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Can Vaccination Incentives Backfire?

Experimental Evidence That Offering Cash Incentives Can Reduce Vaccination Intentions in Some Contexts

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Abstract

This paper studies the effect of proposing a monetary incentive for vaccination intentions, with a survey-based randomized controlled experiment conducted separately in three countries, Tajikistan, Uzbekistan, and Kazakhstan. Respondents from nationally representative surveys were randomly assigned to a control group (for which no incentive was proposed) or to one of several treatment groups with varying levels of hypothetical compensation. Offering incentives markedly reduced overall vaccination intentions —all three counties. Country-level results ranged from no meaningful effect on vaccination intentions (Tajikistan) to a decline of up to 22 percent (Uzbekistan and Kazakhstan). In follow-up questions, most respondents said they disapprove of offering financial incentives for vaccination, and especially in contexts with strong negative effects in the experiment. The results contrast with the well-established efficacy of monetary incentives to influence vaccination behavior in other settings, but they are consistent with findings from the behavioral literature in which incentive payments signal inferiority or disutility. The findings suggest that policy makers and practitioners should use caution when considering extrinsic incentives for vaccination and other health interventions where effects have not been tested.

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Introduction

As the price of a good falls, the quantity demanded rises. This basic economic principle is called the 'law of demand' as it is rarely violated. Though there are some well-known exceptions – such as Giffen and Veblen goods – they are rare and represent a tiny minority of all transactions. Policy designs often use the predictable relationship between price and quantity demanded to encourage consumption of goods and services that produce positive externalities, for instance, reducing the price of health care and education below market prices to induce greater demand. To focus on the topic of this paper, many governments subsidize vaccination against communicable diseases assuming that this will increase vaccination rates. In some cases, public policy takes this logic even further, providing subsidies that are so large that the price becomes negative, such as in many health-focused conditional cash transfer (CCT) programs (Souza et. al 2022; Barham and Maluccio 2009). These approaches have been used in many counties during the COVID-19 pandemic, as authorities introduced CCTs, in-kind benefits such as food or services, lotteries, and other incentives to increase vaccination rates and address hesitancy.

The effectiveness of incentive payments to increase vaccination has been demonstrated in many settings. In a randomized controlled trial in rural India, Banerjee et. al. (2010) showed that small incentives had large positive impacts on the uptake of immunization services in resource poor areas and were more cost effective than purely improving vaccine supply. Dudley et. al. (2021) found financial incentives increased vaccination uptake in the social networks of pregnant women in the United States. In another randomized controlled trial, Chandir et. al. (2010) found that food and medicine voucher incentives doubled completion of routine diphtheria, tetanus, and pertussis vaccination in a low-income area of Pakistan. Barham and Maluccio (2009) found similar effects in rural Nicaragua, and as did Kusuma et al. (2017) in Indonesia. Barber and West (2021) and Brehm, Brehm, and Saavedra (2021) both showed that a conditional cash lottery program successfully increased COVID-19 vaccine uptake in Ohio. Using a nearly identical survey-based randomized controlled trial design to the present study, Fishman et. al. (2022) found that financial incentives increased COVID-19 vaccination intentions in the United States.

Policy experiments offering individual rewards conditional on completing vaccination have been widespread during the COVID-19 pandemic. One of the first jurisdictions to make use of incentive payments was West Virginia in the Unites States through a program paying $100 to young people who were vaccinated. Over the following months more than 20 other US states began offering lotteries or other prizes to motivate people to be vaccinated against COVID-19.[4] The practice of using lotteries was also common elsewhere in the world, including for instance the Canadian province of Alberta, the Gumma Prefecture of Japan,[5] alongside many others. In May 2021, Serbia became the first country to use cash transfers at the national level, offering the equivalent of $25 cash rewards to those who received their first vaccination dose (Holt, 2021).

But the universality of incentive payment effectiveness for vaccination uptake is not a settled question, and several studies raise concerns that in practice the relationship is more complex. Kamenica (2012)

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[4] National Governor's Association website: https://www.nga.org/center/publications/covid-19-vaccine-incentives/ retrieved 8/8/2022

[5] https://mainichi.jp/english/articles/20210821/p2a/00m/0na/025000c

reviewed the empirical literature on behavioral responses to incentive payments and identified a range of settings in which extrinsic rewards could backfire, often due to signaling or crowding out of intrinsic motivation. Rutschman and Wiemken (2021) reviewed potential risks specifically in the context of vaccination, noting in the case of COVID-19 vaccines that payments lacked rigorous evidence, that incentive policies could be instrumentalized to question the safety and public health value of vaccination, and that incentives could exacerbate socioeconomic and racial disparities. In a qualitative study, McNaughton et. al. (2016) showed that incentives were perceived negatively and risked backfiring in a pilot program in the United Kingdom. In a randomized controlled trial in California, Chang et al. (2021) found that financial incentives and other behavioral nudges did not increase vaccination rates, and in fact decreased vaccination rates for some subgroups. Armiento et al. (2020) studied the impact of a "No Jab, No Pay" policy which disqualified unvaccinated recipients from family assistance payments and found the policy did not increase vaccine uptake. White et. al. (2019) found loyalty-points type phone applications did not increase vaccination in Canada. Dave et. al. (2021) found that the lotteries launched for vaccinated residents in 19 US states failed to increase uptake of the COVID-19 vaccine. Kreps et al. (2021) conducted a conjoint experiment and found incentives (between $10 and $100) were not associated with higher vaccine uptake among American respondents. Although Robertson et. al. (2021) found incentives may on average increase vaccination uptake in the United States (using an experimental approach very similar to the present study), the authors also found a potential backfire effect among some sub-groups. Thus, while the existing literature often finds cash transfers effective for encouraging vaccination, results vary significantly, depending on both the context and program design. One other notable difference between many early studies of vaccine incentives and those focused on vaccinations following the COVID-19 pandemic is that earlier studies were often focused on social safety net interventions for poor households, with conditions intended to improve the utilization of health services among the poor. More recent COVID-19 focused interventions are less often limited to this segment of the population.

To study the external validity of previous findings in novel settings, we conducted three nationally representative survey-based randomized controlled experiments on hypothetical cash incentives for COVID-19 vaccination in countries that have not previously appeared in this literature – Kazakhstan, Tajikistan, and Uzbekistan. To our knowledge, this is the first such experiment to comparatively study the effectiveness of monetary incentives to encourage vaccination across multiple countries.

