

ARTICLE

COVID-19 vaccination: Willingness and practice in Bangladesh

Avinno Faruk  | Ishmam Al Quddus 

Institute of Governance and Development (BIGD), BRAC University, Bangladesh

Correspondence

Avinno Faruk, BRAC Institute of Governance and Development (BIGD), BRAC University, SK Center, TB Gate, Mohakhali, Dhaka-1212, Bangladesh. Email: avinnofaruk@gmail.com

Funding information

BRAC Institute of Governance and Development (BIGD), BRAC University

Summary

Motivation: The urgency and scale of mass adult immunization for COVID-19 presents a huge challenge for any low- and middle-income country (LMIC) like Bangladesh. Our analysis focuses on demand-side constraints early in the vaccination campaign to help gauge vaccine acceptability and potential contributing factors. Identifying registration and compliance challenges early on will help ensure a seamless immunization programme.

Purpose: We seek to identify subgroups who may need specific interventions by comparing willingness to be vaccinated and registration behaviour, and to understand how actual registration and take-up decisions compare between rural areas and urban slum areas.

Approach and Methods: We use data from three surveys conducted between late January and early September 2021. The article includes a nationally representative survey on vaccine acceptability and a study on vaccination rollout behaviour in rural and urban slums.

Findings: Willingness was not an issue in Bangladesh, but the challenge was getting individuals to register. Once they did, compliance was very high. When the information gap regarding registration was addressed by campaigning, registration and take-up increased. Confidence in public service delivery influenced favourable responses to mass immunization efforts. Women were falling behind initially in terms of both registration knowledge and completion. Online registration needed to be complemented with alternatives. Social networking was a vital source of information and encouragement.

Policy implications: Communication strategies are necessary to inform the public at an early stage, and these should provide information about registration eligibility and detailed registration instructions. Ensuring and sustaining service quality is also beneficial. In LMICs like Bangladesh, low-tech intensive registration methods are required. Information campaigns about the registration procedure should specifically target rural communities and women. Community-based mechanisms may reduce transaction costs and increase confidence.

KEYWORDS

Bangladesh, COVID-19, public trust and communication, vaccination, willingness to be vaccinated

1 | INTRODUCTION

With the launch of the nationwide vaccination programme in Bangladesh on February 7, 2021, the country—intending to immunize 80% of the population in three phases—was gearing up to take the next step in combating COVID-19 in the second year of the pandemic. In a country that is no stranger to vaccination programmes and largely considered vaccine-friendly, the authority is dealing with mass adult immunization, unlike earlier child immunization programmes. According to Alici et al. (2017), adults often believe that vaccines are solely for children and are also anxious about the safety of the vaccines. This aspect of vaccination, coupled with the urgency that 80% of the population should be fully immunized within a few years, is an unprecedented challenge for any lower middle-income country (LMIC). In Bangladesh, besides the second wave and the halt in the supply of vaccines (Islam, 2021), one of the main initial concerns was vaccine uptake, i.e. a person's willingness to be vaccinated (WTV). Previously, we had the luxury of time in acquiring and distributing the vaccines and motivating people with long-running communication campaigns. We must also analyse vaccine take-up using vaccine registration and compliance data to determine WTV in practice. These can help programme implementation because they reflect actual uptake, practices, and obstacles.

Since the COVID-19 pandemic, there have been extensive studies on vaccine acceptability. From high-income countries (HICs) to LMICs, several studies attempted to gauge adults' WTV. Some segments of the population remained hesitant, an attitude pervasive in many LMICs (Lazarus et al., 2022), where a dearth of rigorous research was also noted (Sallam, 2021). According to the World Health Organisation advisory body, Strategic Advisory Group of Experts on Immunization (SAGE) vaccine hesitancy is defined as the "delay in acceptance or refusal of vaccination despite the availability of vaccination services" (SAGE, 2014). Heterogeneity in hesitancy exists across time, space, and vaccines while it is driven by elements such as complacency, convenience, and confidence (the 3Cs model). The author further noted that, while high hesitancy results in low demand, low hesitancy does not necessarily imply high demand.

Notably, the model identified trust in the motivations of the policy-makers and the design of vaccination programmes or method of delivery among the influencing factors. Although communication is stressed as a tool rather than a factor, the role of both general and targeted communication has been emphasized to improve vaccine uptake nonetheless. Other studies have also contributed with other models (Betsch et al., 2018; Thomson et al., 2016), where regard for others or collective responsibility came into play as a determinant.

Studies on COVID-19 vaccination also, understandably, attempted to consider governance issues such as public trust and communication (Al-Jayyousi et al., 2021; Biswas et al., 2021; Joshi et al., 2021; Lazarus et al., 2021; Lazarus et al., 2022; Soares et al., 2021; Toro-Ascuy et al., 2022). Lazarus et al. (2022) found variation across nations regarding the salience of public trust. They also noted that the factor played a more critical role in the early phase of the pandemic in 2020. Their study, however, did not cover Bangladesh.

Communication was also a crucial device for influencing early-stage take-up. For instance, Cooper et al. (2021) exhibited the "trust-building measures" as an essential part of the communication strategies to increase vaccine uptake in South Africa. Earlier, Rubin et al. (2010) assessed the swine-flu outbreak, contending that when fear levels of catching the virus are low, increasing the volume of mass media and commercial coverage would probably boost the perceived efficacy of prescribed behaviours, leading to an increase in vaccine uptake.

The Government of Bangladesh (GoB, n.d.) was able to initiate early vaccination against COVID-19 because of its prudent vaccine deals, vaccine diplomacy, and past vaccination experiences. (Islam et al., 2021a). However, there were some challenges initially in relation to demand and supply. The vaccine registration framework for the GoB's Covid-19 Management System "Surokkha" in Bangladesh stated that it needed to be completed online or via the mobile application (GoB, n.d.). The recipients would require their National Identity Card (NID) and mobile number to register for the vaccination programme ("How you can register," 2021). The immunization was to be conducted free of charge and did not include the population under 18 years old in the initial phases ("Covid-19: Govt," 2021), thus willingness to pay was not an issue. Unfortunately, the launch of the mobile application was delayed, and on-site registration was introduced for people who could not register online by the end of January ("DGHS: 11,000 people," 2021). The GoB was also adaptive in its planning. Observing a poor response to online registration, they revised the first-month vaccination target

from 6 million to 3.5 million (Molla, 2021) to avert instances of incomplete dosage. Moreover, the age floor in the first phase was reduced to 40 years from 50 years to enhance the pace of the vaccination programme (Molla & Sujan, 2021).

An initial peak is evident in Figure 1, capturing the early enthusiasm for the free vaccine as specific population segments were quick to register and get vaccinated in Bangladesh (Mathieu et al., 2021). However, despite the availability of the vaccine, daily numbers started falling significantly after February, even though the age floor had been revised downwards from 50 to 40 years. This decline was cause for concern for the authorities as it slowed down the process to achieve the targeted immunization rate within the planned time.

The article therefore aims to shed light on the initial demand-side barriers in an LMIC setting, employing three surveys conducted over various periods, from late January to early September 2021, by the BRAC Institute of Governance and Development (BIGD), BRAC University. We try to assess whether the willingness and registration behaviour vary across groups. Our results help to identify population subgroups that require targeted vaccination interventions. We also try to understand how actual registration and take-up decisions are formed in rural and urban slum regions, and the factors involved. The analysis will enable policy-makers to gauge the degree of vaccine acceptability and its contributing factors and identify subgroups that may require special attention to ensure immunization, at least in the initial stage of the programme. Early identification of registration and compliance barriers and incentives can help the immunization programme run smoothly.

The article primarily consists of a two-fold analysis. In the first part, the study focuses on WTV or the acceptability of the vaccine from a nationally representative survey conducted from late January to early February 2021, bearing the demand-side issues in mind. We then extend this analysis to study the role of governance in the demand-side aspect of the vaccination programme, i.e. WTV, from the nationally representative sample of the adult population. Here, we explored the role of public trust—existing public perceptions and their expectations—in motivating the public towards COVID-19 vaccination.

