Steven J. Green
School of International
& Public Affairs

Department of Economics

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Alejandro Arrieta

Ariadna García-Prado

Juan Pablo Sarmiento

Carmen Paz Castro

Department of Economics

Florida International University

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Alejandro Arrieta[1], Ariadna García-Prado[2], Juan Pablo Sarmiento[3], Carmen Paz Castro[4]

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Abstract

COVID-19 vaccine hesitancy is currently one of the main obstacles to worldwide herd immunity and socioeconomic recovery. Because vaccine coverage can vary between and within countries, it is important to identify sources of variation so that policies can be tailored to different population groups. In this paper, we analyze the results from a survey designed and implemented in order to identify early adopters and laggers in six big cities of Latin America. We find that trust in government and science, accurate knowledge about the value of vaccination and vaccine effects, perceived risk of getting sick, and being a student increase the odds to get vaccinated. We also identify potential laggers as women and populations between 20 and 35 years old who are not students. We discuss specific strategies to promote vaccination among these populations groups as well as more general strategies designed to gain trust. These findings are specific to the context of Latin America insofar as the underlying factors associated with the choice to be vaccinated vary significantly by location and in relation to individual-level factors.

JEL Classification: I12, C13

Keywords: Coronavirus, COVID-19, Vaccines, Latin America.

[1] Department of Health Policy and Management, Florida International University, Miami, FL 33199, USA. Phone: 305-348-7525, E-mail: alejarri@fiu.edu
[2] Department of Economics, Universidad Publica de Navarra, Spain.
[3] Extreme Events Institute, Florida International University, USA.
[4] Department of Geography, Universidad de Chile, Chile.

Introduction

Containment of the COVID-19 pandemic has become even more urgent as more deadly mutations of the SARS-Cov-2 virus emerge. The common goal is to immunize 80% of the population in every country as soon as possible. However, the achievement of global herd immunity faces many obstacles: problems with the production and delivery of vaccines, unequal access to vaccines for different countries and/or population groups, and vaccine hesitancy and refusal, among others.

In this paper, we focus on vaccine hesitancy, which has been aggravated as a result of the COVID-19 pandemic. As acknowledged by the World Health Organization, a person's willingness and motivation to be vaccinated is affected by a variety of thoughts and feelings about vaccines, including varying levels of perceived risk, worry, confidence, and trust, as well as safety concerns.[1] Our purpose is to identify the factors that influence a person's propensity to get a COVID-19 vaccine across several countries of Latin America. Knowledge of these factors is especially important for policy purposes because it makes it possible to identify the population groups that are most willing to get vaccinated and thus can be used to increase demand.[2] It also provides information on perceptions of vaccine safety and efficacy that can be used to implement communication campaigns or other strategies tailored to specific populations.

We designed and delivered a survey across citizens of six cities of Latin America with high incidence of COVID-19 (Buenos Aires, Santiago, Bogotá, Guayaquil, Lima, and Santo Domingo). The survey took place when the vaccine had not yet arrived to any of these countries (between September and December 2020). The timing of the survey was important, as it allowed us to identify the characteristics of individuals who were likely to become early adopters of the new vaccines. Identifying innovators and early adopters is critical, as these groups can help to spur wider adoption of an innovation, while laggers can have a hindering effect.[3]

Before the current pandemic, vaccine confidence was already decreasing worldwide for cultural, and political reasons.[4] In 2019 vaccine hesitancy was already cited as one of the top ten threats to global health;[1] the current situation has only aggravated the problem. The demand for COVID-19 vaccination varies widely for special reasons: differently from other vaccines, COVID-19 vaccines developed with unprecedented speed and possible side effects are still under investigation. In addition, the use of social media to criticize or oppose vaccination has increased notably during the pandemic. It has been estimated that the increase of social media shares, likes and similar interactions with misleading online news accounts for 17% of resistance to vaccines.[5]

In the past, the region of Latin America has not been known for vaccine hesitancy, at least toward children's vaccines or other well-known vaccines among certain age groups such as the seasonal flu.[6] However, previous evidence in the region from the pandemic H1N1 shows that there was some level of distrust regarding safety of the new vaccine; in particular, pregnant women in the region reported a very low rate of vaccination.[4] But according to surveys made in different countries of the region during October and November 2020, it seems that levels of vaccine refusal related to COVID-19 are much higher than before the pandemic.[4] For instance, in countries like Ecuador more than 50% reported an intention to refuse vaccination in October 2020 and around 38.5% in Colombia. Levels of vaccine refusal are lower in countries such as Chile (16%), Perú (10%) and Argentina (10%) but still higher than before the pandemic.[7]