In two of the three countries we find large and significant effects directly opposite to those expected: survey respondents randomly assigned offers of a hypothetical monetary incentive were significantly less likely to agree to be vaccinated. Negative effects on COVID-19 vaccination intentions were large and statistically significant (in Kazakhstan and Uzbekistan). For the third country (Tajikistan), a negative direction was recorded but was not statistically distinguishable from the control group. Across all three countries, higher incentive payment values were not systematically associated with increased vaccination intentions. Follow-up survey questions confirmed that in those settings where the demotivation impacts were strongest, paying incentives for vaccines was a highly unpopular option. About three-quarters of respondents in Uzbekistan actively opposed providing cash incentives for vaccination. In Kazakhstan, 58 percent said they disagreed with paying incentives. Only in Tajikistan, where the experiment failed to find any systematic effect on vaccination intentions, did just 18 percent say they disagreed with paying incentives.

Taken collectively, the experiments suggest previous findings demonstrating increased vaccination intentions due to financial incentives may be context specific and may not fully generalize outside of the context of those studies. The risk of a “backfire” effect suggests that it is prudent to systematically pre-test incentive programs in novel settings.

Context

Vaccination campaigns against COVID-19 in Central Asia began from February to April 2021 and were focused first among high-risk groups. By March 2021, widespread vaccination campaigns had begun in all three countries, with Kazakhstan typically leading in terms of the share of the target population vaccinated.

Different vaccines were available in each of the three countries, and among those who planned to be vaccinated, preferences varied substantially. In Kazakhstan, there were three main vaccine options available at the time of the study: QazCovid, produced in Kazakhstan jointly with Chinese manufacturers, Sputnik V, produced in the Russian Federation alongside some local production in Kazakhstan under license, and Sinovac, produced in China. Survey results show that Sputnik V was the most trusted option, particularly when manufactured in the Russian Federation. In Uzbekistan, four different vaccines were available. The first on the market was ZFSW, a locally produced vaccine, followed by AstraZeneca and Sputnik V (imported from producers in Russia). These were later supplemented with the Moderna COVID-19 vaccine through the COVAX platform in late July 2021. In Tajikistan, the COVAX platform first supplied the AstraZeneca vaccine, follow by shipments of Sinovac, a small number of Sputnik V doses, and later the Moderna vaccine.

Panel surveys conducted throughout the COVID-19 pandemic by the World Bank in Central Asia (see details in the following section) revealed a varied and complex set of challenges to achieve widespread vaccination. In June 2021, only 40 percent of respondents in Kazakhstan said they were either already or planned to be vaccinated, compared to 43 percent who would “definitely not” be vaccinated (Table 1). In the same month, at 54 percent, the share in Uzbekistan open to vaccination was consistently higher than Kazakhstan, but still below levels needed to minimize future outbreaks. Of the three countries surveyed, Tajikistan’s respondents were on average most open to being vaccinated against COVID-19, with between 80 and 84 percent willing in summer and autumn in 2021. But due to limited supply, Tajikistan struggled with the lowest vaccination rate among the three in 2021 at the time of the survey experiment.

However, despite relatively high rates of hesitancy when campaigns began in early 2021, vaccination uptake and intentions to be vaccinated have consistently improved, and hesitancy has fallen throughout the region. In Kazakhstan, about 80 percent of adult respondents said that they were either vaccinated or “definitely” would be in June 2022. By that time, the share of people who said they “definitely” would not be vaccinated had fallen from 47 percent of respondents in April 2021 to just 15 percent in June 2022.

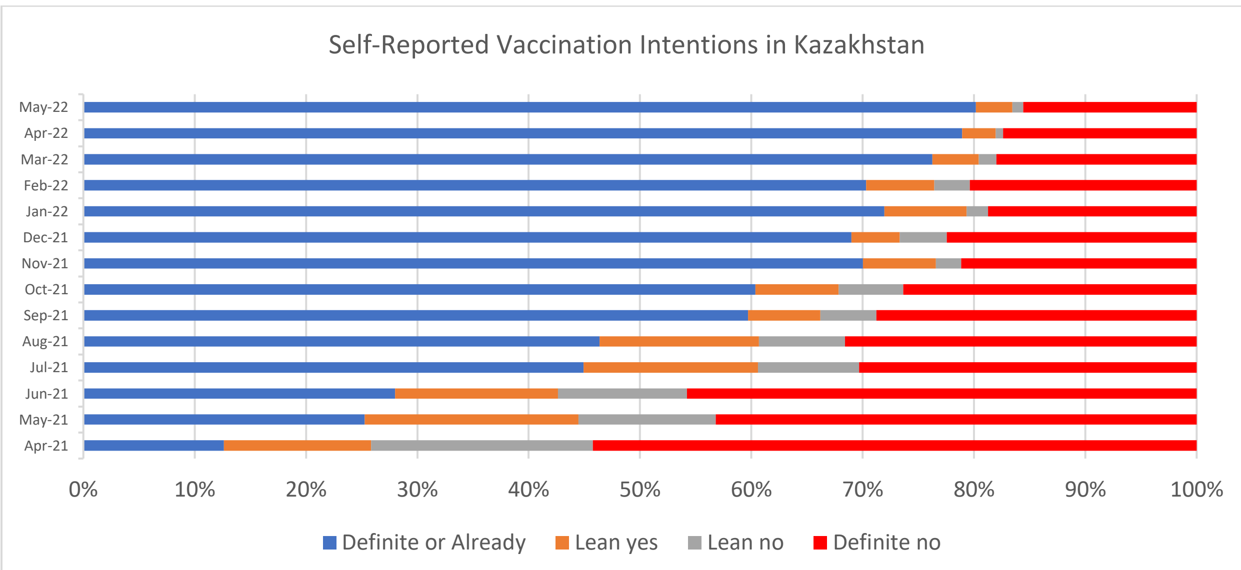
Very similar trends were clear in Uzbekistan. There, the share who said they “definitely would not” be vaccinated fell from about 20 percent in April 2021 down to 12 percent in April 2022. The share of saying that they were either already vaccinated or would definitely be rose to 74 percent of adult respondents by April 2022.

At 54 percent, a relatively high share of respondents in Tajikistan said they were either already vaccinated or planned to be in July 2021.[6] Only about 17 percent of respondents said they either probably or definitely would not be vaccinated. By March 2022, vaccination intentions had risen to 92 percent, with only 4 percent responding that they would not be vaccinated.

