

**Authors**

Julio Saul Solís Arce  
WZB Berlin Social Science Center

Shana Warren  
Associate Director, Path-to-Scale Research & Research Scientist

Niccoló Meriggi  
International Growth Centre

Alexandra Scacco  
WZB Berlin Social Science Center

Nina McMurry  
WZB Berlin Social Science Center

Maarten Voors  
Wageningen University & Research

Georgiy Syunyaev  
Columbia University

Amyr Malik  
Yale University Institute for Global Health

Dean Karlan  
Northwestern University

Michael Callen  
London School of Economics and Political Science

Matthieu Teachout  
International Growth Centre

Macartan Humphreys  
Columbia University

Mushfiq Mobarak  
Yale University

Saad B. Omer  
Yale University Institute for Global Health

Andrea Guariso  
Trinity College Dublin

Jakob Svensson  
Stockholm University

Matthieu Teachout  
International Growth Centre

Macartan Humphreys  
Columbia University

Saad B. Omer  
Yale University Institute for Global Health

**Staff**

Shana Warren  
Research Scientist for Path-to-Scale Research

Samya Rahman  
Research Analyst

Gloria Ayesiga Eden  
Research Associate

Elliott Collins  
Research Economist and Director of Poverty Measurement

Margarita Rosa Cabra Garcia  
Senior Research Associate

Sofia Jaramillo  
Senior Research Manager

Anthony Kamwesigye  
Associate Research Manager

Gisele Manirabaruta

Field Manager

Jean Leodomir Habarimana Mfura  
Research and Policy Coordinator

Fatoma Momoh  
Senior Field Manager

María Juliana Otalora  
Research Analyst

Béchir Wendemi Ouédraogo  
Research Associate

Touba Bakary Pare  
Senior Field Manager

Melina Platas Izama  
New York University Abu Dhabi

Laura Polanco  
Research Associate

Sarene Shaked  
Research Associate

Achille Mignondo Tchibozo  
Research Manager

Michael Callen  
London School of Economics and Political Science

Mushfiq Mobarak  
Yale University



**ARTICLES**  
<https://doi.org/10.1038/s41591-021-01434-y>

**OPEN**

## COVID-19 vaccine acceptance and hesitancy in low- and middle-income countries

Julio S. Solis Arce<sup>1</sup>, Shana S. Warren<sup>2</sup>, Niccolò F. Meriggi<sup>3</sup>, Alexandra Scacco<sup>4</sup>, Nina McMurry<sup>5</sup>, Maarten Voors<sup>6</sup>, Georgiy Syunyaev<sup>1,2,6</sup>, Amyn Abdul Malik<sup>7</sup>, Samya Aboutajdine<sup>8</sup>, Opeyemi Adejola<sup>9</sup>, Deborah Anigo<sup>10</sup>, Alex Armand<sup>11,12</sup>, Saher Asad<sup>13</sup>, Martin Atyera<sup>14</sup>, Britta Augsburg<sup>15</sup>, Manisha Awasthi<sup>16</sup>, Gloria Eden Ayesiga<sup>17</sup>, Antonella Bancalari<sup>18,19</sup>, Martina Björkman Nyqvist<sup>20</sup>, Ekaterina Borisova<sup>1,20</sup>, Constantin Manuel Bosancianu<sup>21</sup>, Margarita Rosa Cabra García<sup>22</sup>, Ali Cheema<sup>14,23</sup>, Elliott Collins<sup>24</sup>, Filippo Cuccaro<sup>25</sup>, Ahsan Zia Farooqi<sup>26</sup>, Tatheer Fatima<sup>14</sup>, Mattia Fracchia<sup>14,28</sup>, Mery Len Galindo Soria<sup>29</sup>, Andrea Guariso<sup>30</sup>, Ali Hasanain<sup>31</sup>, Sofia Jaramillo<sup>32</sup>, Sefu Kallion<sup>1,33</sup>, Anthony Kamwesigye<sup>34</sup>, Arjun Kharel<sup>35</sup>, Sarah Kreps<sup>36</sup>, Madison Levine<sup>37</sup>, Rebecca Littman<sup>38</sup>, Mohammad Malik<sup>39</sup>, Gisele Manirabaruta<sup>40</sup>, Jean Leodomir Habarimana Mfura<sup>41</sup>, Fatoma Momoh<sup>42</sup>, Alberto Mucanque<sup>43</sup>, Imamo Mussa<sup>44</sup>, Jean Aime Nsabimana<sup>45</sup>, Isaac Obara<sup>46</sup>, Maria Juliana Otalora<sup>47</sup>, Béchir Wendemi Ouédraogo<sup>48</sup>, Touba Bakary Pare<sup>49</sup>, Melina R. Platas<sup>50</sup>, Laura Polanco<sup>51</sup>, Javaria Ashraf Qureshi<sup>52</sup>, Mariam Raheem<sup>53</sup>, Vasudha Ramakrishna<sup>54</sup>, Ismail Rendra<sup>55</sup>, Taimur Shah<sup>56</sup>, Sarene Eyla Shaked<sup>57</sup>, Jacob N. Shapiro<sup>58</sup>, Jakob Svensson<sup>59</sup>, Ahsan Tariq<sup>60</sup>, Achille Mignondo Tchibozo<sup>61</sup>, Hamid Ali Tiwaziz<sup>62</sup>, Bhartendu Trivedi<sup>63</sup>, Corey Vernot<sup>64</sup>, Pedro C. Vicente<sup>12,65</sup>, Laurin B. Weissinger<sup>66</sup>, Basil Zafar<sup>64,67</sup>, Baobao Zhang<sup>68</sup>, Dean Karlan<sup>1,69</sup>, Michael Callen<sup>70</sup>, Matthieu Teachout<sup>1</sup>, Macartan Humphreys<sup>1,6</sup>, Ahmed Mushfiq Mobarak<sup>42,71</sup> and Saad B. Omer<sup>72</sup>