The intention to get vaccinated in Latin America also seems to be lower than in other regions of the world. While in Fall 2020 the average level of intention to get vaccinated was around 73% for a sample of 15 countries around the world,[8] surveys in countries of Latin America in the same period report that only about 40% of Argentineans and Chileans were willing to be among the first to be vaccinated, and in Perú around 48% were willing to get vaccinated.[7] The percentage is larger in Colombia (57,7% in October 2020), and Dominican Republic (68%).[9]

Other studies that have analyzed the propensity to get vaccinated against COVID-19 either do not focus on early adopters and/or gather data from other countries or regions.[8, 10] Our study is especially relevant to the context of Latin America, as the underlying factors associated with the choice to be vaccinated vary significantly by location and with individual-level factors. This variance can be attributed to complex socio-environmental, psychological and cultural influences,[11] and indicates the importance of information about vaccination propensity by region/country in order to design policies that target specific populations. Without this information, differences in vaccine coverage between and within countries could potentially delay global control of the pandemic and subsequent recovery. Although data about vaccine coverage is widely collected, no similarly robust monitoring system exists for vaccine confidence.

Study Data and Methods

Data

Data was collected through the Latinwell survey, an instrument developed to assess the effects of COVID-19 on the subjective wellbeing of residents of Latin American cities and their willingness to get a COVID-19 vaccine. The Latinwell survey was implemented online and distributed to residents aged 25 to 60 from

six large cities of Latin America and the Caribbean: Buenos Aires (Argentina), Bogota (Colombia), Guayaquil (Ecuador), Lima (Peru), Santiago (Chile), and Santo Domingo (Dominican Republic). A non-probability sampling design was implemented through two web-based recruitment platforms. A total of 1,689 respondents were recruited from September 11th to November 8th, 2020 using Facebook's advertising model to construct samples by age and city of residence. Facebook is a promising platform for survey sampling and recruitment in social science,[12] but its use is still limited in the Latin American region. Additionally, 5,252 respondents were recruited from December 4th to December 13th using the Offerwise opt-in online panel. The Offerwise panel in the Latin American region covers the six countries included in the study with over 1.3 million panelists.[13] Of all respondents, 2,155 completed the survey and were used for the analysis. The final sample included 460 (21.3%) respondents recruited from Facebook, and 1,695 (78.7%) respondents recruited from Offerwise.

The study was approved by the Scientific Ethics Evaluation Committee of the University of Chile, and the Florida International University Office of Research Integrity, IRB protocol 20-0553.

Measures

Our dependent variable is willingness to get a COVID-19 vaccine. Before any vaccination campaign was rolled out in Latin America, the Latinwell survey asked respondents whether they would be vaccinated if a vaccine against COVID-19 were approved and provided free of charge by the government. Response options were recorded on a 4-point Likert scale, ranging from "*I will definitely not get the vaccine*" to "*I will definitely get it.*"

We grouped our independent variables into five topics: i) knowledge about vaccines, ii) trust in government and science and beliefs about COVID-19, iii) health and economic impact of COVID-19, iv) perceived compliance with COVID-19 public health policies relative to others, and v) access to COVID-19 public assistance programs. Additionally, we used a large set of variables to control for socioeconomic and demographic characteristics, pre-existing medical conditions, and personality trait dimensions. We also added city fixed-effects, a weekly time trend to capture changes in behavior over time that are common to all cities, and the weekly number of COVID-19 cases reported in each city to capture changes in willingness to get vaccinated associated with the magnitude of the epidemic over time. Details of all the variables included in the analysis are provided in Table 1.

[INSERT TABLE 1 HERE]

Analytical Strategy

We used an ordered logit model to assess the association between the respondent's willingness to get a COVID-19 vaccine and our set of COVID-19 related variables and control variables. Estimates are expressed as odds ratios, and the estimation was performed in StataMP v.16 using robust standard errors.

Limitations

It must be kept in mind that all public surveys of the type reported here are snapshots taken at a particular time. This particular survey was conducted in the context of a highly dynamic and changing landscape, with daily variations in perceived disease threat and COVID-19 vaccine development. Further, reporting one's willingness to be vaccinated might not be a good predictor of acceptance, as vaccine decisions are multifactorial and can change over time. Finally, collecting survey responses through social media platforms such as Facebook may have introduced biases related to the use of social media (which is not so commonly used in Latin America as in the US, for instance.)[12] The response was much higher when we launched the questionnaire via the Offerwise opt-in online panel.