The second part studies the behavioural aspects regarding the vaccination rollout, using rural area and urban slum samples from another two surveys conducted in March 2021 and September 2021 by the Power and Participation Research Centre (PPRC) and BIGD, BRAC University. The first survey asked vaccination process-oriented questions

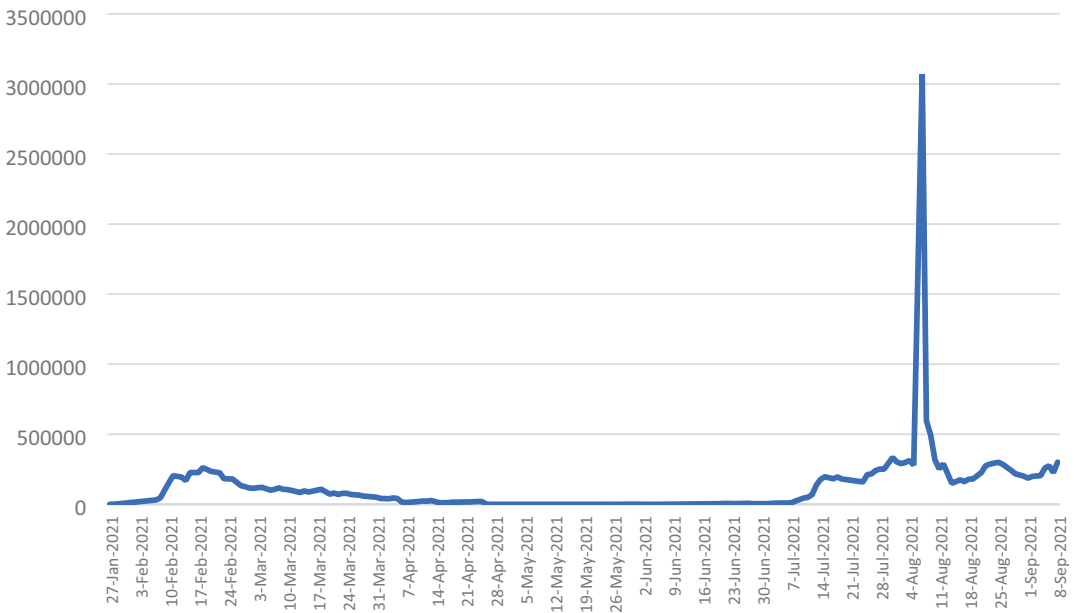


FIGURE 1 First doses administered over time in Bangladesh (January 27, 2021 to September 8, 2021) Source: DGHS (n.d.)

to comprehend the registration practices and difficulties. The second survey is a follow-up to assess registration and compliance following some significant government policy changes between these two surveys. The analysis of this sample would be vital to formulating effective policies based on the different factors to induce vaccine registration and compliance in urban slum and rural areas.

The article is organized as follows. Section 2 reviews the existing literature on demand for vaccination, COVID-19 vaccine acceptability, and the role of governance and trust. Section 3 presents the methodology and discusses our sampling strategy for the various surveys. We then present our discussion on the findings of the role of governance in WTV for a nationally representative survey in Section 4. Section 5 covers vaccine registration and compliance practices using rural and urban slum samples, followed by our concluding remarks in Section 6.

2 | LITERATURE REVIEW

Earlier models of vaccine hesitancy tended to ignore contextual factors which affect vaccine uptake (Larson et al., 2014). Cooper et al. (2019) highlighted how demand for vaccines resides in a much more nuanced spectrum, far from the binary notion of acceptance and refusal. Knowledge deficits are not enough to explain the heterogeneity in demand; other factors—such as those identified by the 3Cs model—play a role. The need for more rigorous evidence to understand the demand mechanism's complexity and its challenges is, therefore, imperative—especially in the context of LMICs, where there is a dearth of research compared to HICs.

Concerning COVID-19 vaccine acceptability, authors synthesized the global evidence in the form of systematic reviews and meta-analysis, many of which were conducted during the early phase of the pandemic, i.e. from 2020 to early 2021 (Aboelsaad et al., 2021; AlShurman et al., 2021; Lin et al., 2021; Salomoni et al., 2021, among others). Apart from demographics, the safety of vaccines was one of the critical concerns that repeatedly came up during this initial phase, stressing the need for public trust and public health communication strategies. A further discernible feature was that most of the reviewed studies focused on HICs. One of the few early LMIC studies emerged from India (Umakanthan et al., 2021). Still, the longitudinal data were collected from only four states and could not be said to be nationally representative. However, the authors also highlighted the dual salience of public satisfaction with government and evidence-based communication strategies.

Historically, Bangladesh has had success in mass-scale immunization programmes, for example the World Health Organization (WHO) initiative of the Expanded Programme on Immunization (Jamil et al., 1999). Chowdhury et al. (2003) extensively examined inequality in access to vaccination and illustrated the contrasting picture among different socioeconomic groups. The study found low immunization coverage in rural regions, urban slums, and ethnic minorities, drawing attention to the need for targeted approaches for vulnerable and marginalized communities.

In light of the current COVID-19 vaccination programme, the early studies on Bangladesh reflect a high acceptance rate towards vaccination. Kamal et al. (2021) noted a high vaccination acceptance rate among the majority of the respondents in their study. In another study (Islam et al., 2021b) a positive attitude (60%) was observed among the general population in Bangladesh towards vaccination, albeit alongside inadequate general knowledge regarding vaccination. In another study, around 41% of participants were informed about their vaccine hesitancy (Hossain et al., 2021). Abedin et al. (2021) found willingness towards vaccination among 75% of the respondents, which is also in line with the general acceptance worldwide. Haque et al. (2021) stated that most of their study respondents favoured vaccination being made mandatory. Disconcertingly, a study observed a relatively low vaccination acceptance rate among health professionals (Alam et al., 2021). In addition, Kalam et al. (2021) identified the behavioural determinants of the COVID-19 vaccine and highlighted the importance of an integrated behaviour change strategy to increase vaccine uptake.

Paul et al. (2021) found that 46% of their respondents reported fear of side effects associated with vaccination, and another study observed concerns about whether the vaccine is halal (permissible for consumption according to Islamic rules) (Kabir et al., 2021). Nath et al. (2021) explored vaccination uptake among the young adult cohort of

Bangladesh and estimated the significant effect of vaccine hesitancy and eHealth literacy on vaccination intent.¹ They found no significant association between vaccine literacy and vaccination uptake intent. Most of the older cohort in Bangladesh were unvaccinated, mainly because of accessibility issues (Mistry et al., 2022).

A high prevalence of vaccine refusal and hesitancy was perceived among rural people and urban slum dwellers in Bangladesh (Abedin et al., 2021). Most of the marginalized households (55%) in Bangladesh have unvaccinated eligible members in December 2021, particularly urban slum and rural households (Badiuzzaman et al., 2022). These studies reinforce the rationale behind extending the research to ascertain various aspects of vaccination—willingness and practice—among vulnerable communities. In urban slums, governance from below plays a significant role, as Zaman et al. (2022) showed how community-level interventions helped tackle COVID-19 transmission. Understanding the prevailing registration attitudes and practices among urban slum residents is vital as immunization is administered through formal channels.

The article contributes to the existing literature in several ways. First, we attempt to shed light on the initial demand-side barriers for COVID-19 vaccination and capture the factors which determine WTV in the context of a vaccine-friendly LMIC, with a focus on governance-related aspects. Second, we use random sampling to obtain representative estimates through three surveys conducted over key event periods, from late January to early September 2021. Third, we present disaggregated results for the population's vulnerable rural and urban slum segments, which may help determine the need for more targeted immunization policies. Finally, rather than limiting our analysis to WTV and its associated factors, we offer detailed practical insights into the registration and take-up decision-making processes from the early stages of an immunization programme in an LMIC.

3 | METHODOLOGY

The background information on COVID-19 vaccination in Bangladesh, as discussed in Section 1, continued up to March 31, 2021, and serves as the foundation for understanding why we decided to conduct a survey early this year and the various aspects of COVID-19 vaccination later, in line with the survey findings. This was done with the help of media tracking, where the major updates were collated from the available published material on various media and news sources.

The empirical analysis is based on three telephone surveys. The first two surveys took place between January and March 2021—capturing the preliminary stages of the vaccination programme—and the last was conducted in September 2021. An overview of the sampling strategies pursued by the surveys is presented below.

The study uses three samples from three telephone surveys. The first is the State of Governance Bangladesh 2021 (SOG'21) survey (Hassan et al., 2021), denoted as Feb'21 in the discussions. The telephone survey of SOG'21 includes three sampling frames (from three existing BIGD survey samples), but we focus primarily on the main one as discussed below. By the time we started our first survey, the vaccines had arrived in the country two days earlier, as shown in Figure 2. *Our first survey, in effect, captured the public perception from the arrival of the vaccine right up to the early days of the mass immunization programme.* The second and third surveys considered used the rural and urban slum samples of the third and fourth phases of the study "PPRC BIGD COVID-19 Livelihoods & Recovery Panel Survey," denoted here as LSR3'21 and LSR4'21, respectively (Rahman et al., 2022). They are referred to as Mar'21 and Sep'21 in the discussions. The second survey considered in the paper, LSR3'21, began on March 10, 2021 (see Figure 2). *The vaccination programme was a month old by then, thus allowing us to study the registration and compliance aspects, which was the focus of this survey regarding vaccination. The follow-up survey six months later, LSR4'21, allows us to study the vaccination uptake after some significant policy changes.* Table A1 summarizes the key figures for these surveys.

¹"eHealth literacy" means "the ability to seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained to addressing or solving a health problem" as defined by Norman and Skinner (2006).