Following the introduction of vaccination mandates in Uzbekistan and Tajikistan and a new wave of infection that rapidly spread in Central Asia in July and August 2021, all three countries later achieved significantly higher vaccination rates, with Tajikistan highest among them as of June 2022. By June 2022, about 9.29 million people were fully vaccinated in Kazakhstan (49.5 percent of the population including children), 15 million in Uzbekistan (43.9 percent), and nearly 5 million in Tajikistan (52.2 percent).[7]

Figure 1: Self-Reported Vaccination Intentions

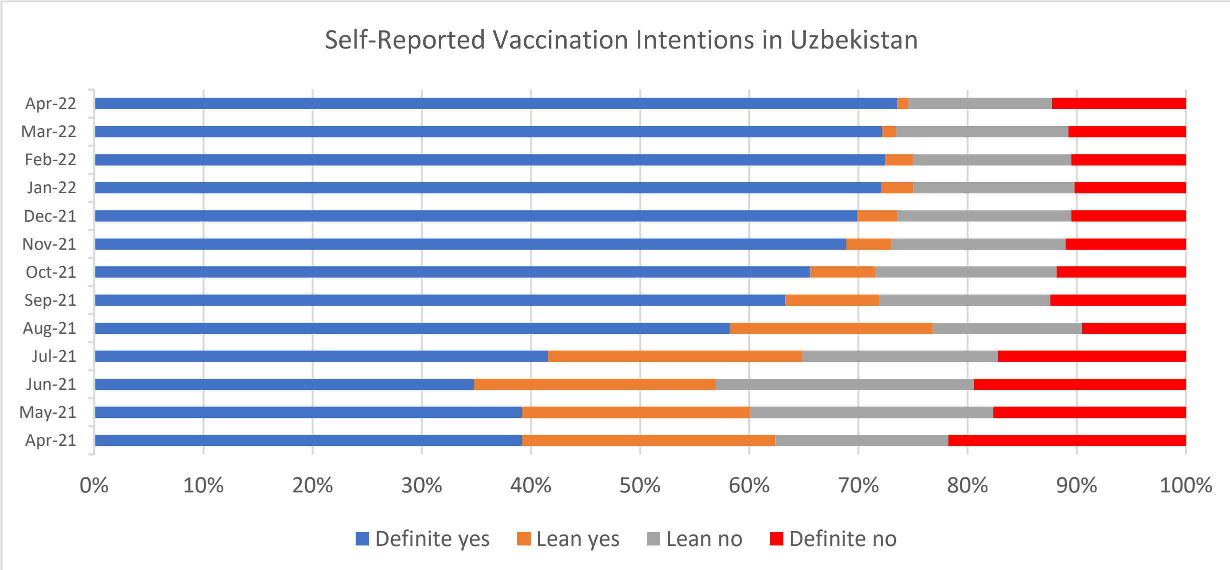
(A) Kazakhstan



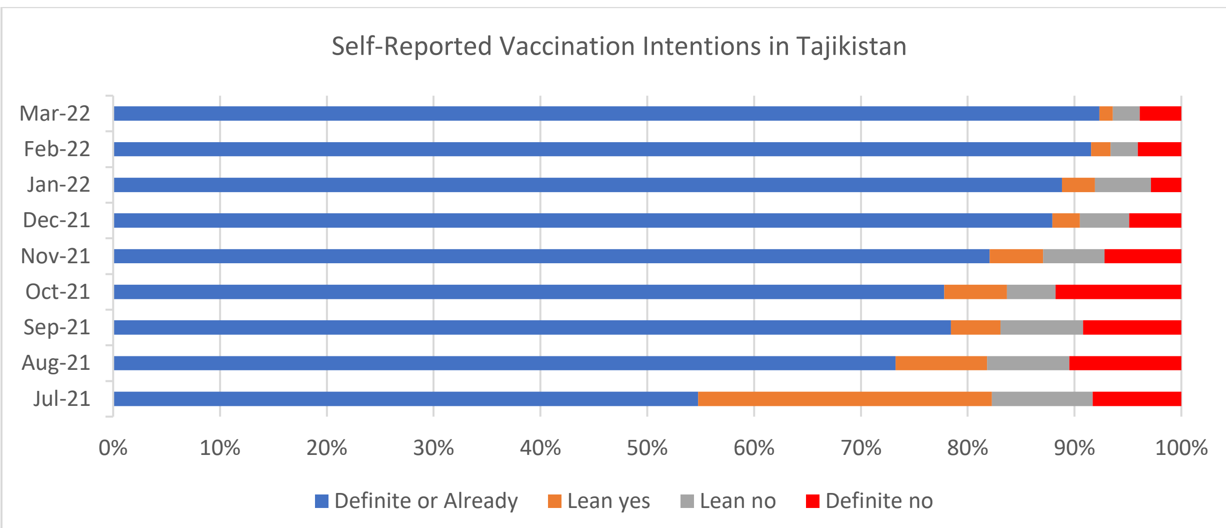
[6] Due to differences in fieldwork and questionnaire updating protocols, questions on vaccine hesitancy were added in July 2021 in Tajikistan.

[7] All estimates from the *Our World in Data* dashboard: https://ourworldindata.org/covid-vaccinations?country=OWID_WRL , retrieved June 8, 2022.

(B) Uzbekistan



(C) Tajikistan



Source: World Bank "Listening to Central Asia" Question: "If any vaccine to prevent COVID-19 were available today, would you..." Options included: a) Definitely get the vaccine, b) Probably get the vaccine, c) Probably NOT get the vaccine, d) Definitely NOT get the vaccine, e) Already got the vaccine, f) Do not know.

As each of the three surveys uses a panel design, individual responses can be tracked over time to identify transitions in responses. Identifying these changes is particularly useful to describe changes in views among previously vaccine hesitant respondents. Table 1 panel (A) shows the panel transition matrix of reasons for vaccination refusal from April 2021 to May 2022 in Kazakhstan, panel (B) shows the same for Uzbekistan from April 2021 to April 2022, and panel (C) for Tajikistan from July 2021 to March 2022. In each, the leftmost column can be thought of as the "starting" response and moving from left to right reports the share of respondent observations that shifted into one of the other response categories (or stayed the same) in later rounds of the survey.

Table 1: Vaccination intention transition matrix

(A) Kazakhstan

Vaccination Intention Transition Matrix: Kazakhstan

From: \ To:	Neg exp.	Lack trust health	Risk of vaccine	Pers/relig beliefs	Lack trust producers	Counter-indication	Other	Will/Did Vaccinate
Negative exp.	13.46	3.85	1.92	3.85	19.23	15.38	23.08	19.23
Lack trust health	1.19	22.91	5.01	6.68	21	9.79	10.98	22.43
Risk vaccine	0.7	5.62	20.61	5.85	23.65	11.01	7.03	25.53
Pers/relig. beliefs	0.49	4.9	1.47	35.54	15.44	9.8	9.8	22.55
Lack trust prod.	0.46	4.19	4.44	2.91	44.18	10.83	11.03	21.96
Counterindication	0.17	1.65	1.9	1.52	7.43	57.55	7.76	22.03
Other	0.63	3.33	2.43	4.23	19.35	15.12	27.54	27.36
Will/Did Vaccinate	0.08	0.19	0.47	0.5	1.82	2.46	1.55	92.93