Results

Descriptive statistics of the Latinwell data are presented in Table 2 by city. The willingness to get the vaccine, which ranges from 1 to 4 (highest willingness), is similar across cities, with Santo Domingo and Guayaquil having the lowest levels among the cities studied.

[INSERT TABLE 2 HERE]

While this sample is not representative of each city, it is worth highlighting that Lima and Guayaquil are the cities with the largest fraction of individuals with COVID-19 diagnosis (see Table 2) consistent with national statistic of COVID-19 incidence. However, all the cities in the study have high incidence of COVID-19. In addition, in most of them, about one-third of individuals lost their employment due to the pandemic, and one-half had salary cuts. Monetary assistance from governments was received by around 20% of individuals on average with a large variation between cities. Nearly 37% of Santiago residents who responded to the survey received monetary assistance compared to only 5.7% of residents of Guayaquil.

Table 3 presents the results of our ordered logistic regression analysis, with estimates expressed as odds ratios. The first model assesses the association between willingness to get the vaccine and knowledge about the vaccine, government trust and beliefs about COVID-19, controlling by city fixed effects, demographics

and socio-economic characteristics, medical conditions, and personality dimensions. The second model adds a group of variables that assess the impact of COVID-19 on the individual and other members of the household, their individual compliance with public policies for the control of COVID-19 in the cities, and public assistance programs received by the individual and other members of the household.

[INSERT TABLE 3 HERE]

Results from the first model shows significant differences between cities in willingness to be vaccinated against COVID-19. Interviewed individuals from Bogotá are 3.19 times more willing to get the vaccine than respondents from Santo Domingo (city of reference), followed by Santiago (2.13), Lima (1.79) and Guayaquil (1.75). These differences increase when variables capturing the impact of COVID-19 on individuals and other members of the household are included (second model).

The results also show the relevance of knowledge about vaccination. For instance, respondents with high levels of general knowledge about vaccines are 1.4 more likely to accept a COVID-19 vaccine, similar to those who feel that vaccines are worth the risk (1.5) and those who understand that vaccines are needed even when infection rates are low (1.5). Moreover, respondents who do not believe in conspiracy theories about COVID-19 are 1.1 times more likely to accept the vaccine.

Trust in the government and science is also highly relevant to increasing the probability of acceptance of COVID-19 vaccination. In particular, we find that trust in the government is higher when the respondent (or a member of their household) has received financial support from the government during the pandemic.

Results from the second model show that the impact of COVID-19 on the immediate environment of the respondent can also increase the probability of getting the vaccine. Thus, respondents who have experienced the death of a close friend or family member during the covid-19 pandemic are 1.3 times more likely to accept the vaccine. Respondents who lost their employment due to COVID-19 are also more likely to accept the vaccine. Similarly, compliance with anticovid-19 regulations within the social environment is also relevant. When people perceive that their own compliance with COVID-19 regulations is higher than in their community (social comparison) the probability of accepting the vaccine increases (odds of 1.7 for maintaining physical distance and 1.4 for avoiding social activities).

Our results also show that women are less likely than men to accept the COVID-19 vaccine. Also, younger individuals (25-34 years old) are generally less willing to get the vaccine, although students have higher odds of acceptance. Respondents that have a medical condition such as obesity have increased willingness

to be vaccinated. We also found that higher educational attainment was associated with lower willingness to get the vaccine, although it was not statistically significant in the second model after controlling for COVID-19 impact and regulations. While education and knowledge about vaccines could be positively correlated, we explored the interaction effect between both variables. The third model in Table 4 shows that respondents with more education are less likely to accept a COVID-19 vaccine when their general knowledge about vaccines is more limited. Regarding personality traits, we also found those who are agreeable seem to have lower odds of getting vaccinated (0.9). In the fourth model in Table 4 we analyzed the interaction of being agreeable with trust in the information provided by the government about COVID-19. We found that those who are more agreeable are less likely to accept the vaccine when their trust in the government is lower. This is not the case, however, when the agreeable people trust the government.

