to waning immunity. However, assuming that pre-reward intrinsic motivation and behavior level for vaccination are high in the case of COVID-19, repeated rewards would undermine people's intrinsic motivation. Hence, the net effect of incentivizing booster shots appears ambiguous; on one hand, a repeated reward may increase the uptake among people with low intrinsic motivation, but on the other hand, it may decrease the uptake among those with high intrinsic motivation.

Therefore, it seems most appropriate to offer a one-time reward late in the vaccination campaign, thus avoiding a disincentive for those with high intrinsic motivation. For fairness, it has been argued to reward not only late adopters, but also previously vaccinated people [22].

An additional question appears regarding the timing of the one-time reward offer. It has been argued that “[t]here’s now enough immunity in the human population to ratchet up an evolutionary competition, pressuring the virus to adapt further.” Thus, SARS-CoV-2 could mutate and become even deadlier [23]. Therefore, it may be prudent to withhold the “one-shot” reward until a massive failure of immunity appears.

## 8 Cost Effectiveness

Given the considerable gain in life-years through vaccination [24], a reward appears to be cost effective even for small increases in vaccination uptake. As a successful reward program would prevent another lockdown, the cost of the latter presents the upper limit of the prize pool.

## 9 Conclusions

This article uses insights from behavioral economics to shed light on the potential effectiveness of reward programs that aim at increasing vaccination uptake. However, given their detrimental effect on intrinsic motivation, timing becomes an important consideration. It may be reasonable to introduce rewards late in the vaccination campaign and only once. Diminishing cost effectiveness of educational approaches later in the campaign due to heightened resistance supports this timing. Lotteries are particularly attractive at a late entry point because they exploit the reasons for vaccine hesitancy. In any case, it may be argued that a one-shot reward should be withheld for a deadlier emerging SARS-CoV-2 variant. User fees for coronavirus tests, which capitalize on loss aversion, are justifiable in the meantime. A word of caution: motivating behavioral change in health is far more complex than a single strategy can accomplish, and offering incentives is just one route to promoting desirable health behaviors [25].

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