(B) Uzbekistan

Vaccination Intention Transition Matrix: Uzbekistan

From: \ To:	Negative exp.	Lack trust health	Risk of vaccine	Pers/relig beliefs	Lack trust producers	Counter-indication	Other	Will/Did Vaccinate
Negative exp.	37.02	0.24	15.14	0.96	3.37	3.61	3.61	36.06
Lack trust health	0	9.3	4.65	6.98	23.26	13.95	9.3	32.56
Risk vaccine	1.29	0.29	53.22	0.72	6.58	6.29	2.72	28.9
Pers/relig. beliefs	1.81	0	3.01	18.07	12.65	19.28	11.45	33.73
Lack trust prod.	5.67	0.31	4.75	3.22	33.74	13.04	7.21	32.06
Counterindication	0.75	0.21	1.77	0.91	4.99	57.38	9.39	24.58
Other	0.55	0.05	1.61	0.81	1.97	8.22	61.17	25.62
Will/Did Vaccinate	0.61	0.05	1.45	0.41	1.32	3.84	3.2	89.14

(C) Tajikistan

Vaccination Intention Transition Matrix: Tajikistan

From: \ To:	Negative exp.	Lack trust health	Risk of vaccine	Pers/relig. beliefs	Lack trust producers	Counter-indication	Other	Will/Did Vaccinate
Negative exp.	0	3.45	20.69	0	0	31.03	3.45	41.38
Lack trust health	3.23	9.68	6.45	1.08	0	26.88	0	52.69
Risk vaccine	1.87	3.73	23.51	1.12	0	19.4	1.49	48.88
Pers/relig. beliefs	3.57	7.14	10.71	3.57	0	3.57	3.57	67.86
Lack trust prod.	0	0	15.38	0	0	7.69	0	76.92
Counterindication	0.7	2.82	6.69	0.88	0.18	36.09	0.53	52.11
Other	3.23	3.23	16.13	0	0	12.9	12.9	51.61
Will/Did Vaccinate	0.18	0.44	1.29	0.28	0.06	3.33	0.13	94.29

Source: Listening to Central Asia. Options conditional on respondent stating they will not or are unlikely to be vaccinated against COVID-19: a) Negative past experiences with vaccines, b) Lack of trust to heath system or healthcare providers, c) The risk of vaccinating is higher than the benefits, d) Personal or religious beliefs, e) Lack of trust to producers of vaccines, f)Counter-indication or prolonged medical discharge, g) Other [if nothing above applies]. The timeframe of the transition is defined as from April 2021 to May 2022 in Kazakhstan, from April 2021 to April 2022 for Uzbekistan, and July 2021 to March 2022 for Tajikistan.

In early 2021, the predominant reason for refusing vaccines was that the respondent did not trust vaccine producers. Although this remained a significant concern in all three countries, much more striking is the rising prevalence of the response that "counterindication" was the reason a respondent did not plan to be vaccinated. By August 2021 this accounted for the plurality of vaccine hesitant people in all three countries. The rise of counterindication is not solely an effect of composition, it also continuously rose in absolute terms in Uzbekistan and Kazakhstan. See annex 2 for more details on counterindication patterns in Central Asia.

Among those saying they will not vaccinate in Kazakhstan and Tajikistan, those who cited counterindication were the "stickiest" in their responses, in the sense that they were consistently the least likely to change their response. In Uzbekistan only the "other" category is stickier, and in Uzbekistan, many people providing "other" responses describe ineligibility due to various health criteria that are not formally counterindication restrictions on vaccination. For instance, a common response in the other category was the (mistaken) impression that vaccines were unsafe for people over age 60 or 65.

The prevalence of counterindication as a reason for vaccine hesitancy in Central Asia is likely linked to official guidance (please see annex 2 for more details). In Kazakhstan, Uzbekistan, and to a limited extent Tajikistan, vaccination programs explicitly excluded some at-risk groups, with public communications campaigns often listing these conditions explicitly. Eligibility restrictions were primarily based on perceived risk arising due to pre-existing health conditions. However, the guidance in some cases strongly contrasted with conventional practice elsewhere in the world where members of these same at-risk groups are often targeted for early vaccination with the same vaccines.[8]

Methods

Our survey experiment was embedded in the Listening to Central Asia series of surveys in Tajikistan, Uzbekistan, and Kazakhstan, surveys that are designed to continuously monitor wellbeing and views on topical policy issues.[9] The surveys are nationally representative and based on fieldwork conducted in two phases. In the first phase, a national in-person household survey was conducted in each country using regionally stratified two-stage cluster sampling procedures. In the second stage, a randomly selected sub-sample from the first stage in each country was recruited in a monthly panel survey using a phone-based method conducted by private survey companies under the direction of World Bank staff. The sub-samples were each nationally representative and for the present study include a total of 6,783 individual responses (2,714 in Uzbekistan, 2,267 in Tajikistan, and 1,802 in Kazakhstan). Data collection for the survey experiment was conducted May-June 2021. Descriptive statistics on vaccination and concerns related to COVID-19 were collected continuously in all three countries from early 2021 to August 2022.

For the core experiment, we randomly assigned respondents to one of five groups within each country survey. Each respondent was asked if they would agree to be vaccinated, and a subset of respondents

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[8] A list of prioritized groups by country is provided at the following website: https://graphics.reuters.com/world-coronavirus-tracker-and-maps/vaccination-rollout-and-access/

[9] See https://www.worldbank.org/en/country/uzbekistan/brief/l2cu; and https://www.worldbank.org/en/country/tajikistan/brief/listening2tajikistan

were offered a hypothetical incentive payment of varying amounts. For instance, in Kazakhstan, respondents were assigned to one of the following experiment groups: (1) offered nothing – control group, (2) offered 2,500 tenge (T-Arm1), (3) offered 5,000 tenge (T-Arm2), (4) offered 10,000 tenge (T-Arm3), and (5) offered 20,000 tenge (T-Arm4). Assignments using incentives valued similarly in each experimental arm (in local currency terms) were used in the other two countries (table 2).