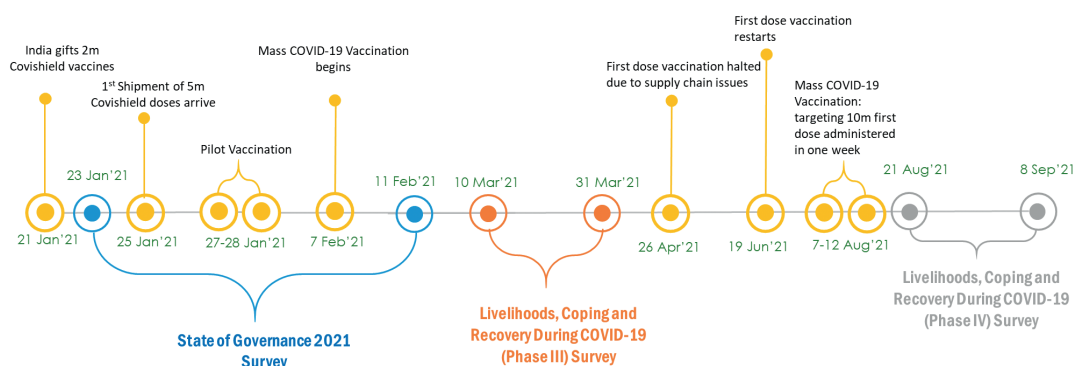


FIGURE 2 Survey Timeline and COVID-19 Vaccination Major Events Sources: *The Daily Star*, January 25, 2021 ("India to gift Bangladesh," 2021); *Dhaka Tribune*, January 25, 2021 ("5 million COVID-19 vaccine doses," 2021); *Prothom Alo*, January 27, 2021 ("Bangladesh launches vaccination campaign as nurse Runu takes first shot," 2021), *Dhaka Tribune*, April 25, 2021 ("For now, Bangladesh stopping," 2021), *Prothom Alo*, 2021, June 14 ("Vaccinating to restart," 2021), *The Business Standard*, August 3, 2021 (Tajmim, 2021).

The SOG'21 survey took place from January 23 to February 11, 2021. We collected data on the perceptions of Bangladeshis regarding their WTV for COVID-19 and factors that may have contributed to forming those decisions. This survey constituted three sampling frames—a general sample of the adult population, the youth, and an urban slum sample. For this article, we mainly use the general sample and, in some instances, the urban slum sample.

The general sample is nationally representative—drawn from the study "The State of Bangladesh's Political Governance, Development, and Society: According to its Citizens: A Survey of the Bangladeshi People 2019 Edition" sample (Hassan et al., 2020; Hassan et al., 2021). Any adult (aged 18 years or above) from the household, not necessarily the household head, could participate in the telephone survey for the general sample of this survey. The general sample is disaggregated at the rural–urban level approximately (76%–24%) in line with the national rural–urban disaggregation level of 75%–25% of the main survey. However, the male–female distribution (60%–40%) is not disaggregated equally in the general sample as it was in the previous survey (Hassan et al., 2021).

The urban slum sample of SOG'21 was drawn from the Urban Development Programme (UDP) 2016 (BRAC, 2018). The urban slum sample is restricted to adults who were 18 years or above here.

The second survey uses the urban slum and nationally representative rural samples from LSR3'21 to analyse the vaccination registration aspect. In this case, a telephone survey was conducted from March 10 to March 31, 2021. The sampling strategy is extracted from the Phase-II study of "PPRC BIGD COVID-19 Livelihoods & Recovery Panel Survey" (Rahman et al., 2020). In the third phase, namely LSR3'21, the response rate was around 80% of the total respondents from the second phase, interviewing 6099 respondents. In LSR3'21, the household heads were the default respondents; however, if unavailable, the second income earner or the spouse was considered for the survey. This meant that gender balance could not be achieved in this sample, as household heads in a patriarchal society like Bangladesh tend to be male; women constituted 14% of the respondents, which is slightly higher than the national average of 13% (Bangladesh Bureau of Statistics, 2019), so the sample was representative of female-headed households.

Lastly, in LSR4'21 (Rahman et al., 2022), the sampling strategy employed is the same as LSR3'21 by (Rahman et al., 2021). The successful 6099 respondents of the third round were the sample for this fourth round. Although a household-level panel was consequently formed between the two rounds, we were able to keep the individual respondents the same in 97% of the successful 4872 surveys. This survey was conducted by telephone from August 21 to September 8, 2021. Survey weights had been applied to both LSR3'21 and LSR4'21 to ensure representativeness (Rahman et al., 2021; Rahman et al., 2022). Again, since this is a household-level panel and heads were the preferred respondents, gender balance could not be achieved. However, a head's decisions and behaviour tend to

reflect and be influential for other household members; thus, the analysis is helpful in that regard. In this round, 18% of the respondents were women (Rahman et al., 2022).

All three surveys drew samples from in-person surveys conducted before the pandemic, where telephone numbers had been collected (Hassan et al., 2020; Rahman et al., 2021). Standard limitations of telephone surveys apply here. SOG'21 could not achieve a 50/50 gender balance, unlike its first round, which was in-person, possibly due to lower ownership and access to mobile phones among women due to prevailing gender norms. For the last two surveys, as heads were targeted, women were more likely to possess phones in Bangladesh, but female respondents still tended to report not owning the phone number. There was a gender difference in ownership of two percentage points (pp) in LSR3'21 and 5 pp in LSR4'21.

4 | THE ROLE OF GOVERNANCE IN WILLINGNESS TO BE VACCINATED

4.1 | Descriptive analysis

This analysis of WTV uses the SOG'21 survey to understand demand-side perceptions of the COVID-19 vaccine. The nationally representative general sample is examined to assess the respondents' WTV across various demographic and governance dimensions, emphasizing the latter to determine the role of public trust in WTV. The results reflect WTV during an eventful period in the course of the COVID-19 vaccination in Bangladesh, specifically from late January to early February 2021.

The respondents' willingness to vaccinate, if the COVID-19 vaccine was made available, was termed the willingness to be vaccinated (WTV). From Figure 3, we see a generally high level of WTV in the sample, with 82% definitely or probably willing. More respondents were willing with certainty than with some hesitancy. The former can be termed leaders or early adopters, and the latter early followers. We also did a comparative assessment of WTV between the overall urban sample from the general sampling frame and the urban slum sample, and found the differences to not be significant, with $\chi^2(1) = 1.980$, $p\text{-value} = 0.1594$.

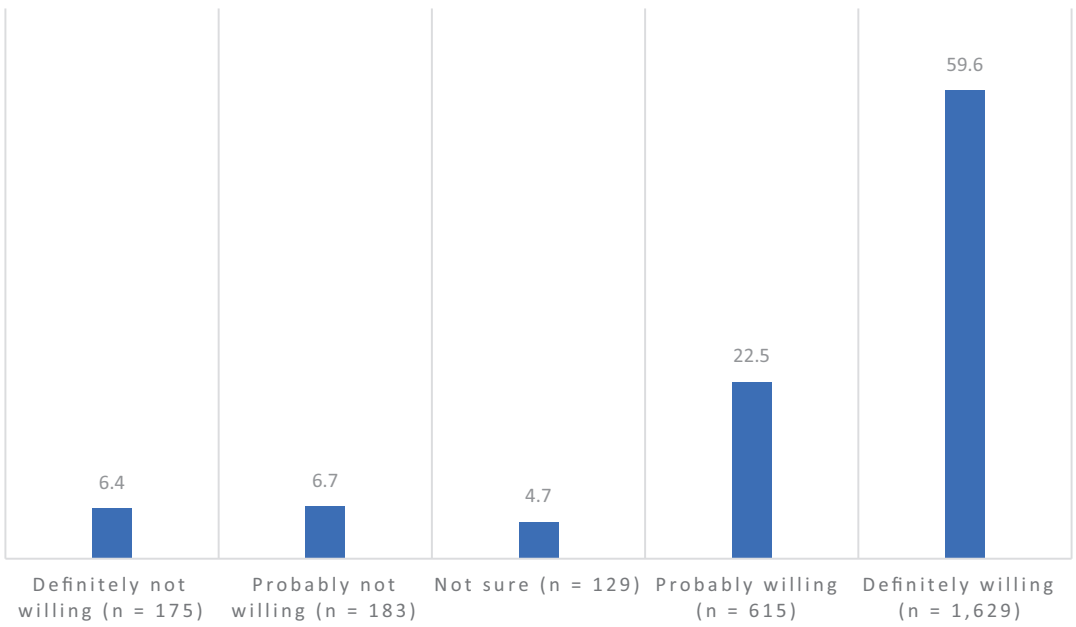


FIGURE 3 Willingness to be vaccinated (WTV) (n = 2731) Source: SOG'21.