[INSERT TABLE 4 HERE]

Discussion and Policy Implications

This study explores the intention to be vaccinated against COVID-19 in a sample of population from six main cities of Latin America. The survey was made during the fall of 2020, before vaccines were available, with the purpose of identifying potential groups of early adopters who might help to promote willingness to vaccinate among the wider population. Because individuals learn about social norms in part by observing others, early adopters of the COVID-19 vaccine can be given badges or ribbons that display their pro-vaccination choice.[14] In addition, the survey also allows us to identify which population groups can hinder vaccination now that vaccination is taking off in LAC. In the past, it was more difficult for anti-vaccine groups to influence individuals who had doubts and questions about vaccination because traditional mainstream media (even in an imperfect way) dominated the diffusion of information and served as a filter for their audience. However, as social media has grown in importance this model of diffusion has broken down. In the new model, non-credible sources closely resemble credible sources, and it is the user who is responsible for determining the difference. As it is widely known, most consumers of social media do not or cannot check the reliability of their news sources.

We find, for instance, that individuals with an agreeable personality who do not trust the government are less likely to be vaccinated against COVID-19, probably because they are more likely to trust unreliable sources of information. This result is aligned with previous evidence on how differential exposure to media channels and social networks can explain the observed asymmetric polarization between self-identified Democrats and Republicans in the US.[15] In general, our results indicate that the role of the media is as important to the pandemic response as political management and the economy.

Arguably, trust is an essential component of a successful vaccination campaign, but fortunately it is also potentially modifiable. For instance, after early stumbles in the management of the pandemic caused the British government to lose the trust of the population, this trust was recovered thanks to the effective design and deployment of an anti-COVID-19 vaccination strategy.[16] Our findings show that trust in government is strongly associated with vaccine acceptance and can contribute to public compliance with recommended actions. Trust in government has been consistently shown as a factor that can lead to higher rates of vaccination.[17] Lessons learned from previous infectious disease outbreaks and public health emergencies, including HIV, H1N1, SARS, MERS and Ebola, remind us that trusted sources of information and guidance are fundamental to disease control.[18]

In addition, our study shows that trust in science also leads to higher willingness to be vaccinated. Unfortunately, it seems that distrust in science and politics has grown during the current pandemic.[19] As the relationship between science and politics continues to break down, it is clear that evidence-based arguments are not enough.[19] In the face of this challenge, it is important to evaluate the effectiveness of communication strategies and other interventions. For instance, the communication strategy for publicizing the safety of Astrazeneca vaccine is an example of a bad communication strategy. Vaccine hesitancy against this vaccine has increased, which may delay the vaccination process in both European and Latin American countries where this vaccine is also being distributed and offered. What is evident is that a substantial number of health officials, national governments, news organizations, non-governmental organizations, and social media platforms are propagating confusing and contradictory messages about COVID-19 and available vaccines. This global "infodemic" undermines the public trust on which successful public health programs depend. Insofar as effective communication strategies are essential to building public trust, governments need to find alternative ways to communicate, providing information that is clear, objective, and understandable different target groups. For instance, in the past celebrities and respected public figures have proved successful in improving public attitudes, trust, and uptake of health interventions, including vaccines.[2]

In addition to trust, citizens need to access to reliable sources of information. Our results indicate that the higher levels of accurate knowledge about vaccination is linked to increased willingness to be vaccinated, while those who believe that COVID-19 pandemic is just a conspiracy are less likely get vaccinated. It is worrisome to find that 54% of the surveyed population believe the conspiration theory is definitively true or probable, even if among these only 10.6% think it is definitively true. And although having more or less years of education is relevant, we find that those individuals with higher levels of education but whose general knowledge of vaccine effectiveness is low are still reluctant to be vaccinated. This does not happen for those with higher levels of education and accurate general knowledge about vaccines.

Other demographic variables are relevant too. Women seem to be less inclined to be vaccinated than men. This is interesting because this result is also found in the US[17] while in other countries such as France, Germany, Russia and Sweden the trend is reversed: women are more likely to accept a COVID-19 vaccine than men.[8] This finding has special importance because women are often the primary healthcare decision-makers for their families. Accordingly, to lower overall levels of vaccine hesitancy an effective strategy may be to design and disseminate messages that target the more hesitant female audience in these countries of Latin America. In the US, famous scientists such as Kissmekia Corbett (lead developer of the Moderna vaccine) are helping to combat vaccine hesitancy by talking about COVID-19 science in communities of color.[20] Corbett is one of many black scientists and doctors who are engaged in outreach activities, often virtually, in their free time. Researchers say that outreach is necessary to make scientific knowledge more accessible to the public and to ease health disparities, including varying attitudes toward vaccination, among minorities. Although we do not find race disparities in our sample, the example of Corbett indicates a promising strategy for influencing women in Latin America: using women scientists and other trusted women as messengers who promote the importance of vaccination. The inspiring example of Dolly Parton in the US getting her first shot of Moderna while singing an adapted version of her famous song "Jolene" ("vaccine, vaccine, vaccine, vaccine, I am begging of you, please, do not hesitate") could be reproduced in LAC with famous singers or artists of the region.[21]