Table 2: Payment offers by country with USD and PPP equivalents

	UZBEKISTAN	TAJIKISTAN	KAZAKHSTAN
CONTROL	No payment offers	No payment offers	No payment offers
TREATMENT ARM 1	**50,000 soum** ($4.62, $19.69 PPP)	**50 somoni** ($4.42, $14.59 PPP)	**2,500 tenge** ($5.83, $15.40 PPP)
TREATMENT ARM 2	**100,000 soum** ($9.23, $39.38 PPP)	**100 somoni** ($8.85, $29.17 PPP)	**5,000 tenge** ($11.66, $30.80 PPP)
TREATMENT ARM 3	**200,000 soum** ($18.47, $78.76 PPP)	**200 somoni** ($17.70, $58.35 PPP)	**10,000 tenge** ($23.31, $61.60 PPP)
TREATMENT ARM 4	**400,000 soum** ($36.93, $157.52 PPP)	**400 somoni** ($35.40, $116.69 PPP)	**20,000 tenge** ($46.62, $123.20 PPP)

Notes: Market exchange rates: 1 USD=429 KZT; 1 USD=10,830 UZS; 1 USD=11.3 TJS.
Purchasing power parity, 2017: KAZ: 125.26, UZB: 1521.48, TJK: 2.59

Formally, we model the probability of intention to vaccinate unconditionally, and then conditional on the respondent's observed covariates. We use a binary logit model with linear predictors of the form:

$$Pr(V_i \mid X_i, Z_i) = \phi(X_i^T \xi)$$

Where $\phi(\cdot)$ denotes the cumulative distribution function of the standard logistic distribution, χ. For ease of interpretability, all specifications are also conducted using ordinary least squares regression and reported alongside the results of the binary logit models. Randomization was successful in each of the three countries. Income quintile was constructed using inflation-adjusted income (including income from wage employment, self-employment, sale of agricultural goods, remittances, social assistance, and pensions) grouped by monthly quintile. A household's dwelling was defined as either rural or urban by the official sample frame in each country. Household size was constructed based on the household roster of members present. As demonstrated in tables 3 and 4, there was no statistically significant difference (at conventional levels) between treatment and control groups across measures of income, rural-urban location, and household size. As an additional robustness check, household-level balance variables are included as controls. Balance checks at the individual (respondent) level were only possible in Kazakhstan and Uzbekistan (table 4) as these data were not collected in Tajikistan.

Table 3: Household-level balance tests

	Uzbekistan			Tajikistan			Kazakhstan		
	Income Quintile	Rural	H.hold Size	Income Quintile	Rural	H.hold Size	Income Quintile	Rural	H.hold Size
Control	3.05	0.76	5.75	2.75	0.72	7.62	2.88	0.37	3.61
Any Treat	3.02	0.78	5.88	2.60	0.76	7.80	3.01	0.38	3.82
T-Arm 1	3.09	0.77	5.82	2.60	0.72	8.21	2.94	0.38	3.96
T-Arm 2	3.01	0.81	5.90	2.54	0.73	7.67	3.20	0.36	3.78
T-Arm 3	3.06	0.77	5.91	2.63	0.78	7.76	2.99	0.39	3.73
T-Arm 4	2.92	0.78	5.89	2.65	0.81	7.53	2.89	0.41	3.83
p-value	0.70	0.39	0.26	0.13	0.10	0.39	0.24	0.81	0.08

Notes: the table provides average values among randomly assigned treatment arms, excluding respondents who were already vaccinated.

Table 4: Balance test at level of individual respondent

	Uzbekistan			Kazakhstan		
	Age	Female	Tertiary	Age	Female	Tertiary
Control	47.12	0.58	0.14	40.27	0.47	0.27
Any Treat	47.55	0.54	0.14	42.61	0.54	0.34
Treat 1	46.94	0.53	0.11	41.90	0.52	0.34
Treat 2	48.03	0.52	0.15	43.28	0.53	0.37
Treat 3	47.56	0.55	0.16	42.71	0.58	0.33
Treat 4	47.66	0.55	0.16	42.49	0.54	0.33
p-value C/T	0.53	0.09	0.93	0.21	0.13	0.07

Notes: the table provides average values among randomly assigned treatment arms, excluding respondents who were already vaccinated.

Results

The take-up rate among the group with no cash compensation was highest, in each country falling within the confidence interval of the national average for vaccination uptake. Take-up rates for all other "treated" groups were significantly lower. In specifications pooled over all three countries, being assigned a prompt that included any form of financial compensation resulted in take-up rates that were 18.7 percent lower than the control group (Table 5, columns 1 and 4), with results consistent using either OLS or logit regression. This key result clearly demonstrates a negative effect of cash compensation offered on vaccination intentions. Assessing the treatment arms individually (Table 5, columns 2 and 5) shows that the effect is present across all levels of compensation, with potentially a slight reduction at the highest levels of compensation studied. Including controls (Table 5, columns 3 and 6) for income, living in a rural area, and household size reveals a significant pattern of vaccine intentions with respect to rural/urban location (a positive and significant coefficient suggests respondents in rural areas were much more likely to agree to be vaccinated), but not with respect to income per capita or household size. With respect to the coefficient of interest for the experiment, the inclusion of additional controls had no material impact on the main findings.

Table 5: Main results Pooling sample (three countries)

	OLS: Agree to Vaccinate = 1			Logit (odds ratio): Agree to Vaccinate = 1		
	(1)	(2)	(3)	(4)	(5)	(6)
Any Treat	-0.187***		-0.189***	0.400***		0.394***
	(0.019)		(0.019)	(0.035)		(0.035)
T-Arm1		-0.201***			0.371***	
		(0.022)			(0.042)	
T-Arm2		-0.190***			0.393***	
		(0.022)			(0.044)	
T-Arm3		-0.191***			0.392***	
		(0.022)			(0.044)	
T-Arm4		-0.167***			0.446***	
		(0.023)			(0.050)	
Inc. Per Capita			-0.000			1.000
			(0.000)			(0.000)
Rural Location			0.077***			1.526***
			(0.015)			(0.126)
Household Size			0.000			1.003
			(0.003)			(0.014)
Constant	0.454***	0.454***	0.393***	0.892	0.892	0.636***
	(0.018)	(0.018)	(0.025)	(0.073)	(0.073)	(0.079)
Observations	6,779	6,779	6,779	6,779	6,779	6,779
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.176	0.177	0.181			

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Logit model coefficients report odds ratios. Country binary variables are included in each regression but not shown.

The summary results from pooled regressions maintain the same patterns at the national level for Kazakhstan. In Table 6, columns 1 and 4 show that assignment to any hypothetical incentive is associated with a more than 22 percent lower intention to vaccinate than the control group, with results consistent using either OLS or Logit regression. Examining the results for each treatment arm (Table 6, columns 2 and 5) suggests that the effect remains uniformly negative across all offer amounts with an inverted-u shape in average reductions with rising compensation amounts (moving from the first to the fourth treatment arm). Including additional controls (Table 6, columns 3 and 6) does not make any meaningful change in the estimated effect.