TABLE 1 Reasons for not wanting to be vaccinated

Reason	% of respondents			$\chi^2(1)$
	Definitely not willing	Probably not willing	Total	
No need	55.4	39.3	47.2	9.286*
No trust in vaccine	33.1	29.5	31.3	0.550
Not sure of the effectiveness	27.4	31.2	29.3	0.597
Fear of side effects, such as fever, pain, etc.	26.3	30.1	28.2	0.627
Religious beliefs	25.7	15.3	20.4	5.976
Not sure of safety	14.9	20.2	17.6	1.773
Cannot afford	0.6	11.5	6.2	18.441***
No trust in government	4.6	2.7	3.6	0.865
Other(s)	2.9	1.6	2.2	0.607
<i>n</i>	175	183	358	

Notes: Pearson $\chi^2(1)$ with Bonferroni-adjusted *p*-values. * *p* < 0.05, ** *p* < 0.01, *** *p* < 0.001. Multiple responses were allowed.
Source: SOG'21.

In a multiple-response question, the unwilling and probably unwilling respondents were asked to state their reason(s) (Table 1). Overall, nearly half of the respondents did not perceive the vaccine as necessary, followed by distrust in the vaccine, concerns regarding its effectiveness, and fear of side effects. Moreover, those definitely not willing feel the lack of necessity of the vaccine proportionately more, while those probably unwilling tend to think they cannot afford the vaccine. When compared to the reasons stated by urban respondents in the SOG'21 general sample, it was found that a significantly higher proportion of slum respondents who were unwilling did not feel the need for the vaccine (75% in urban slums vs 45% in overall urban).

We considered several governance-related indicators to assess whether there is any linkage between WTV and public trust. The first two focused on the perceptions of relief operations during the pandemic. Sixty-eight per cent of respondents thought there were some irregularities in the relief distribution. The rural–urban distribution was almost symmetrical, except that more rural respondents reported they do not know (9% in rural vs 4% in urban), and a higher proportion of urban dwellers thought there were some irregularities involved (66% in rural vs 73% in urban). Figure 4 shows a significant negative relation between the perceived degree of irregularities and WTV for both rural and urban regions. However, for those viewing the process as having many irregularities, urban dwellers are more averse to vaccination than their rural counterparts—59% of urban dwellers who thought the distribution had many irregularities were definitely or probably willing, vs 77% for rural.

Most respondents (58%) reported being mostly satisfied with the relief operation and 11% were very satisfied, 24% were mostly unsatisfied, and 7% were not at all satisfied. From Figure 5, we notice a significant positive association between the level of satisfaction and WTV. However, dissatisfied urban dwellers are somewhat less willing than their rural counterparts (Table A2).

The respondents were also asked to evaluate the government's response to managing the COVID-19 crisis, of whom 54% thought its response to crisis management was somewhat effective, followed by 36% thinking it was effective. Only about 6% thought it was not very effective, whereas 4% said they did not know; respondents not commenting or thinking it was entirely ineffective each constituted less than 1%. Rural respondents were more likely to report they do not know (4% in rural vs 2% in urban), while those in the urban area were more likely to report it as not very effective more (5% in rural vs 8% in urban). In Figure 6, as the degree of perceived effectiveness falls, WTV falls—the fall is much greater in the urban sample than rural (not shown), which is expected given a slightly larger correlation coefficient for the urban sample in Table A2.

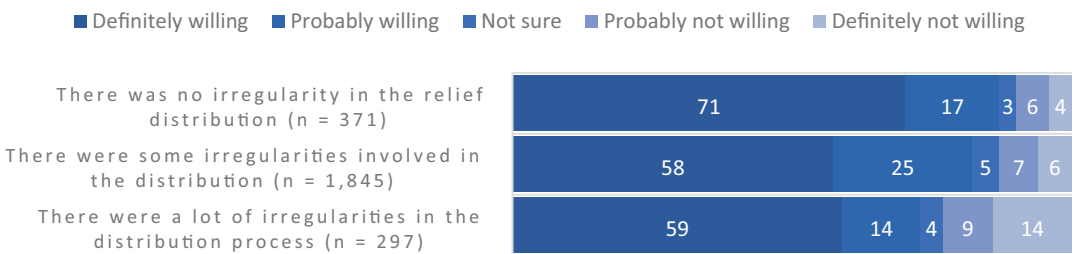


FIGURE 4 WTV by perceived irregularities in relief distribution (n = 2513) *Note:* Respondents reporting “Don’t know” (n = 218) not included here. *Source:* SOG’21.

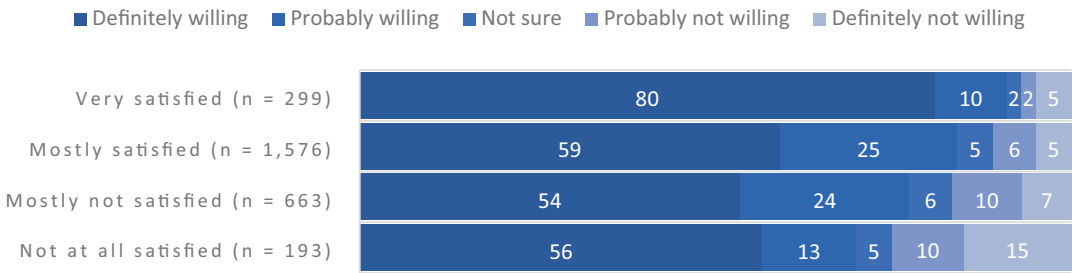


FIGURE 5 WTV by level of satisfaction with the relief operation (n = 2731) *Source:* SOG’21.

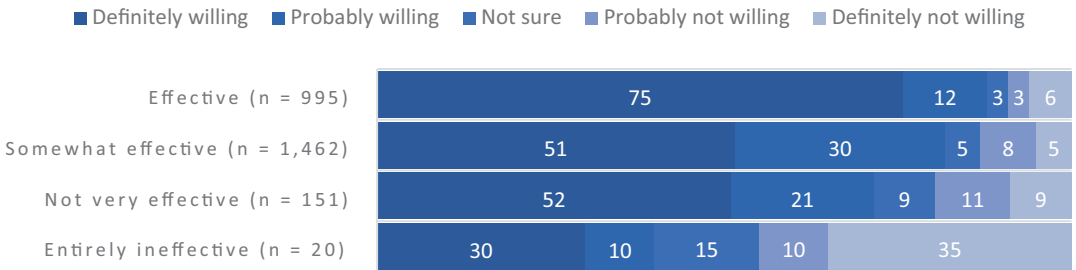


FIGURE 6 WTV by perceived effectiveness of the government’s response (n = 2628) *Note:* Respondents reporting “don’t know/no comment” (n = 103) not included here. *Source:* SOG’21.

Finally, we asked respondents how confident they were regarding the efficiency of the COVID-19 vaccine distribution in Bangladesh. Seventy-six per cent were either very confident or moderately confident, and there is not much difference in the rural and urban distribution. In Figure 7, there is a significant positive linkage between the degree of confidence and WTV. The urban rise in WTV due to higher confidence is lower than the rural increase, as shown by the smaller urban correlation coefficient in Table A2.

The confidence regarding the success of vaccine distribution in Bangladesh among urban slum residents is also worth exploring. As shown in Figure 8, respondents with extreme views at both ends of the spectrum are proportionately higher in urban slums, and in-between cases are higher among the overall urban sample, and the difference was significant, with $\chi^2(1) = 8.149$, $p\text{-value} = 0.0043$.

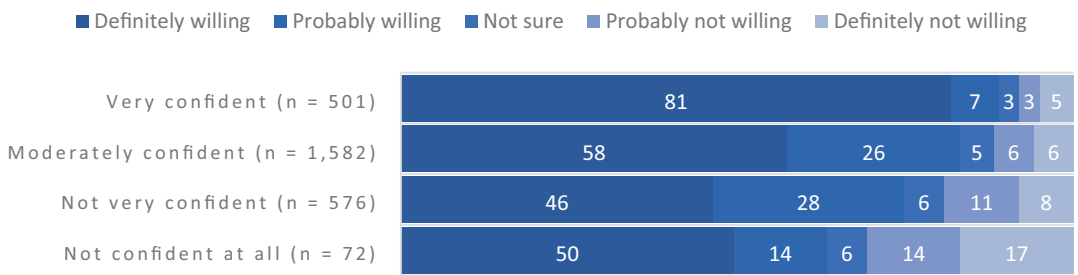


FIGURE 7 WTV by confidence in efficiency of COVID-19 vaccine distribution & locality (n = 2731) *Source:* SOG'21.