Widespread acceptance of COVID-19 vaccines is crucial for achieving sufficient immunization coverage to end the global pandemic, yet few studies have investigated COVID-19 vaccination attitudes in lower-income countries, where large-scale vaccination is just beginning. We analyse COVID-19 vaccine acceptance across 15 survey samples covering 10 low- and middle-income countries (LMICs) in Asia, Africa and South America, Russia (a unique middle-income country) and the United States, including a total of 44,260 individuals. We find considerably higher willingness to take a COVID-19 vaccine in our LMIC samples (mean 80.3%; median 78.9%; range 30.3 percent age points) compared with the United States (mean 64.6%) and Russia (mean 30.4%). Vaccine acceptance in LMICs is primarily explained by an interest in personal protection against COVID-19, while concerns about side effects is the most common reason for hesitancy. Health workers are the most trusted sources of guidance about COVID-19 vaccines. Evidence from this sample of LMICs suggests that prioritizing vaccine distribution to the Global South should yield high returns in advancing global immunization coverage. Vaccination campaigns should focus on translating the high levels of stated acceptance into acts of uptake. Messages highlighting vaccine efficacy and safety, delivered by healthcare workers, could be effective for addressing any remaining hesitancy in the analysed LMICs.

**A** safe and effective vaccine is a critical tool to control the COVID-19 pandemic. As of 21 June 2021, 23 vaccines had advanced to Stage 3 clinical trials and more than a dozen had been approved in multiple countries<sup>1</sup>. The BNT162b vaccine from Pfizer-BioNTech, for example, has been approved in about 90 countries, while the ChAdOx1 nCoV-19 vaccine from Oxford-AstraZeneca has the most country authorizations at 117. At present, however, global vaccine distribution remains highly unequal, with most of the current supply directed toward high-income countries<sup>2</sup>. Although effective and equitable distribution of COVID-19 vaccines is a key policy priority, ensuring acceptance is just as

important. Trust in vaccines as well as the institutions that administer them are key determinants of the success of any vaccination campaign<sup>3</sup>. Several studies have investigated willingness to take a potential COVID-19 vaccine in high-income countries<sup>4–7</sup>, and some studies have included middle-income countries<sup>8–11</sup>. Little is known, however, about vaccine acceptance in low-income countries where large-scale vaccination has yet to begin. Understanding the drivers of COVID-19 vaccine acceptance is of global concern, because a lag in vaccination in any country may result in the emergence and spread of new variants that can overcome immunity conferred by vaccines and prior disease<sup>12</sup>.

A full list of affiliations appears at the end of the paper.

**NATURE MEDICINE** | www.nature.com/naturemedicine

# COVID-19 Vaccine Acceptance and Hesitancy in Low- And Middle-Income Countries

Widespread acceptance of COVID-19 vaccines is crucial for achieving sufficient immunization coverage to end the global pandemic, yet few studies have investigated COVID-19 vaccination attitudes in lower-income countries, where large-scale vaccination is just beginning. We analyze COVID-19 vaccine acceptance across 15 survey samples covering 10 low- and middle-income countries (LMICs) in Asia, Africa and South America, Russia (an upper-middle-income country) and the United States, including a total of 44,260 individuals. We find considerably higher willingness to take a COVID-19 vaccine in our LMIC samples (mean 80.3%; median 78%; range 30.1 percentage points) compared with the United States (mean 64.6%) and Russia (mean 30.4%). Vaccine acceptance in LMICs is primarily explained by an interest in personal protection against COVID-19, while concern about side effects is the most common reason for hesitancy. Health workers are the most trusted sources of guidance about COVID-19 vaccines. Evidence from this sample of LMICs suggests that prioritizing vaccine distribution to the Global South should yield high returns in advancing global immunization coverage. Vaccination campaigns should focus on translating the high levels of stated acceptance into actual uptake. Messages highlighting vaccine efficacy and safety, delivered by healthcare workers, could be effective for addressing any remaining hesitancy in the analyzed LMICs.

July 16, 2021