Table 6: Main results table Kazakhstan

	OLS: Agree to Vaccinate = 1			Logit (odds ratio): Agree to Vaccinate = 1		
	(1)	(2)	(3)	(4)	(5)	(6)
Any Treat	-0.221***		-0.223***	0.331***		0.329***
	(0.048)		(0.047)	(0.064)		(0.063)
T-Arm1		-0.262***			0.243***	
		(0.051)			(0.064)	
T-Arm2		-0.207***			0.360***	
		(0.056)			(0.093)	
T-Arm3		-0.188***			0.375***	
		(0.061)			(0.097)	
T-Arm4		-0.228***			0.348***	

	(1)	(2)	(3)	(4)	(5)	(6)
		(0.052)			(0.089)	
Inc. Per Capita			0.000			1.000
			(0.000)			(0.000)
Rural Location			-0.044			0.889
			(0.027)			(0.146)
Household Size			0.000			0.998
			(0.009)			(0.044)
Constant	0.370***	0.370***	0.378***	0.538***	0.538***	0.530
	(0.045)	(0.045)	(0.067)	(0.089)	(0.089)	(0.163)
Observations	1,802	1,802	1,802	1,802	1,802	1,802
R-squared	0.052	0.055	0.055			

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Logit model coefficients report odds ratios. Offers in each arm of the experiment include: (1) nothing – control group, (2) 2,500 tenge (T-Arm1), (3) 5,000 tenge (T-Arm2), (4) 10,000 tenge (T-Arm3), and (5) 20,000 tenge (T-Arm4) (1 USD=425 Kazakh Tenge).

The summary results from pooled regressions also maintain the same patterns at the national level for Uzbekistan. In Table 7, columns 1 and 4 show that assignment to any hypothetical incentive is associated with a 22 percent lower intention to vaccinate than the control group. Examining the results for each treatment arm (Table 7, columns 2 and 5) suggests that the effect remains uniformly negative across all offer amounts with modest differences between them. Including additional controls (Table 7, columns 3 and 6) does not meaningfully impact the estimated effect.

Table 7: Main results table Uzbekistan

	OLS: Agree to Vaccinate = 1			Logit (odds ratio): Agree to Vaccinate = 1		
	(1)	(2)	(3)	(4)	(5)	(6)
Treat	-0.224***		-0.226***	0.373***		0.367***
	(0.026)		(0.025)	(0.040)		(0.040)
T-Arm1		-0.226***			0.370***	
		(0.031)			(0.052)	
T-Arm2		-0.234***			0.355***	
		(0.031)			(0.050)	
T-Arm3		-0.235***			0.354***	
		(0.031)			(0.050)	
T-Arm4		-0.203***			0.416***	
		(0.031)			(0.058)	
Inc. Per Capita			-0.000			1.000
			(0.000)			(0.000)
Rural Location			0.104***			1.719***
			(0.021)			(0.205)
Household Size			-0.002			0.992
			(0.004)			(0.020)
Constant	0.484***	0.484***	0.415***	0.938	0.938	0.651***
	(0.023)	(0.023)	(0.034)	(0.088)	(0.088)	(0.107)
Observations	2,710	2,710	2,710	2,710	2,710	2,710
R-squared	0.037	0.038	0.046			

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Logit model coefficients report odds ratios. Offers in each arm of the experiment include: (1) nothing – control group, (2) 50,000 soum (T-Arm1), (3) 100,000 soum (T-Arm2), (4) 200,000 soum (T-Arm3), and (5) 400,000 soum (T-Arm4).

Only in Tajikistan did the summary results differ from the trends in the pooled regressions. In Table 8, columns 1 and 4 show that assignment to any hypothetical incentive is not significantly different from controls. Examining the results for each treatment arm (Table 8, columns 2 and 5) suggests that the effect reaches significance only for the first treatment arm. Including additional controls (Table 8, columns 3 and 6) does not meaningfully impact the estimated effect.

Table 8: Main results table Tajikistan

	OLS: Agree to Vaccinate = 1			Logit (odds ratio): Agree to Vaccinate = 1		
	(1)	(2)	(3)	(4)	(5)	(6)
Treat	-0.015		-0.019	0.917		0.890
	(0.023)		(0.022)	(0.123)		(0.121)
T-Arm1		-0.050*			0.755*	
		(0.030)			(0.126)	
T-Arm2		-0.011			0.936	
		(0.028)			(0.157)	
T-Arm3		-0.016			0.911	
		(0.029)			(0.153)	
T-Arm4		0.021			1.144	
		(0.028)			(0.202)	
Inc. Per Capita			0.000*			1.001*
			(0.000)			(0.000)
Rural Location			0.125***			1.951***
			(0.024)			(0.233)
Household Size			0.005*			1.033
			(0.003)			(0.021)
Constant	0.791***	0.791***	0.651***	3.780***	3.780***	1.776***
	(0.020)	(0.020)	(0.035)	(0.458)	(0.458)	(0.352)
Observations	2,267	2,267	2,267	2,267	2,267	2,267
R-squared	0.000	0.003	0.022			

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Logit model coefficients report odds ratios. Offers in each arm of the experiment include: (1) nothing – control group, (2) 50 somoni (T-Arm1), (3) 100 somoni (T-Arm2), (4) 200 somoni (T-Arm3), and (5) 400 somoni (T-Arm4).

As additional validation, all respondents were asked whether they "support giving people financial incentives for vaccination" following the experiment questions. The results are consistent with findings from the survey experiment. In Uzbekistan, 72 percent of respondents said they disagree with paying incentives for people to be vaccinated. In Kazakhstan, 58 percent said they disagreed with paying incentives. Only in Tajikistan, where the experiment failed to find any systematic effect on vaccination intentions, just 18 percent said they disagreed with paying incentives.

In table 9, using the same dependent variable, responses are disaggregated by reason for non-vaccination among those who stated they would not be vaccinated in a separate question during the same interview. These highlight that much of the negative response to incentive payments comes from respondents who stated they would be willing to be vaccinated changing their response to refusal in the case that they were offered an incentive. Among those who said they would not be vaccinated, very few changed their response following the offer of an incentive. However, small but significant differences in some cases were apparent with respect to suspicion of vaccines and their risks (table 9 columns 1, 3 and 4).

Table 9: Disaggregation by stated reasons for hesitancy (among the hesitant, OLS estimation)

	KAZ		UZB		TJK	
	(1)	(2)	(3)	(4)	(5)	(6)
Experiment Treatment	-0.068**	-0.065**	-0.008	-0.010	-0.010	-0.009
	(0.029)	(0.028)	(0.020)	(0.020)	(0.089)	(0.087)
Negative past experiences	-0.050**	-0.033	-0.041***	-0.042***	-0.066	-0.065
	(0.021)	(0.023)	(0.016)	(0.016)	(0.077)	(0.074)
Lack of trust in health system	0.020	0.025	0.018	0.017	-0.076	-0.075
	(0.033)	(0.033)	(0.038)	(0.037)	(0.076)	(0.074)
Risk more than disease	0.041	0.037	-0.040***	-0.041***	-0.079	-0.078
	(0.035)	(0.035)	(0.015)	(0.015)	(0.076)	(0.075)
Personal/religious beliefs	0.041	0.041	-0.005	-0.007	-0.073	-0.072
	(0.048)	(0.046)	(0.019)	(0.019)	(0.076)	(0.073)
Counter-indication	0.037	0.037	0.023	0.021	-0.063	-0.057
	(0.026)	(0.026)	(0.019)	(0.019)	(0.078)	(0.076)
Other	0.040	0.038	-0.013	-0.013	0.006	0.007
	(0.026)	(0.025)	(0.015)	(0.015)	(0.005)	(0.005)
Inc. Per Capita		-0.000**		-0.000***		0.000
		(0.000)		(0.000)		(0.000)
Rural Location		-0.012		0.015		0.010*
		(0.019)		(0.012)		(0.005)
Household Size		-0.007		0.000		-0.001**
		(0.005)		(0.002)		(0.000)
Constant	0.090***	0.145***	0.051**	0.040	0.073	0.071
	(0.028)	(0.042)	(0.021)	(0.028)	(0.075)	(0.071)
Observations	1,209	1,209	1,380	1,380	1,117	1,117
R-squared	0.020	0.030	0.007	0.009	0.021	0.024

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Base category "Lack of trust in producers"; among the vaccine hesitant in each country.