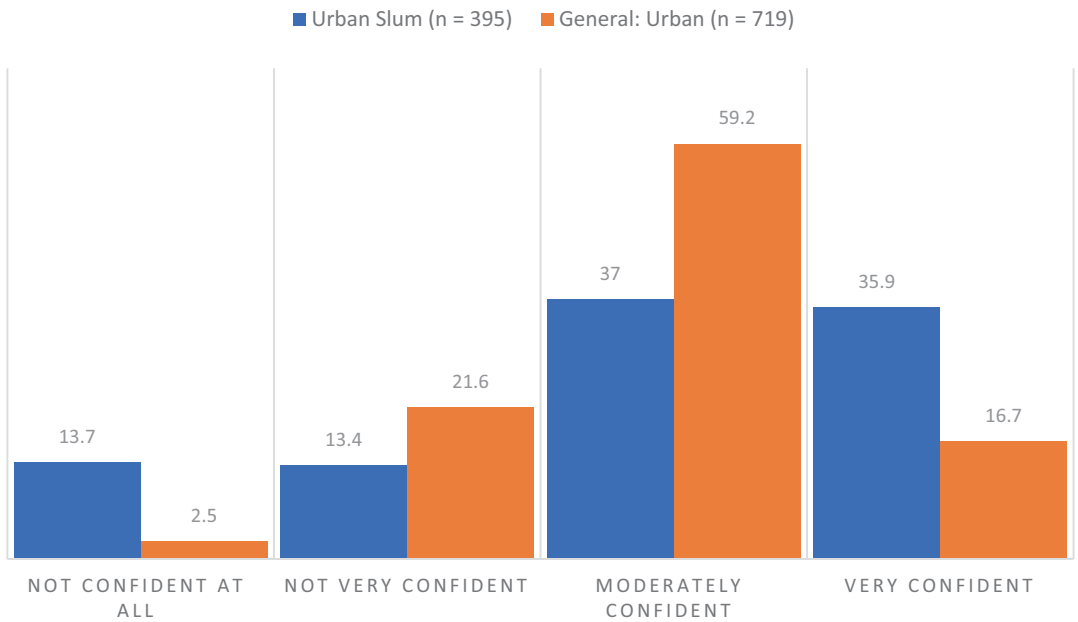


FIGURE 8 Confidence in efficiency of COVID-19 vaccine distribution, SOG'21: General: Urban (n = 719) vs. Urban Slum (n = 395) *Source:* SOG'21.

4.2 | Empirical analysis

Next, we perform a regression analysis for WTV using independent variables across four broad dimensions: regional, demographic, general COVID-19 factors, and governance-related COVID-19 factors. We use the 5-point scale WTV as our dependent variable in a heterogeneous choice model.² Only the independent variables which were found to have a significant relationship with WTV at $p < 0.10$ (see Table A2) are considered. Upon observing the significant gender effect on WTV in the rural sample, we added an interaction term for locality and gender in our model.

²We began by estimating an ordinal logit model and the Brant test showed that the parallel odds assumption had been violated by seven out of 11 variables, which might occur in the presence of heterogeneity. This, together with the other appealing features described in Williams (2009), compels us to estimate the heterogeneous choice model instead of an ordinal logit model.

The raw coefficients from the regression are presented in Table A3. The interaction term was found to be insignificant. Stepwise selection led the variables' perceived health risk to self and perceived irregularities in the relief operation to be included in the variance equation, and these variables are significant in both the choice and variance equations. The positive effect in the variance equation implies that those having a lower self-assessment of personal health risk are less variable in their views regarding WTV and vice versa; similarly, those viewing the relief operation as having fewer irregularities exhibit less conflicted opinions on WTV.

Table A4 reports the average marginal effects (AMEs) from the regression. An increase in perceived health risk to self significantly increases the probability of definitely not willing and definitely willing by 1.7 pp and 4.7 pp, respectively, and decreases the probability of others. This reflects the significant variability in opinions we noted above for this variable. Increases in the preferred stringency of lockdown, perceived effectiveness of GoB's response to the COVID-19 crisis management, and confidence in the vaccine distribution efficiency significantly improves the probability of definitely willing on average by 6.6 pp, 7.8 pp, and 11.35 pp, respectively, but reduces the probability of other outcomes. Thus, greater public trust and satisfaction in the public service delivery system can be said to have a positive effect on being certainly willing to be vaccinated.

5 | REGISTRATION BEHAVIOUR AND PRACTICES IN RURAL REGIONS AND URBAN SLUMS

Here we present the findings regarding the behavioural aspect of COVID-19 vaccination based on registration and compliance-related data collected in the rural regions and urban slum samples of LSR3'21 and LSR4'21. While the previous analysis dealt with expressed behaviour, this looks into the realized behaviour and other practical issues associated with the vaccination process. A summary of the vaccination decision process is presented in Figure 9, using the LSR3'21 data. The remainder of this analysis will focus on various aspects of this decision tree, namely registration knowledge, registration action, and compliance—at first, using the LSR3'21 data for one month after the launch of the programme, and then in the end based on the LSR4'21 data which depicts the situation about six months after that.

5.1 | Knowledge about COVID-19 registration

As shown in Figure 9, unfortunately about one-third in both rural and urban slum regions had heard nothing about the vaccination registration even a month after the launch of the vaccination programme, with the rate being higher in urban slums. This highlights a possible benefit of the greater access to information prevalent in urban regions. Relatively more men (67%)³ had heard about the COVID-19 registration than women (54%) in both areas area categories. Among the eligible age group during the survey period (40 years and above), 34% had not heard about the registration.

We asked the informed respondents regarding their sources of information in a multiple-response question. The most common sources of information were relatives, friends, and neighbours, with about 80% of respondents citing these in both samples. This was followed by TV and radio in both areas (60% in rural areas and 68% in urban slums). The remaining sources were reported by less than 20% of respondents. Therefore, social networks and mass media played a significant role in disseminating information and encouraging rural and urban slum residents to be immunized. Since less than 10% of respondents stated social media platforms as a source of information, this suggests that rural area and urban slum residents still resort to the traditional media for news rather than digital platforms.

The respondents who knew were then asked about their demand for information regarding the COVID-19 vaccination in yet another multiple-response question. The two most common responses were that they either do not

³The discussion extensively used combined figures for rural and urban slum residents, unless otherwise stated.

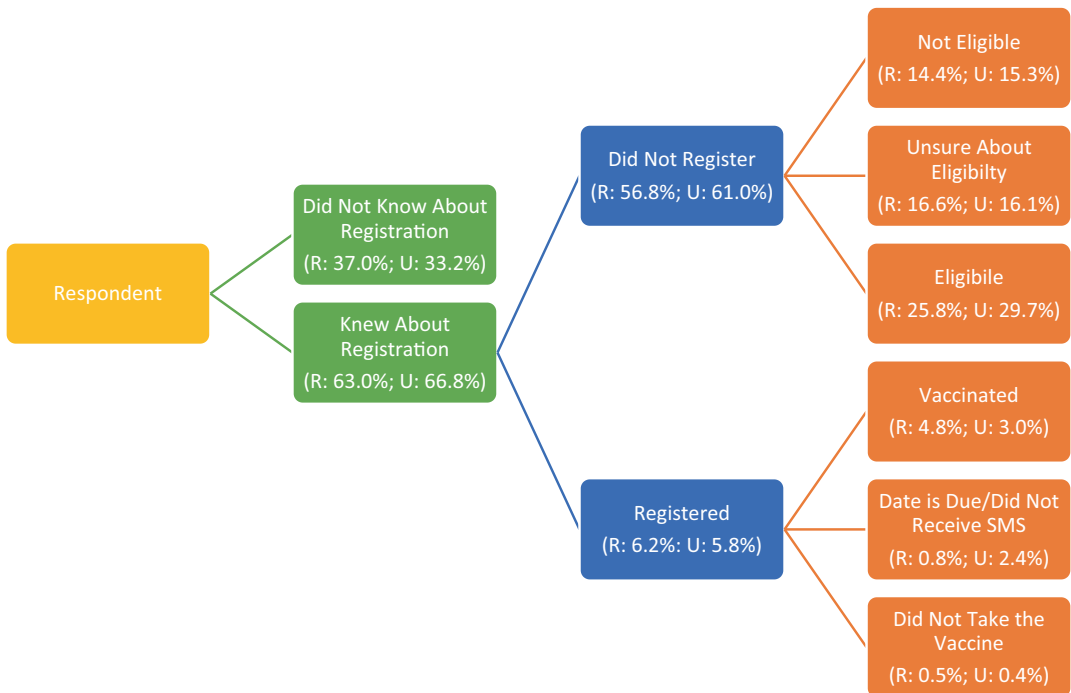


FIGURE 9 Decision tree of vaccination ($n_R = 2710$; $n_U = 3389$) Note: R denotes rural and U denotes urban slum. Source: LSR3'21.

need or are uninterested (approximately 40%) or wanted to know details about how to register for the vaccine (about 40%). The former response was significantly higher among rural respondents (42% in rural areas vs 37% in urban slums). While both responses are worrying, the latter highlights that respondents did not know the details of the registration process despite having heard of it. Other information respondents sought included the venue for vaccination (28%) and whether there would be a fee (20%).

5.2 | COVID-19 vaccination registration status

Around 59% of the respondents did not register despite knowing about it (Figure 9). Only 6% of the total respondents registered for vaccination, and 9% of those within the eligible age range. In rural areas, more men than women had registered (6.9% men vs 2.2% women), but men were also more likely to be unsure about their eligibility. Thus, although there were fewer rural women who might not have heard about vaccine registration, those who have heard are indeed well informed as opposed to their counterparts. Among those who knew, around 25% in each area did not register due to being unsure about eligibility.

We also disaggregated the self-reported eligible respondents in both areas by their pre-pandemic poverty status (see Figure 10). The extreme and moderate poor were more likely to not register despite being eligible.

