

Artículo Científico

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Edited by Jens Heinmueller, Stanford University, Stanford, CA, and accepted by Editorial Board Member Mary C. Waters July 22, 2021 (received for review December 23, 2020)

How does the public want a COVID-19 vaccine to be allocated? We conducted a conjoint experiment asking 15,536 adults in 13 countries to evaluate 248,576 profiles of potential vaccine recipients who varied randomly on five attributes. Our sample includes diverse countries from all continents. The results suggest that in addition to giving priority to health workers and to those at high risk, the public favors giving priority to a broad range of key workers and to those with lower income. These preferences are similar across respondents of different education levels, incomes, and political ideologies, as well as across most surveyed countries. The public favored COVID-19 vaccines being allocated solely via government programs but were highly polarized in some developed countries on whether taking a vaccine should be mandatory. There is a consensus among the public on many aspects of COVID-19 vaccination, which needs to be taken into account when developing and communicating rollout strategies.

COVID-19 | vaccinations | public health | public opinion

How to allocate scarce COVID-19 vaccines is one of the most important decisions governments around the world have recently faced. COVID-19 vaccines have been developed at an unprecedented speed. Several vaccines have been shown to be safe and highly effective (1) and have received widespread regulatory approval (2). At the time of writing, there are also many vaccine candidates undergoing human trials.

In many countries, because public confidence in vaccination has been fragile, the policies for prioritizing vaccine allocation have needed to be seen as both equitable and evidence based (3). Ethical frameworks have been suggested for the allocation of scarce vaccine supplies between countries (4). The World Health Organization (WHO) has developed a values framework based on 12 objectives and six principles (human well-being, equal respect, global equity, national equity, reciprocity, legitimacy). Importantly, the WHO does not provide any guidance on the order of importance of either the principles or the objectives (5). Constraints on timely supply of vaccines have meant that it is not possible to secure all of the objectives simultaneously. The WHO Strategic Advisory Group of Experts on Immunization proposed a road map that prioritizes health workers and older adults (6). The Oxford COVID-19 Vaccine Preference and Opinion Survey (CANDOUR) Project aims to measure the global public's preference for vaccine allocation priorities.

At a national level, governments rapidly developed guidelines to prioritize access to COVID-19 vaccines. Based on a survey

of governments' vaccine allocation policy plans, conducted in early December 2020 (to coincide with the fieldwork for the CANDOUR surveys), Table 1 indicates that there was, at that time, considerable diversity across countries in the groups being prioritized. While prioritization of health workers and the clinically vulnerable was almost universal, there was little consensus on which other groups to prioritize. The UK prioritization strategy was largely age based, starting with the oldest age categories followed by the clinically vulnerable (7), with no other criteria to be employed until after everyone over 50 and/or with underlying health conditions had been vaccinated. In contrast, an expert committee in France had recommended prioritizing workers who have contact with the general public, including shop workers, school staff, transport staff, and hospitality workers. In the United States, the Centers for Disease Control and Prevention was deciding whether to prioritize essential workers (including school staff, police, grocery workers, and bus drivers), adults over 65, and those of any age who have high-risk medical conditions (8). Chile appeared to be planning yet a different strategy, prioritizing health care workers, other essential workers, and teachers. In sum, there was substantial variation in who could get a vaccine and when.*

Author contributions: R.D., L.S.J.R., M.V., M.F.B., T.S.R., J.-F.B., J.F., P.J.L., P.M., A.M., M.B., J.V., J.S., P.C., A.G.C., X.H., A.B., and P.M.C. designed research; R.D., L.S.J.R., M.V., M.F.B., T.S.R., and P.M.C. performed research; R.D., M.F.B., T.S.R., and A.B. analyzed data; and R.D., L.S.J.R., M.V., T.S.R., and P.M.C. wrote the paper.

The authors declare no competing interest.

This article is a PNAS Direct Submission. J.H. is a guest editor invited by the Editorial Board.

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This article contains supporting information online at <https://www.pnas.org/lookup/suppl/doi:10.1073/pnas.2026382118/-DCSupplemental>.

Published September 15, 2021.

*At the time of writing, countries appear to have broadly followed these initial plans. When Chile formally announced its prioritization criteria in late December 2020, the elderly and vulnerable were also included. Unsurprisingly, as vaccination programs have progressed, a number of countries have expanded their priority lists. For example, teachers became eligible in Canada, Colombia, Italy, Spain, Uganda, and the United States. In India, younger people who were vulnerable due to comorbidities were prioritized. Age became a priority in Spain, and essential infrastructure workers were prioritized in both Spain and Italy. In Colombia, from early May, there has been a greater emphasis on reducing transmission. It is also worth highlighting that the relative focus on different priority groups has varied across countries. For instance, in China, the focus seems to have been more on transmission, with 18- to 59-year-old cohorts vaccinated before the elderly.

Significance

How to allocate COVID-19 vaccines is one of the most important decisions currently facing governments. With limited supplies, what is most pressing is deciding who gets priority in the vaccine allocation rollout. Some governments are exploring allowing private purchases of COVID-19 vaccines. Many countries are debating whether COVID-19 vaccines should be mandated. There is little evidence on what policies are preferred by the global public. Our survey of 15,536 adults in 13 countries confirms that priority should be given to health workers and those at high risk but also, to a broad range of key workers and those with lower incomes. The public favors allocating COVID-19 vaccines solely via government programs but was polarized in some countries on mandatory vaccinations.