Discussion and conclusions

The experiment found that hypothetical incentive payments reduced vaccination intentions in two of the three countries studied. The findings suggest that the behavioral responses to incentives are not uniform across countries. While offering incentives markedly reduced overall vaccination intentions by 19 percent (p=0.000) in all three counties, significant reductions are observed in Uzbekistan and Kazakhstan but not in Tajikistan. These qualitatively large and statistically significant effects were directly opposite to those expected. The results contrast with the well-established efficacy of monetary incentives to influence vaccination behavior in other settings but are consistent with findings from the behavioral literature in which incentive payments signal inferiority or disutility.

Moreover, we find that the risk of backfire does not systematically depend on the monetary amount offered. In Kazakhstan, the size of negative coefficient is slightly lower for a higher incentive amount, while it does not change systematically according to the payment in Uzbekistan. Higher incentive payment values were not systematically associated with increased vaccination intentions.

Follow-up survey questions confirmed that in those settings where the negative motivation impacts were strongest, paying incentives for vaccines was unpopular. Such consistent findings are an additional validation of the experimental results but also suggest a cost-effective method to identify contexts in which such effects may arise. In this case, simple descriptive analysis of a survey question pointed to the same motivation and incentive issue as a more complex experimental design.

It is important to avoid over-generalizing the results of this study. COVID-19 vaccination intentions were different from other routine health interventions in several respects. The science was very new, the pandemic was of unprecedented proportions and created both social anxiety and prevalent disinformation. In addition, around the time the data used in this study were collected, the first reports linking the Oxford/AstraZeneca vaccine with thrombosis/blood clots were published. There is little doubt that these factors affected the way populations viewed COVID-19 vaccines and the way the governments promoted them.

The results do not demonstrate that extrinsic incentives for vaccination and other health interventions do not work in all settings. Rather, the findings suggest that policy makers and practitioners should use caution when considering such interventions where effects have not been tested. Taken collectively, the experiments suggest that previous findings demonstrating increased vaccination intentions due to financial incentives may be context specific and may not fully generalize outside the context of those studies. The risk of a "backfire" effect demonstrated in this context suggests that systematic pre-testing of incentive programs in novel settings is prudent.

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Annex 1: Questionnaire

COV8 *[only Round 6]* *[experiment: randomly choose one of the 5 arms]* *[everyone]*	**8 Imagine COVID-19 vaccines were locally available to you. Would you be willing to get the COVID-19 vaccine of your choice [random part of the question]?** **[random part of the question]:** **[nothing].** **if, hypothetically, an incentive payment of KZT2,500 was offered to you** **if, hypothetically, an incentive payment of KZT5,00 was offered to you** **if, hypothetically, an incentive payment of KZT10,00 was offered to you** **if, hypothetically, an incentive payment of KZT20,000 was offered to you**	**Yes..1** **No ....2** **I have already been vaccinated.................................3**
	8 Представьте, что Вам доступна любая из существующих вакцин от коронавируса. Стали бы Вы вакцинироваться… [случайная часть вопроса]: 1 – бесплатно 2 – если бы Вам предложили за это 2 500 тенге 3 – если бы Вам предложили за это 5 000 тенге 4 – если бы Вам предложили за это 10 000 тенге 5 – если бы Вам предложили за это 20 000 тенге	Да……………………… ………..1 Нет…………………… ………. ....2 Мне уже сделали прививку 3
	8 Коронавирусқа қарсы қолданыстағы бар вакциналардың кез-келгені қолжетімді деп елестетіңіз. Сіз вакцина салдырар ма едіңіз... [сұрақтың кездейсоқ бөлігі]: 1 – егер ол тегін болса 2 - егер ол үшін Сізге 2500 теңге ұсынылса 3 - егер ол үшін Сізге 5000 теңге ұсынылса 4 - егер ол үшін Сізге 10 000 теңге ұсынылса 5 - егер ол үшін Сізге 20 000 теңге ұсынылса	Иә ....1 Жоқ..2 Мен вакцинаны алдым …..3

COV9 *[only Round 6]* *[everyone]*	**9 Do you support paying people for vaccination?**	**Yes..1** **No 2**
	9 Поддерживаете ли Вы идею о том, что необходимо платить людям за то, что они вакцинируются?	Да ....1 Нет..2
	9 Вакцинаны салдырғаны үшін адамдарға ақша төлеу керек деген ойды қолдайсыз ба?	Иә……………………… ………..1 Жоқ…………………… ………...2

Annex 2: Health Experts and Official Guidance on Counterindication

Official guidance for vaccination programs explicitly excludes some at-risk groups in each of the three countries, Kazakhstan, Uzbekistan, and Tajikistan. Eligibility restrictions are primarily based on perceived risk arising due to pre-existing health conditions. Such guidance in some cases contrasts strongly with conventional practice elsewhere in the world where members of these same at-risk groups are often *targeted for early vaccination*.[10]

In Kazakhstan for instance, the list of reasons for counterindications include the following provisions:

- Persons with permanent and temporary medical contraindications to preventive vaccinations in accordance with the order of the Minister of Health of the Republic, including:
    - People diseases of immune deficiency, including HIV
    - People with previous allergic reactions to vaccines
    - People diagnosed with cancer
    - Women who are or may be pregnant
    - People with infectious and/or severe noninfectious diseases
- People under age 18 (now elsewhere in the world often reduced to age 12).
- Some legal documents still refer to insufficient safety information to recommend vaccination for people over 65 in Kazakhstan.
- Patients receiving immunosuppressive therapy.
- People with acute and asymptomatic form of COVID-19.
- People who have been in contact with a patient with an infectious disease, including COVID-19, may only be vaccinated after the end of the quarantine period.