Age is also a relevant factor, especially in the case of Latin America. Similarly to other countries, the population that is most reluctant to be vaccinated is young adults ages 20-35, especially those who are not students and have not studied at the university (96%). Due to the young average age of the population in Latin America, vaccine hesitancy among those under 35 can present a major obstacle towards herd immunity in the region even after most of the rest of the population is vaccinated. In contrast, in European countries where the average age of populations tends to be older but vaccine hesitancy is also more prevalent among the young (e.g. Spain), herd immunity should be easier to achieve.

Another relevant factor is the perceived risk of illness related to COVID-19. Those who have a condition (e.g., obesity) that increases the risk of a severe case of COVID-19 or who know someone within their circle of close family and friends who has died from COVID-19 are likely to be more willing to be vaccinated. This finding is consistent with studies in other countries: in Italy, for example, the perceived risk of contagion increased during the lockdown (in comparison to before lockdown) as did the intention to be vaccinated.[22] Related to perceived risk, we find that individuals who perceive that their compliance with the rules is higher than the general level of compliance in their environment or society have a higher willingness to get vaccinated. Also, previous studies of barriers to vaccination in Latin America indicate that other environmental factors such as individual/group influences and contextual influences are

relevant.[23] Moreover, a recent study finds that vaccine hesitancy can be reduced by encouraging individuals to believe that they could be part of a successful collective effort to achieve herd immunity and harnessing the expected reputational benefits of vaccination.[10] Communication strategies that take these social factors into account may be more successful in promoting vaccination, but governments can go even farther by offering incentives or "nudges" that facilitate the decision to be vaccinated. For instance, in the US now that vaccine intention is dropping free baseball tickets or drinks are being offered at vaccine locations. Similar strategies are being fine-tuned to target specific groups in rural and conservative populations at county fairs and rodeos.[11] In Israel, bars offer a free drink or pizza along with vaccination to attract younger populations.[24, 25] In previous studies, onsite vaccination in the workplace has also been identified as a key lever.[16]

This study represents an initial effort to delineate the diversity and extent of the challenges to vaccination in six Latin American countries, but it also underscores that "one size will not fit all" when it comes to building public trust in a COVID-19 vaccine. The recently discovered side effects of certain COVID-19 vaccines have increased vaccine hesitancy even among those who believe in the value of vaccination and would normally follow the early adopters. Our survey did not include questions about different types of vaccines as these issues had not emerged at the time of the survey. However, it would be interesting to explore how willingness to be vaccinated varies according to the types of vaccine available in each country. This would also offer lessons on how different communication strategies about different vaccines are reaching different segments of the population.

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Table 1. Dependent and independent variables grouped by topics

Dependent variable: Willingness to get a COVID-19 vaccine

4-point Likert scale from (1) "*will definitely not get the vaccine*" to (4) "*will definitely get the vaccine*".

Knowledge about vaccines

4-point Likert scale from (1) "*definitely false*" to (4) "*definitely true*" to different knowledge statements about vaccines [26]:

- Vaccine knowledge - general ("*Vaccines prepare your immune system to recognize and disarm harmful viruses and bacteria*")
- Vaccines vs. natural immunity ("N*atural immunity is better than vaccine-acquired immunity*"†)
- Vaccines and toxins ("*Vaccines contain unsafe toxins*"†)
- Vaccines and health risk ("*Vaccines are not worth the risk*"†)
- Vaccines and infection ("*Vaccines can infect us with the disease it is trying to prevent*"†)
- Vaccines and herd immunity ("*We do not need to vaccinate when infection rates are low*"†)

Trust and believes about COVID-19

7-point Likert scale from (1) "*completely disagree*" to (7) "*completely agree*" to different statements about trust and believes in conspiracy theories:

- Trust on government ("*Trust in the information provided by the government about COVID-19*")
- Trust on science ("*Trust that scientists and health experts work on the public best interes*t")
- Rejects COVID-19 conspiracy ("*Believe that COVID-19 is influenced by the self-interests of powerful and secret groups*"†).