Most respondents registered online with the help of an acquaintance or went to a shop to get registered, as seen in Figure 11, meaning that most of the registrations in both regions were completed with the help of others. This could be explained by the fact that the COVID-19 registration has been online, so the rural and urban slum respondents required assistance to register, possibly due to a lack of digital literacy. This has a direct, but also indirect, cost in creating constraints for the poor, the illiterate, and women. When designing the vaccination campaign and support, these equity considerations should be considered.

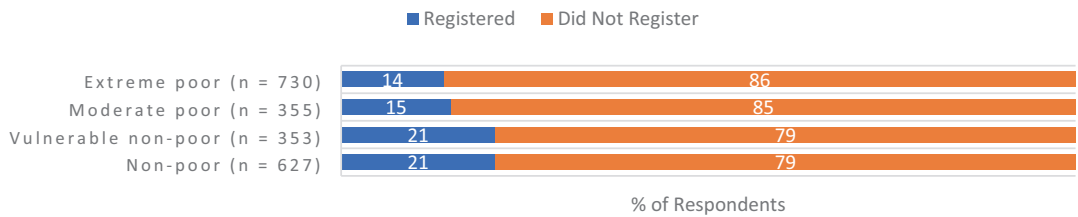


FIGURE 10 Registration rate in Mar'21 by poverty status in Feb'20 (pre-COVID) Notes: Only self-reported eligible respondents who had heard about the registration are included here. Does not cover urban non-slum areas. The poverty status calculation details are available in Rahman et al. (2021). Source: LSR3'21.

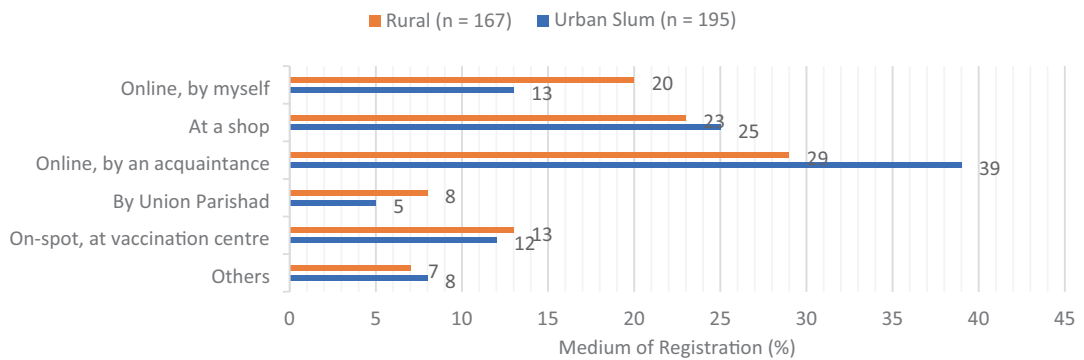


FIGURE 11 Medium of registration by locality in Mar'21 (if registered) Note: Only those who had registered were asked this question. Source: LSR3'21.

As shown in Figure 9, some of those who did not register (despite knowing about vaccination) were unsure of their eligibility, but most were aware of their eligibility status. The main reasons among the self-reported eligible respondents for not registering are lack of interest, inability to manage time, not knowing how to register or who to ask for help, and concerns about side effects (Table 2).⁴ The lack of interest is significantly higher among the urban slum dwellers.

5.3 | Vaccine compliance

This subsection focuses on those who had completed their registrations, i.e. the 6% of respondents who had registered (see Figure 9). An overall high level of compliance can be observed among them (about 90%) in both rural and urban slum regions, once we exclude those who registered but had not yet received their SMS (n = 98) or whose date is due (n = 7).

Additionally, most of those who took vaccines in both localities mentioned the role of their social networks—family, friends, co-workers, relatives, and neighbours—in motivating them (Figure 12). Thus, once again, the role of social networks has proved instrumental in vaccination. Moreover, the influence of friends and occupation networks has been greater than family members and/or relatives, which may have some connection with livelihoods.

⁴These are the group of respondents who were eligible and knew they were so but did not register as per Figure 10.

TABLE 2 Reasons for not registering by locality in Mar'21 (if eligible but not registered)

Reason	% of respondents		
	Rural	Urban slum	$\chi^2(1)$
Uninterested to take vaccine	29.9	38.2	12.402**
Could not manage time	27.1	27.0	0.003
Do not know how to register	21.4	19.8	0.605
Do not know who to ask to get registered	15.6	14.3	0.540
Will get sick if got vaccinated	11.6	15.4	5.031
Vaccination centre is very far	8.3	4.7	9.396*
There is no Corona any more	3.2	3.9	0.633
Have other health complications	3.4	3.1	0.165
Poor people will not receive vaccines	4.9	2.1	10.197*
Saw negative information on social media	1.4	2.7	3.047
Family and others told not to (societal and religious pressure)	0.9	2.0	3.501
Do not have any device (mobile/PC/laptop) to get registered	1.6	1.4	0.095
Will not take Indian vaccine	1.3	1.3	0.000
Tried to register but facing problems with registration form	1.2	1.0	0.090
Do not have NID	0.1	0.5	1.472
Doctor told not to	0.4	0.1	1.918
Other(s)	7.5	4.7	5.786
N	698	1005	

Notes: Pearson $\chi^2(1)$ with Bonferroni-adjusted p -values. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Multiple responses were allowed.

Source: LSR3'21.

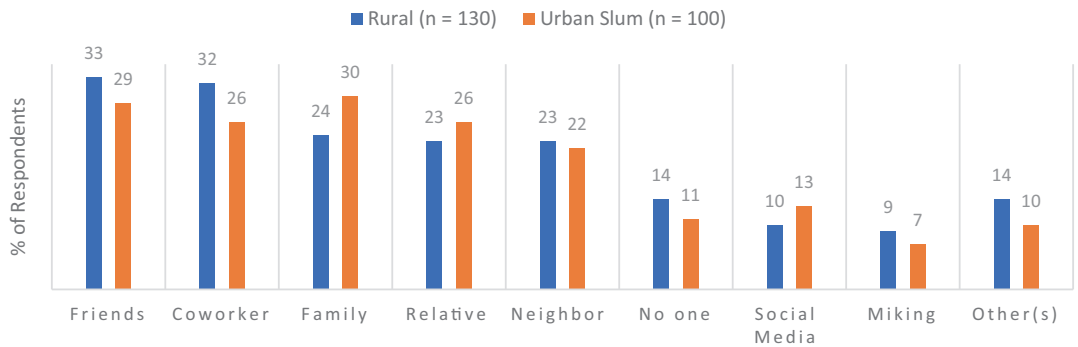


FIGURE 12 Source of influence to be vaccinated in Mar'21 (if vaccinated) Note: Only those who got vaccinated were asked this question. Multiple responses were allowed. Source: LSR3'21.

5.4 | Aftermath

As highlighted in Figure 2, the period between LSR3'21 and LSR4'21 witnessed some critical developments in the programme. Immediately one month after completion of LSR3'21 in March 2021, GoB halted the administration of the first dose owing to supply shortages (Islam, 2021), which did not resume until about two months later in June 2021 ("Vaccinating to restart," 2021).

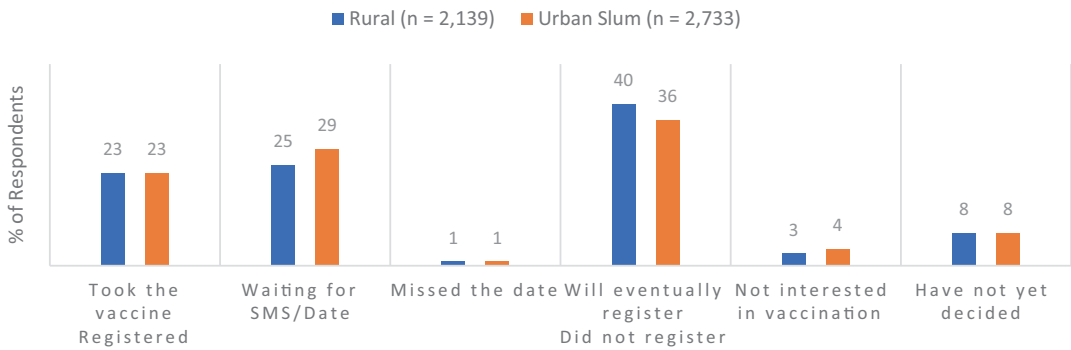


FIGURE 13 Vaccine registration and compliance by locality in Sep'21 *Note:* The vaccine take-up can be either only the first dose or double-dose. *Source:* LSR4'21.