Very similar restrictions are in place in Uzbekistan, with additional counterindication restrictions on women who are breastfeeding. To confirm these as primary contributing factors to vaccine hesitancy, the World Bank research team undertook key informant interviews with health care workers in Uzbekistan.[11] These interviews fully confirmed the centrality of counterindication guidelines as a driver of hesitancy. The finding also indicated that medical workers often apply additional restrictions beyond those recommended by senior public health authorities. The following figure provides a diagram of vaccination procedures as currently practiced in Uzbekistan. According to these interviews, about 15-20 percent of people who attempt to be vaccinated are ultimately refused (either temporarily or permanently) due to health issues based on the recommendations of a special commission. Refusal decisions are typically made based on explicit instruction of the Ministry of Healthcare and the view that high rates of refusal indicate "taking a cautious approach."

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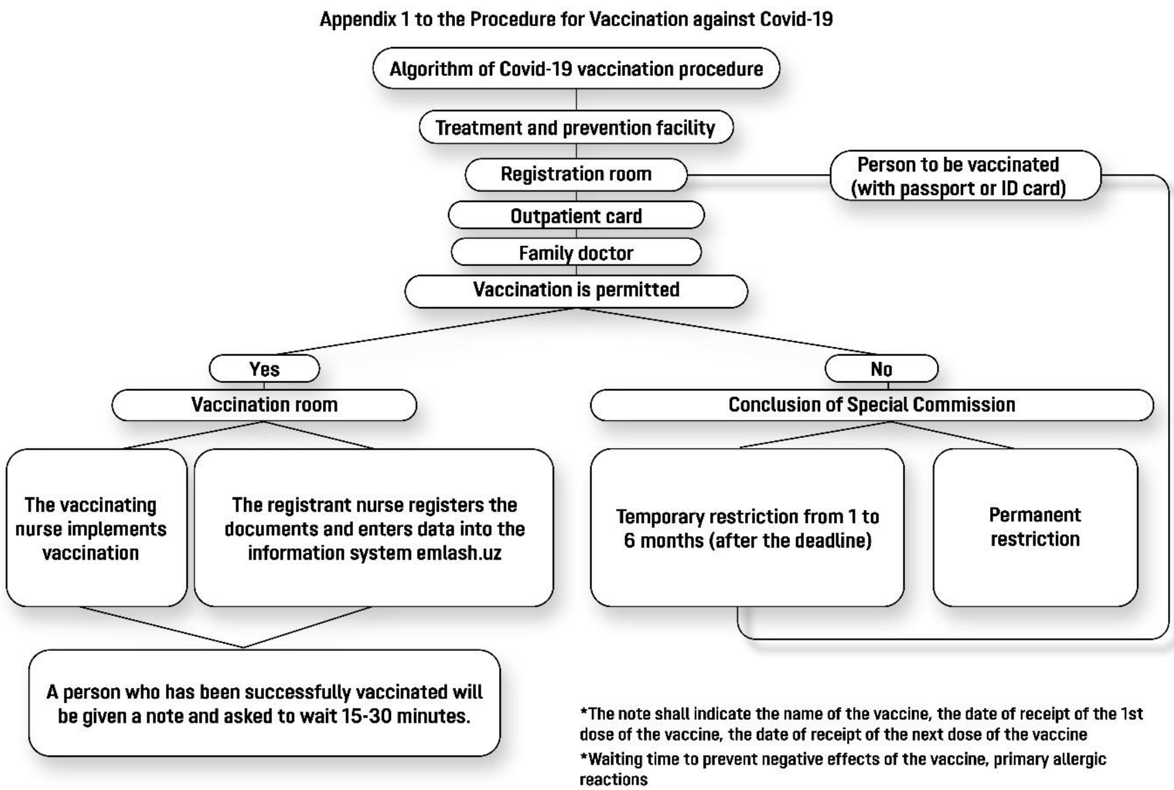
[10] A list of prioritized groups by country is provided at the following website:
https://graphics.reuters.com/world-coronavirus-tracker-and-maps/vaccination-rollout-and-access/

[11] Interviews were conducted with 36 health care professionals (2 FGDs 24 KIIs of health care workers participating in vaccination campaigns).



However, in many instances, health care professionals reported reasons for counterindication that were more rigid than official guidance. Common reasons for refusal to vaccinate a person according to health care workers in Uzbekistan included:

- People who had surgery (can only be allowed for vaccination in three months after surgery)
- People who had strokes and heart attacks
- People with allergies
- Pregnant women
- Breastfeeding women with children up to 2 years old
- Cancer patients
- People below 18 years old
- People with any chronic diseases
- People with HIV/AIDS
- People with tuberculosis
- People with liver cirrhosis
- People with diabetes
- People with infectious and severe noninfectious diseases
- Overweight people
- People with high blood pressure and/or blood diseases
- Women of fertile age

In general, health care workers reported concerns about vaccinating people with chronic diseases or people with any health complications. Around half of doctors interviewed reported they fear the possible consequences of even small risk of anaphylactic shock followed by vaccination, and act accordingly in making refusal decisions. This concern was reported to be especially common at the beginning of vaccination campaign. However, several health care professionals reported that they felt restrictions could now be relaxed as more information on the safety profile of vaccines has become available.

Of the three countries, Tajikistan's vaccine eligibility criteria are the least restrictive at the time of this writing and follow international practice with only few exceptions (for instance, with respect women who are pregnant or breastfeeding). That hesitancy in Tajikistan is nonetheless commonly attributed to counterindication suggests that revising standard regulations may not be alone sufficient to address the challenge. Thus, beyond revising vaccination eligibility criteria, it will also be important that the authorities ensure all health care professionals as well as the public at large are aware that vaccination is recommended in nearly all cases, including among people with pre-existing health conditions.

Annex 3: Target sample and participation

Non-participation or refusal is one potential concern using panel data of the type used in this study. Participation is summarized in table 10.

Table 10: Response rates and replacement

	Target Sample	Target completed	Share	Replaced (Same PSU)
Kazakhstan	2000	1801	90%	199
Uzbekistan	1500	1489	99%	11
Tajikistan	1277	1005	79%	272

Notes: Tajikistan analysis uses 2 rounds of data

To maintain the surveys over time, participation in every round is not a strict requirement, i.e., respondents can miss a scheduled round of the survey and continue to participate in later rounds. To ensure that non-participation did not seriously affect the required sample size for survey representativeness, households that refused to participate were replaced with other households drawn from the same sample cluster.

However, any systematic difference in the household characteristics due to refusal to participate could lead to bias (with respect to population representativeness) if the replacement households were different on average (with respect to observable characteristics) from the household that refused. To take non-take-up and attrition into account, the participating sample was reweighted by developing a model using observable and relatively time-invariant characteristics to predict the probability of non-participation for each household. Responses were then weighted to account not only for the sampling design but also reweighted with respect to household characteristics in each round to partially account for any bias introduced due to households not participating (insofar as this is not addressed by random replacement from the same PSUs).