COVID-19 impact

Binary variables indicating the health and economic impact of COVID-19 on individuals and other members of their household:

- Diagnosed with COVID-19 (respondent reports having been diagnosed with COVID-19, compared to negative diagnosis, unknown or waiting for test results)
- Death of a close person (respondent reports that somebody close to him/her—family member or close friend—died in the last 6 months due to COVID-19 or other cause)
- Lost employment due to COVID-19 (respondent reports having been fired or lost employment due to the COVID-19 pandemic.)
- Other member lost employment due to COVID-19 (respondent reports that somebody from the same household was fired or lost employment due to the COVID-19 pandemic)
- Lost income due to COVID-19 (respondent reports having been affected with loss of income due to unpaid leave, reduced work hours or reduced salary due to the COVID-19 pandemic)
- Other member lost income due to COVID-19 (respondent reports that somebody from the same household was affected with loss of income due to unpaid leave, reduced work hours or reduced salary due to the COVID-19 pandemic).

Social comparison of compliance with COVID-19 public health policies

Binary variables indicating whether the respondent's compliance with specific COVID-19 public health policies was better than the community compliance as perceived by the respondent. Respondents were asked to assess their own compliance using a 4-point Likert scale from (1) always or almost always to (4) never complied to specific policies in the last 6 months. A similar question was used to assess compliance by people in the community where they live. The specific public health policies were: stay at home, washing hands, surface disinfection, mask use, physical

distancing, public transportation use, social activities (restaurants/bars/theaters), and family activities (family reunions).

COVID-19 public assistance

Binary variables indicating whether the respondent or other member of the household received monetary support as part of the government's COVID-19 public assistance program. We also included binary variables to indicate non-monetary assistance (food or other) from the government or private organizations.

Socioeconomic and demographic control variables

- Demographic and socioeconomic characteristics including age (in years, ranging from 25 to 60 years old)
- Binary indicators for young adult (25 to 34 years old compared to older adults)
- Gender (female compared to male and other), civil status (married or divorced/separated compared to single)
- Living alone (compared to living with 1 or more person in the same household), religion (catholic, evangelic, or no-religion compared to other religions)
- Race (mestizo, black or other race compared to white)
- Employment status (independent worker, dependent worker, homemaking, retired or student compared to unemployed).
- Educational attainment ranging from incomplete elementary (level=1) to completed post-graduate (level=10), and monthly income, including remittances, in U.S. dollars.

Medical conditions

Self-reported medical conditions: having a medical condition or illness diagnosed by the physician. List among these conditions: pregnancy, hypertension, high cholesterol, diabetes, cancer, asthma, obesity, depression, anxiety, other illness.

Personality dimensions

Personality dimensions were assessed using the Ten-Item Personality Inventory (TIPI), a widely accepted instrument that uses both the positive and negative poles of five personality traits [27]: extraversion, agreeableness, conscientiousness, emotional stability, and openness to experiences. Each dimension is scored from (1) lowest to (7) highest in the specific personality trait.

Common trend and COVID-19 cases

We included a weekly trend to capture changes in vaccination attitudes over time. Additionally, we included the reported weekly number of COVID-19 cases (in logarithms) for each city to capture the highly dynamic variations in perceived disease threat and its influence on willingness to get the COVID-19 vaccine.

† Negatively worded in the survey but reverse coded for statistical analysis.

Table 2. Descriptive statistics by city

Variables	Buenos Aires	Santiago	Bogota	Santo Domingo	Guayaquil	Lima	All cities
Willingness to get a COVID-19 vaccine (no=1 - yes=4)	2.9	2.9	3.0	2.6	2.6	2.9	2.9
Knowledge about vaccines (lowest=1 - highest=4)							
Vaccine knowledge - general	3.5	3.3	3.3	3.2	3.0	3.3	3.3
Vaccines vs. Natural immunity	3.0	2.6	2.6	2.3	2.4	2.5	2.6
Vaccines and toxins	3.0	2.5	2.7	2.5	2.6	2.7	2.7
Vaccines and excessive health risk	3.5	3.1	3.3	3.0	3.0	3.2	3.2
Vaccines and infection	3.1	2.7	3.0	2.8	2.8	2.9	2.9
Vaccines and herd immunity	3.4	3.0	3.3	3.0	3.0	3.1	3.1
Trust and believes about COVID-19							
Trust on government (lowest=1 - highest=7)	3.6	3.3	3.7	3.9	3.1	4.2	3.7
Trust on science (lowest=1 - highest=7)	4.4	4.4	4.6	4.6	4.0	4.6	4.5
Rejects COVID-19 conspiracy (lowest=1 - highest=4)	2.8	2.5	2.5	2.5	2.5	2.6	2.6
COVID-19 impact (yes=1, in %)							
Diagnosed with COVID-19	4.1	5.0	6.3	10.4	14.7	17.5	9.8
Death of a close person	25.3	29.7	30.5	48.2	46.5	48.1	38.0
Lost employment due to COVID-19	19.3	31.9	36.8	28.4	37.5	31.8	31.3
Other member lost employment due to COVID-19	7.4	12.0	18.1	18.7	16.7	16.6	15.0
Lost income due to COVID	42.9	45.6	60.7	49.5	62.5	53.2	52.5
Other member lost income due to COVID-19	10.5	16.3	15.1	16.7	19.1	18.3	16.2
Social comparison of compliance with COVID-19 public health policies (individual compliance better than community compliance=1, in %)							
Stay at home	94.6	90.7	91.7	88.3	88.6	89.0	90.4
Washing hands	94.6	98.1	97.2	98.7	95.7	97.8	97.1
Surface disinfection	88.2	91.4	91.4	92.3	91.6	93.3	91.5
Mask use	96.0	98.1	98.7	99.0	99.0	96.4	97.8
Physical distancing	97.3	96.9	96.7	97.7	97.0	94.6	96.6
Public transportation use	87.5	85.4	84.9	88.0	85.0	87.7	86.4
Social activities (restaurants/bars/theaters)	97.0	89.2	90.2	91.6	85.0	86.1	89.6
Family activities (family reunions)	99.7	99.5	100.0	100.0	99.3	99.6	99.7
COVID-19 public assistance (received assistance=1, in %)							