From August 7–12, 2021, GoB launched a mass vaccination programme targeting 10 million people in one week (Tajmim, 2021), and planned different measures to achieve this, which is reflected by the spike shown in Figure 1. BRAC, a non-governmental organization (NGO), has partnered with the GoB to administer vaccination in many areas of the capital since August 8, 2021 to increase vaccine uptake (“BRAC partners with govt's COVID-19 vaccination drive,” 2021). On August 10, 2021, the GoB lowered the eligibility limit to 18 years to accelerate the vaccination rate; down from 40 years in February (Sakib, 2021) and offered walk-in registration facilities (Hasan, 2021),⁵ an alternative to online registration. This plan, which allows students over 18 years old to be immunized, would allow the educational institutions to reopen swiftly (Sakib, 2021). As a result of these policy changes, the daily number of vaccines administered rose sharply. According to the Directorate General of Health Services (DGHS, n.d.) data for 2021, about 10 million persons had received the first dose by August 5, 2021; by the end of the week-long mass vaccination programme coupled with lower age floor and option for walk-in registration, the figure reached around 15 million on August 12, 2021.

Arguably, the increase in registration and immunization demonstrates the efficiency of mass campaigning and the start of vaccine administration at the country's union levels.⁶ A unique vaccination campaign was carried out in several rural and hard-to-reach areas, with booths at union levels to make vaccines more available to locals and avoid undesirable situations (overcrowding) in existing vaccination sites (Hasan, 2021). The campaign further, to some extent, addressed the registration knowledge gap we identified back in March.

The subsequent policy changes and rise in vaccine uptake reiterate a few important points we already found in our March 2021 survey: (1) willingness is not a significant issue in Bangladesh; (2) once the information gap is addressed by campaigning, registration and take-up rise; and (3) online registration needs to be complemented with other options to ensure uptake by all sectors of the population, as many reported not knowing how to register (Table 2) and many registrations were made with the help of others (Figure 11).

These developments are also reflected in our data collected between late August 2021 and early September 2021 (Rahman et al., 2022). When we contacted the same sample as in March 2021, we found that the registration rate had gone up by 43 pp and 47 pp in rural and urban slum areas, respectively (Figure 13). Only a negligible proportion was uninterested in vaccination. Among the registered, if we exclude those awaiting SMS/date, 96% had taken the vaccine—again, indicating high compliance once registered. The vaccination rate of 23% in our sample is higher than the national rate of 11.66% (as of September 8, 2021), this is owing to our respondent profile: household heads being the default respondent

⁵For the walk-in registration, the person needs to bring their National Identification (NID) card.

⁶Unions (or union councils) are the smallest local (rural) administrative units in Bangladesh.

resulted in an older sample with a median age of 40 years and also a male-dominated one (82%).⁷ This, in turn, indicates the connection between vaccination and livelihood, as household heads are usually the primary income earners.

6 | CONCLUDING REMARKS

This article has offered a narrative of events surrounding the COVID-19 vaccination programme in Bangladesh, highlighting underlying factors that may have influenced the population's WTV in early February 2021 and the role of perceptions regarding trust and confidence in that. The practical features of the immunization process—registration and vaccination—in the early stage of the programme for rural and urban slum regions were discussed, employing two surveys conducted in March 2021 and September 2021. Insights from the study could help other LMICs draw lessons from the initial demand-side challenges, as some nations are still struggling with low vaccination rates even in 2022, such as some African nations suffering from relatively high hesitancy (Obiezu, 2022; Rich, 2022). Masses of unvaccinated populations threaten global and not just national immunity.

So far, the GoB has adapted to local developments, as demonstrated by lowering the age limit to 40 years, bringing in teachers under the first phase, and conducting mass vaccination drives. Leaving aside issues of supply, like procurement and vaccination distribution equality, our analysis focused on demand-side constraints at an early programme stage in an LMIC like Bangladesh, where willingness is not an issue. Several demand-side challenges have been identified: ensuring vaccine uptake by increasing registration rates, addressing the gender gap in vaccine registration knowledge and completion, communicating the need for vaccination and details of the eligibility status and registration process, and tackling misconceptions and mistrust. These are similar challenges faced by nations still struggling to immunize a significant proportion of their population. Yet, as we also saw in our survey six months later, the vaccination rate has improved in Bangladesh: as of February 27, 2022, GoB successfully administered the first dose to 72% of the total population and 102% of the initial targeted population (DGHS, n.d.). Thus, the setting was conducive to drawing practical insights that could assist other LMICs.

We found that confidence in public service delivery influences vaccination intent positively; hence, ensuring and sustaining service quality will be beneficial. In the nationally representative sample, the following subgroups were more inclined to be vaccinated at the outset: those with a greater perceived health risk to self, preferring the stringency of lockdown, having higher perceived effectiveness of the GoB's response to the COVID-19 crisis management, and exhibiting greater confidence in the vaccine distribution efficiency. The issue of public trust is reflected in the slum dwellers' WTV: they exhibited more polarized views regarding confidence in the efficiency of vaccine distribution than the urban respondents. Therefore, ensuring no disruption is imperative for a smooth immunization programme to gain public confidence. This process requires adequate training and infrastructure. Besides, equity in terms of distribution to create and maintain public goodwill should be emphasized by the efficient distribution among all the targeted people in different phases, as we found poor and marginalized households tended to have lower vaccination rates. This was partly attempted in Bangladesh by the mass walk-in vaccination drives.

The most common reason for being unwilling to be vaccinated at an early stage was the perceived lack of necessity, followed by distrust in the vaccine, concerns regarding effectiveness, and fear of side effects—in line with studies from other LMICs on hesitancy. The vulnerable urban slum population tended to cite the lack of necessity more than the overall urban population. Public health communication strategies are thus crucial to inform the public at the early stage, which should include raising awareness about the health risks of the virus and the need for the vaccine and its effectiveness and safety; restoring faith in vaccine distribution efficiency; and providing information about registration eligibility and step-by-step registration instructions—as we observed knowledge gaps regarding the registration process. Mobile messages from the government to inform people about the registration should be sent as well as

⁷Among those vaccinated nationally, the gender gap was apparent back then: 57% were men as of September 18, 2021, as per DGHS (n.d.), but this has disappeared as of March 27, 2022.

reminders on taking the vaccine doses if registered. In places of worship, the religious leaders could be involved in encouraging the general population to register for vaccines and dispel any religious concerns. Social media platforms could play the same role. Safety regulations should be in place to follow up on any post-vaccination side effects. It should be noted that the credibility of such campaigns run by the government is also tied to its perception of trust among the citizens, so both must go hand-in-hand.

The weak link we found was getting individuals to register for vaccination, because compliance was very high once they did. Low-tech intensive registration methods, such as walk-in registrations, are also necessary for LMICs like Bangladesh, where only 16% use the internet in rural regions (Rabbani et al., 2020). Information campaigns about the registration procedure should specifically target the rural communities and women, as the daily national vaccination data initially showed the gender gap, as well as in internet usage in rural regions previously—20% of men use the internet against only 12% of women (Rabbani et al., 2020). This also meant that, until walk-in registration was introduced, the digitally illiterate had to ensure they were accompanied by someone who could open the appointment SMS sent after electronic registration for verification purposes at the vaccination centres. If the helper was employed, for example, their availability depended on being able to get a day off work. Thus, countries with low digital literacy should introduce alternative modes of registration from the outset to ensure maximum coverage and reduce complexity. LMICs such as Nigeria had also introduced electronic registration at first but faced various management challenges (Adepoju, 2021).

Vaccination centres need to be increased as time management and distance should not be an issue in being vaccinated—especially as we observed this to be an issue in rural areas. For hard-to-reach areas, village visits by the community health service teams would be particularly effective. There are certain places where mobile and other network forms could be an issue. This is where community-based mechanisms and alternatives such as “pop-up” vaccination booths become vital in reaching marginalized communities. Union-level engagement in Bangladesh highlighted the importance of community-based mechanisms, solving both trust and transaction cost problems, which are prevalent in, for example, urban slums. Partnership with NGOs and other development organizations might be fruitful, as was the case in Bangladesh.

Since we found that social networks—friends, family members, and colleagues—are a valuable source of knowledge and encouragement to be vaccinated, building the notion of “vaccinated status” might be effective. This could work as a signal to motivate others in the surrounding directly or indirectly to take vaccines and reflect their concerns for the society. In the past, Karing (2021) examined social signalling in the context of child immunization in Sierra Leone and observed signalling “vaccinated status” with low-cost signals could effectively stimulate increased vaccination uptake. Employers could mandate the requirement of vaccination as there was a possible linkage identified with livelihood among the household heads.

Our ability to combat this pandemic will be determined by how swiftly we can immunize the targeted 80% of the population globally. If policy-makers address both supply and demand aspects of the immunization programme, the goal can be achieved. Learnings from our findings have far-reaching consequences beyond Bangladesh's borders in other LMICs with similar constraints, particularly in countries struggling with sluggish vaccination uptake. Vaccine wastage (expired or destroyed) was shown in the report (Mwai, 2021; Obiezu, 2022), illustrating widespread vaccine apprehension besides infrastructural barriers. Thus, governments of other LMICs could use similar strategies to ensure a high coverage rate from the outset of their mass immunization programmes, not just for COVID-19.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from BRAC Institute of Governance and Development (BIGD), BRAC University. Restrictions apply to the availability of these data, which were used for this study. Data are available from the authors subject to the permission of BRAC Institute of Governance and Development (BIGD), BRAC University.