Many health technology assessment (HTA) agencies involve the public in decisions (9). Such processes have, however, been largely absent from the development of guidelines for COVID-19 vaccine prioritization. While HTA agencies often involve patient representatives (10), wider input, including the use of citizen juries (11) and surveys of public preferences [including use of conjoint methods (12)], has long been advocated. While there have been calls for the public to have a say in COVID-19 vaccine priority setting (13), to date empirical evidence on public preferences has been very limited (11, 14, 15).

Beyond priority setting, governments have considered a number of vaccine policy measures that may, or may not, be seen by the general public as equitable and fair. Some governments have debated whether citizens should be able to purchase COVID-19 vaccines from private providers. Indeed, COVID-19 vaccines have been available for private purchase in India and Pakistan since early March and April 2021, respectively, while the Australian government has also indicated the potential for a private market (16). On the other hand, in many countries there are no plans for the private sale of COVID-19 vaccines (17).

Governments are also considering whether they should make COVID-19 vaccination mandatory. At the time of writing, no countries appear to have yet mandated COVID-19 vaccination at a population level. However, Italy recently made vaccination mandatory for health care workers (18). There have also been calls to make vaccination of children mandatory, provided a COVID-19 vaccine that reduces transmission proves to be safe in pediatric trials. There are strong ethical arguments (19) for forms of coercion in public health to deal with the externalities that arise from infectious diseases (i.e., those who refuse vaccination not only put themselves at risk but increase the risk to others). While a recent international survey on factors that could influence potential COVID-19 vaccine uptake indicated that employer-mandated vaccination would decrease the likelihood of use, governments already have in place policies to provide strong incentives for uptake of existing vaccines. The merits of some form of mandating have already been subject to considerable public discussion (20), and a recent ruling by the European Court of Human Rights has potentially helped to clear the legal pathway to doing so (21). Nonetheless, we do not know whether, where, or to what extent mandates are supported by the general public.

The successful rollout of COVID-19 vaccines will depend on high uptake. An important element of this successful rollout is a public that views the adopted prioritization system as fair and equitable. If this is not the case, for whatever reasons, governments risk the types of public resistance and polarization that occurred in some countries regarding the wearing of masks (22). It also risks the creation of vaccine black markets that would threaten the safety and fairness of vaccination campaigns. To

accomplish these goals, governments should seek evidence of the public's opinions and preferences regarding the groups to be prioritized, public vs. private distribution channels, and mandatory requirements to be vaccinated. This information can aid in the design of better policies and the implementation of successful communication campaigns, both of which would help ensure successful COVID-19 vaccination programs (23).

Study Design

To provide an evidence-based understanding of public opinions on key aspects of vaccine allocation, we implemented online public opinion surveys in 13 countries. In all countries, with the exception of India and Uganda, we employed quota sampling to ensure that national samples matched the demographic profiles of each country (India and Uganda are primarily samples of urban communities). As the detailed discussion in *SI Appendix* indicates, the distributions of key sample demographics resemble those of their populations.[†] For many countries, the distribution of demographic factors in the sample matched the population. Median incomes (individual and household) for the samples resemble those for the population and typically deviate no more than 20%. In most countries, the better educated were overrepresented, and the lesser educated were underrepresented. Additionally, in some countries (Chile, China, Colombia, and Uganda), young respondents were overrepresented in the samples. In order to address sample imbalances on key demographics, we implemented post-stratification weighting—in *SI Appendix*, we describe the raking procedure employed for estimating the weights and also provide a description of the distributions of key demographics for the pre- and postweighted samples.

The survey included a conjoint experiment to identify preferences for different vaccine prioritization schemes. Conjoint survey experiments are frequently employed to identify the importance individuals attribute to different features or characteristics of choices (24). Examples include environmental migrants (25), asylum seekers (26), and migration destinations (27). Ref. 28 employed conjoint experiments that generated 40 million decisions to determine the ethical principles the public thinks should guide self-driving cars.[‡] In the case of policy-oriented survey experiments, evidence suggests that the weights given to attribute characteristics in conjoint survey experiments map closely to the actual policy choices made by the population (30).

In our conjoint experiment, each of the 15,536 subjects made eight binary choices over hypothetical vaccine recipients (a total of 124,288 pairwise comparisons) who randomly varied on five attributes: occupation, age, transmission status (risk of contracting and transmitting the virus), risk of death from COVID-19, and income.[§] As Table 1 and subsequent rollouts have shown, these five attributes have played particularly important roles in the vaccine allocation policies employed by our sample of countries.[¶]

Global COVID-19 Vaccine Allocation Priorities

We estimated the importance of specific characteristics of vaccine allocation priorities using linear probability models (LPMs).

[†]*SI Appendix, section 3* describes in detail how the sampling was conducted and the characteristics of the quota sample for the 13 countries.

[‡]Other recent policy-related illustrations of conjoint experiments include ref. 29.

[§]*SI Appendix, Fig. S1* provides an example of the attributes and values that characterized the two potential vaccine recipients presented to respondents. Checking the proportion of times individual conjoint levels were shown to subjects confirms that they were adequately randomized (*SI Appendix, Table S2*).

[¶]It is important to point out that we did not have any strong priors as to what should constitute the complete set of attributes to present to respondents. We relied on the comprehensive survey of government policies summarized in Table 1 to define this set of allocation priority attributes for the conjoint experiment.