Received monetary assistance	21.6	37.4	13.1	29.4	6.4	22.4	22.2
Other member received monetary assistance	5.7	7.0	6.3	9.4	2.3	6.5	6.3
Received non-monetary assistance	10.5	57.8	16.6	18.7	15.1	10.7	22.6
Other member received non-monetary assistance	3.0	8.4	6.1	8.4	6.0	3.6	5.9
Socioeconomic and demographic control variables (in % unless otherwise indicated)							
Age (in years)	46.4	41.7	37.3	34.5	37.7	38.6	39.3
Age 20 to 34 years old	15.9	27.1	41.6	52.8	42.1	40.9	36.8
Married	55.4	49.2	50.6	49.8	56.9	53.9	52.4
Divorced	23.3	14.4	10.8	9.0	9.0	13.9	13.4
Single (reference group)	21.3	36.5	38.5	41.1	34.1	32.2	34.2
Living alone	15.9	8.6	7.6	12.0	5.0	5.2	8.7
Female	75.3	70.0	56.4	56.9	56.2	60.2	62.5
Catholic religion	46.6	47.5	62.2	39.1	57.2	71.1	55.2
Evangelic religion	2.4	7.4	6.8	26.4	17.7	7.8	10.8
No religion	10.1	22.3	12.9	12.0	12.7	6.5	12.9
Other religions (reference group)	40.9	22.8	18.1	22.4	12.4	14.5	21.2
Education	619.9	629.3	670.8	664.9	647.2	683.2	654.3
Mestizo race	15.5	33.6	41.8	33.1	77.6	68.0	45.8
Black race	1.7	1.9	2.5	36.8	5.0	4.7	7.8
Other race no-white	5.1	18.9	18.4	16.1	2.7	5.4	11.5
White (reference group)	77.7	45.6	37.3	14.1	14.7	21.9	34.9
Independent worker	24.7	13.4	24.4	24.8	28.1	31.5	24.4
Dependent worker	44.6	51.3	38.8	50.5	34.8	40.3	43.4
Homemaking	10.1	9.8	5.5	3.3	8.7	10.1	8.1
Retired	4.7	1.4	2.0	0.0	1.7	0.9	1.7
Student	3.0	3.4	2.8	8.7	4.4	3.1	4.0
Unemployed (reference group)	17.2	22.5	28.7	21.4	27.4	19.0	22.7
Income (in US dollars)	633.3	812.8	401.4	517.5	533.3	612.2	591.0
Medical conditions (in %)							
Pregnant	0.0	1.2	1.8	1.7	1.3	1.8	1.4
Hypertension	17.2	18.0	7.1	14.1	9.4	9.2	12.3
High cholesterol	11.8	15.1	11.3	8.4	16.4	10.1	12.2
Diabetes	7.1	8.2	3.0	6.0	5.7	4.5	5.7
Cancer	3.0	1.9	1.3	0.7	1.3	1.1	1.5
Asthma	7.1	3.6	7.3	7.4	4.7	8.3	6.4
Obesity	16.2	18.2	10.8	11.4	16.4	14.8	14.7
Depression	12.8	14.4	9.6	5.7	6.0	8.1	9.6
Anxiety	19.3	18.2	12.1	12.0	9.4	16.1	14.7
Other illness	17.6	13.0	14.4	6.7	13.0	11.2	12.6