ORCID

Avinno Faruk  <https://orcid.org/0000-0002-4448-8496>

Ishmam Al Quddus  <https://orcid.org/0000-0002-5117-7047>

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APPENDIX A

TABLE A1 Sampling summary

Survey	Sample	List	Approached	Surveyed	Response rate (%)	Final sample ^a
SOG'21	General	3856	3856	2751	71.34	2731
	Urban Slum	1200	947	501	33.17	395
LSR3'21	Rural	3360	3360	2710	80.65	2710
	Urban Slum	4277	4277	3389	79.23	3389
LSR4'21	Rural	2710	2710	2139	78.93	2139
	Urban Slum	3389	3389	2733	80.67	2733

Note: ^aAfter accounting for sampling error.

TABLE A2 Summary results of non-parametric tests for comparisons with WTV: SOG'21 general

Variable	Locality	Test statistic	p-value
Locality		$H(1) = 3.373$	$p < 0.10$
Gender		$H(1) = 1.274$	Ns
Gender	Rural	$H(1) = 4.033$	$p < 0.05$
Gender	Urban	$H(1) = 1.201$	Ns
Age group		$r_s = -0.0004$	Ns
Age group	Rural	$r_s = 0.0094$	Ns
Age group	Urban	$r_s = -0.0311$	Ns
Educational attainment		$r_s = 0.0222$	Ns
Primary occupation		$H(8) = 3.695$	Ns
Perceived health risk to self (1 = Not risky, 4 = Highly risky)		$r_s = 0.2175$	$p < 0.01$
Perceived health risk to family (1 = Not risky, 4 = Highly risky)		$r_s = 0.2139$	$p < 0.01$
Overall perceived impact on life ^a (0 = Least, 10 = Most)		$r_s = 0.1576$	$p < 0.01$
Overall perceived impact on life ^a (0 = Least, 10 = Most)	Rural	$r_s = 0.1775$	$p < 0.01$
Overall perceived impact on life ^a (0 = Least, 10 = Most)	Urban	$r_s = 0.1050$	$p < 0.01$
Lockdown stringency preference (1 = No lockdown, 3 = Strict) ^a		$r_s = 0.1865$	$p < 0.01$
Lockdown stringency preference (1 = No lockdown, 3 = Strict) ^a	Rural	$r_s = 0.1858$	$p < 0.01$
Lockdown stringency preference (1 = No lockdown, 3 = Strict) ^a	Urban	$r_s = 0.2001$	$p < 0.01$
Perceived irregularities in relief distribution ^a		$r_s = -0.0899$	$p < 0.01$
Perceived irregularities in relief distribution ^a	Rural	$r_s = -0.0747$	$p < 0.01$
Perceived irregularities in relief distribution ^a	Urban	$r_s = -0.1318$	$p < 0.01$
Level of satisfaction with the relief operation		$r_s = 0.1330$	$p < 0.01$
Level of satisfaction with the relief operation	Rural	$r_s = 0.1251$	$p < 0.01$
Level of satisfaction with the relief operation	Urban	$r_s = 0.1581$	$p < 0.01$
Perceived effectiveness of the government's response ^a		$r_s = 0.2192$	$p < 0.01$
Perceived effectiveness of the government's response ^a	Rural	$r_s = 0.2133$	$p < 0.01$
Perceived effectiveness of the government's response ^a	Urban	$r_s = 0.2325$	$p < 0.01$
Confidence in efficiency of COVID-19 vaccine distribution		$r_s = 0.2150$	$p < 0.01$
Confidence in efficiency of COVID-19 vaccine distribution	Rural	$r_s = 0.2217$	$p < 0.01$
Confidence in efficiency of COVID-19 vaccine distribution	Urban	$r_s = 0.1984$	$p < 0.01$

Notes: H denotes Kruskal-Wallis H test (Kruskal & Wallis, 1952) while r_s denotes Spearman's Rank-Order Correlation test (Spearman, 1904). ns stands for non-significant at Bonferroni-adjusted $p < 0.10$ to account for multiple testing.

Source: Authors' own calculations from SOG'21.

^aFor Spearman's Rank-Order Correlation test, "Do not know," "No response," "No comment," and/or "Others" answers were set to missing.

TABLE A3 Results from the heteroskedastic ordered logistic regression: SOG'21 general

	Willingness to be vaccinated
<i>Choice</i>	
Rural	0.7202* (0.3088)
Female	0.6386 (0.3896)
Rural # Female	-0.6442 (0.4436)
Perceived health risk to family	-0.1011 (0.3621)
Overall perceived impact on life ^a	0.2694*** (0.0485)
Lockdown stringency preference ^a	0.8142*** (0.1620)
Perceived irregularities in relief distribution ^a	0.6787* (0.2962)
Level of satisfaction with the relief operation	0.3639* (0.1789)
Perceived effectiveness of the government's response ^a	0.9674*** (0.2641)
Confidence in efficiency of COVID-19 vaccine distribution	1.4359*** (0.2390)
<i>Thresholds</i>	
Cutpoint 1	4.1957*** (0.8916)
Cutpoint 2	6.2817*** (1.0058)
Cutpoint 3	7.1856*** (1.0564)
Cutpoint 4	10.3270*** (1.2841)
<i>Variance</i>	
Perceived health risk to self	0.2616*** (0.0303)
Perceived irregularities in relief distribution	0.2517*** (0.0651)
Observations (n)	2277

Notes: Robust standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Source: Authors' own calculations from SOG'21.

^a"Do not know," "No response," "No comment," and/or "Others" answers were set to missing for establishing meaningful relationships and greater interpretability of results, resulting in a lower number of observations.

TABLE A4 Marginal Effects from Heteroskedastic Ordered Logistic Regression

Variables	Definitely not willing	Probably not willing	Not sure	Probably willing	Definitely willing
Locality					
Urban vs. rural	0.0105	0.0101	0.0056	0.0132	-0.0394
p-value	0.0461	0.0481	0.0455	0.0311	0.0382
Std Err	0.0053	0.0051	0.0028	0.0061	0.0190
Gender					
Female vs. male	-0.0039	-0.0037	-0.0020	-0.0047	0.0144
p-value	0.3420	0.3762	0.4060	0.4151	0.3830
Std Err	0.0042	0.0042	0.0024	0.0058	0.0165
Perceived health risk to self					
+1	0.0169	-0.0071	-0.0085	-0.0495	0.0483
p-value	0.0443	0.1699	0.0038	0.0000	0.0416
Std Err	0.0084	0.0052	0.0029	0.0092	0.0237
Perceived health risk to family					
+1	0.0021	0.0021	0.0012	0.0029	-0.0084
p-value	0.7836	0.7824	0.7804	0.7753	0.7800
Std Err	0.0077	0.0078	0.0044	0.0101	0.0300
Overall perceived impact on life ^a					
+1	-0.0053	-0.0054	-0.0032	-0.0082	0.0222
p-value	0.0000	0.0000	0.0000	0.0000	0.0000
Std Err	0.0009	0.0009	0.0006	0.0014	0.0035
Lockdown stringency preference ^a					
+1	-0.0146	-0.0152	-0.0093	-0.0267	0.0659
p-value	0.0000	0.0000	0.0000	0.0000	0.0000
Std Err	0.0025	0.0025	0.0017	0.0052	0.0108
Perceived irregularities in relief distribution ^a					
+1	0.0229	-0.0022	-0.0057	-0.0403	0.0253
p-value	0.0270	0.5980	0.0134	0.0000	0.1583
Std Err	0.0103	0.0041	0.0023	0.0099	0.0179
Level of satisfaction with the relief operation					
+1	-0.0071	-0.0073	-0.0043	-0.0112	0.0299
p-value	0.0331	0.0353	0.0404	0.0553	0.0403
Std Err	0.0033	0.0034	0.0021	0.0059	0.0146
Perceived effectiveness of the government's response ^a					
+1	-0.0169	-0.0177	-0.0109	-0.0323	0.0779
p-value	0.0000	0.0000	0.0000	0.0003	0.0000
Std Err	0.0036	0.0040	0.0026	0.0090	0.0183
Confidence in efficiency of COVID-19 vaccine distribution					
+1	-0.0232	-0.0246	-0.0155	-0.0501	0.1135

(Continues)

TABLE A4 (Continued)

Variables	Definitely not willing	Probably not willing	Not sure	Probably willing	Definitely willing
p-value	0.0000	0.0000	0.0000	0.0000	0.0000
Std Err	0.0029	0.0030	0.0022	0.0071	0.0131

Notes: Robust standard errors reported. Discrete changes of dummy variable from 0 to 1 and by 1 for ordinal variables presented.

Source: Authors' own calculations from SOG'21.

^a“Don't know”, “No response”, “No comment” and/or “Others” answers were set to missing for establishing meaningful relationships and greater interpretability of results, resulting in a lower number of observations.

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