No medical conditions or illness	36.8	40.5	52.6	55.2	45.5	45.0	45.9
Personality dimensions (lowest=1 - highest=7)							
Extraversion	3.9	3.8	3.7	3.6	3.8	3.9	3.8
Agreeableness	5.1	5.2	5.2	5.4	5.3	5.3	5.3
Conscientiousness	5.3	5.4	5.6	5.5	5.4	5.4	5.4
Emotional Stability	4.2	4.7	4.8	5.0	4.9	4.9	4.8
Openness to Experiences	5.1	5.1	5.1	5.3	5.1	5.1	5.1
COVID-19 cases (average weekly cases, in logarithms)	6.6	5.9	7.9	5.7	6.4	6.3	6.5
Sample size	296	417	397	299	299	447	2155

Table 3. Determinants of willingness to get a COVID-19 vaccine †

Variables	Model 1	Model 2
Cities		
Buenos Aires	1.61	1.73*
Santiago	2.13***	2.20***
Bogota	3.19**	3.65**
Guayaquil	1.75**	2.00**
Lima	1.79**	2.02***
Knowledge about vaccines		
Vaccine knowledge - general	1.45***	1.43***
Vaccines vs. Natural immunity	1.02	1.00
Vaccines and toxins	1.11	1.11
Vaccines and excessive health risk	1.43***	1.47***
Vaccines and infection	1.11	1.10
Vaccines and herd immunity	1.47***	1.52***
Trust and believes about COVID-19		
Trust on government	1.33***	1.32***
Trust on science	1.37***	1.38***
Rejects COVID-19 conspiracy	1.13*	1.12*
COVID-19 impact		
Diagnosed with COVID-19		0.97
Death of a close person		1.27**
Lost employment due to COVID-19		1.26*
Other member lost employment due to COVID-19		1.10
Lost income due to COVID		1.00
Other member lost income due to COVID-19		1.13
Social comparison of compliance with COVID-19 public health policies		
Stay at home		1.00
Washing hands		0.66
Surface disinfection		1.21
Mask use		1.60
Physical distancing		1.65*
Public transportation use		1.02
Social activities (restaurants/bars/theaters)		1.37*
Family activities (family reunions)		0.76
COVID-19 public assistance		
Received monetary assistance		1.11
Other member received monetary assistance		1.57*
Received non-monetary assistance		1.07
Other member received non-monetary assistance		1.11
Selected control variables ‡		
Age	0.99	0.99
Age 20 to 34 years old	0.71*	0.69*
Female	0.72***	0.69***

Education	0.95*	0.96
Student	1.46	1.62*
Obesity	1.51***	1.44**
Extraversion	1.07	1.08
Agreeableness	0.91*	0.89**
N	2243	2155
Pseudo-R2	0.22	0.22
LR chi2	1264.3	1262.8

† Ordered logit model estimation. Estimates expressed in odds ratios. Model 1 does not control for the impact of COVID-19 and associated policies on the individuals. Model 2 controls for all variables.
*p<0.05; **p<0.01; ***p<0.001
‡ Selected socioeconomic, demographic, medical condition, and personality dimension control variables. See appendix for full regression estimations.

Table 4. Selected interaction effects on willingness to get a COVID-19 vaccine †

Selected variables ‡	Model 2	Model 3	Model 4
Education	0.96		0.96
Education x Vaccine knowledge=1		0.79***	
Education x Vaccine knowledge=2		0.90**	
Education x Vaccine knowledge=3		0.97	
Education x Vaccine knowledge=4		0.98	
Agreeableness	0.89**	0.88**	
Agreeableness x Trust on government=1			0.77***
Agreeableness x Trust on government=2			0.88**
Agreeableness x Trust on government=3			0.88**
Agreeableness x Trust on government=4			0.93
Agreeableness x Trust on government=5			0.94
Agreeableness x Trust on government=6			1.03
Agreeableness x Trust on government=7			1.05

† Ordered logit model estimation. Estimates expressed in odds ratios. Model 2 controls for all variables. Model 3 controls for all variables and adds the interaction effect between education and general knowledge on vaccination. Model 4 controls for all variables and adds the interaction effect between the personality trait agreeableness and trust on government.
‡ Selected variables. See appendix for full regression estimations.
*p<0.05; **p<0.01; ***p<0.001