Citizens from 13 countries share similar preferences for COVID-19 vaccine allocation priorities

Raymond Duch[a,1], Laurence S. J. Roope[b,c], Mara Violato[b,c], Matias Fuentes Becerra[d], Thomas S. Robinson[e], Jean-Francois Bonnefon[f], Jorge Friedman[g], Peter John Loewen[h], Pavan Mamidi[i], Alessia Melegaro[j], Mariana Blanco[k], Juan Vargas[k], Julia Seither[k], Paolo Candio[c,l], Ana Gibertoni Cruz[b], Xinyang Hua[m], Adrian Barnett[n], and Philip M. Clarke[b,c,m]

[a]Nuffield College, University of Oxford, Oxford OX1 1NF, United Kingdom; [b]Health Economics Research Centre, Nuffield Department of Population Health, University of Oxford, Oxford OX3 7LF, United Kingdom; [c]National Institute for Health Research Oxford Biomedical Research Centre, John Radcliffe Hospital, Oxford OX3 9DU, United Kingdom; [d]Departamento de Economia, Universidad de Chile, Santiago 8330015, Chile; [e]School of Government and International Affairs, Durham University, Durham DH1 3TU, United Kingdom; [f]Toulouse School of Economics, CNRS, Université Toulouse Capitole, 31000 Toulouse, France; [g]Facultad de Administracion y Economia, Universidad de Santiago de Chile, Santiago 9170022, Chile; [h]Department of Political Science, Munk School of Global Affairs and Public Policy, University of Toronto, Toronto, ON M5S1A4, Canada; [i]Center for Social and Behavioral Change, Ashoka University, Sonipat, Haryana 131029, India; [j]Dondena Centre for Research on Social Dynamics and Public Policies, Department of Social and Political Science, Bocconi University, 20136 Milan, Italy; [k]Facultad de Economia, Universidad del Rosario, Bogotá 111711, D.C. Colombia; [l]Institute of Applied Health Research, University of Birmingham, Birmingham B15 2TT, United Kingdom; [m]Centre For Health Policy, University of Melbourne, Parkville, VIC 3010, Australia; and [n]Institute of Health Biomedical Innovation (IHBI), Queensland University of Technology, Brisbane, QLD 4059, Australia

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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.*

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[1]To whom correspondence may be addressed. Email: raymond.duch@nuffield.ox.ac.uk.

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*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-y-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.

Table 1. Criteria proposed or used to prioritize COVID-19 vaccine allocation by country as of early December 2020

		COVID-19		Occupation		
	Age	Transmission	Vulnerability	Essential infrastructure	Health/ social care	Education/ childcare
Australia	X	X	X	X	X	
Brazil	X		X	X	X	X
Canada	X	X	X	X	X	
Chile				X	X	X
China	X	X	X	X	X	
Colombia	X		X		X	
France	X	X	X	X	X	
India	X			X	X	
Italy	X		X		X	
Spain			X		X	
Uganda			X		X	
United Kingdom	X		X		X	
United States	X		X	X	X	

For each pairwise choice, we regressed the participant's binary decision on dichotomous variables representing the attribute values of the five vaccine allocation attribute variables. First, we conducted this analysis at the global level, and then, we conducted this analysis at the level of each country. *SI Appendix*, Tables S3 and S4 present the regression results.

Fig. 1 reports the coefficients from the LPM regression estimated on the data pooled across the 13 countries, along with their 95% CIs (clustered by country). The individual coefficients reflect the average marginal component effect (AMCE) of choosing a profile given the presence of each attribute level (relative to a reference category, included as a dot with coefficient zero). Respondents are about 10% more likely to select a vaccine recipient profile of someone over 65 y of age compared with a profile of someone younger than 26. A potential vaccine recipient employed in a key worker occupation is roughly 20% more likely to be selected by global respondents compared with those not working or nonkey workers who can work at home. Potential recipients with high risk of either transmission or death are roughly 15% more likely to be selected than those with low risk of either transmission or death.

Fig. 2 reports separate LPM models[#] for each country organized by four regions, with 95% CIs clustered by respondent.[‖] There is no evidence in any of the 13 countries of respondents treating all potential vaccine recipient profiles equally. With respect to each of the five priority attributes, there is evidence that the global public favors some profile attributes over others. Moreover, the pattern of coefficient values across our sample of 13 countries is quite similar. The global public exhibits a surprising consensus on which population attributes should have priority in the COVID-19 vaccine implementation efforts.[**]

Age matters. Respondents in virtually all countries favor vaccine candidate recipients with age profiles greater than the young 25-y-old reference category. Additionally, there is evidence in a number of countries suggesting that the two oldest age categories (the 65- and 75-y-old profiles) were favored over the younger 25- and 40-y-old profiles. The one exception is China, where the older 65- and 75-y-old profile attributes were less preferred than the younger 25- and 40-y-old profile attributes. This distinct preference in China for younger vaccine recipients might be a function of the composition of the China sample, which is heavily skewed toward younger participants. However, the results may also reflect some caution in China over giving newly developed vaccines to the elderly.

For a majority of the 13 countries in our study, the income attributes of the potential vaccine recipients affect allocation preferences. The reference category here is the lowest quintile of the income distribution. In most middle- and low-income countries (Brazil, Chile, Colombia, India, and Uganda), respondents exhibit lower preferences for potential vaccine recipients in the average- and high-income categories. We see a similar, although somewhat less pronounced, pattern for the United States, Canada, China, Australia, and European countries. It is worth pointing out that redistributive vaccine allocation preferences seem particularly salient in those countries with higher levels of income inequality.

Vaccine allocation preferences related to occupation are virtually identical across all the sampled countries. The reference category here is "not working." In all of the countries, respondents accorded similar vaccine priority to the not working profile attribute and the "nonkey worker able to work at home" attribute. The nonkey workers unable to work at home attribute had a significantly positive impact on profile selection (relative to the not working reference category). All of the "key worker" occupational attributes had a positive effect on vaccine recipient selection in all sampled countries. This key worker result is very much consistent with the vaccine allocation priority plans employed by the governments of our sampled countries (Table 1).

[#]Identical models, using the same dichotomous outcome variable, were estimated using logistic regression with clustered SEs. The R code for estimating these models is provided in the replication materials available on Harvard Dataverse (https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/PMV0TG). The results are virtually identical to those presented in the text.

[‖]The models generating the coefficient estimates in Fig. 2 are weighted to reflect their respective populations. Details on the weighting methodology are presented in *SI Appendix*. Results without weights are virtually identical to those summarized in Fig. 2 and are presented in *SI Appendix*, Fig. S2.

[**]Our results are noteworthy for the similarity in the AMCEs we estimate for the attribute levels in each of the 13 countries we sampled. We believe this reflects a global consensus regarding the allocation priorities for COVID-19 vaccines. We also find that our results exhibit some small variation across countries—in particular, the prioritization of lower-income individuals that is observed in some countries but not others. It is interesting to note that other large multination conjoint survey projects also find considerable cross-national similarities, although again, these results demonstrate the ability of the design to detect distinct patterns on some key attributes that vary cross-nationally; Bechtel and Scheve (31) report that on many climate change policy attributes, countries agree, although on sanction valuations, they disagree; Bansak and coworkers (26) find that the European public agrees on many concerns regarding asylum seekers but again, that the country samples disagree on others, such as reasons for migrating and country of origin; the AMCEs estimated by ref. 32 are, for the most part, similar for Spain and Italy, although they differ on support for corporate tax increases; and ref. 27 finds distinct patterns of emigration destination preferences for Chinese and Indian emigrants vs. their British and Chilean counterparts.

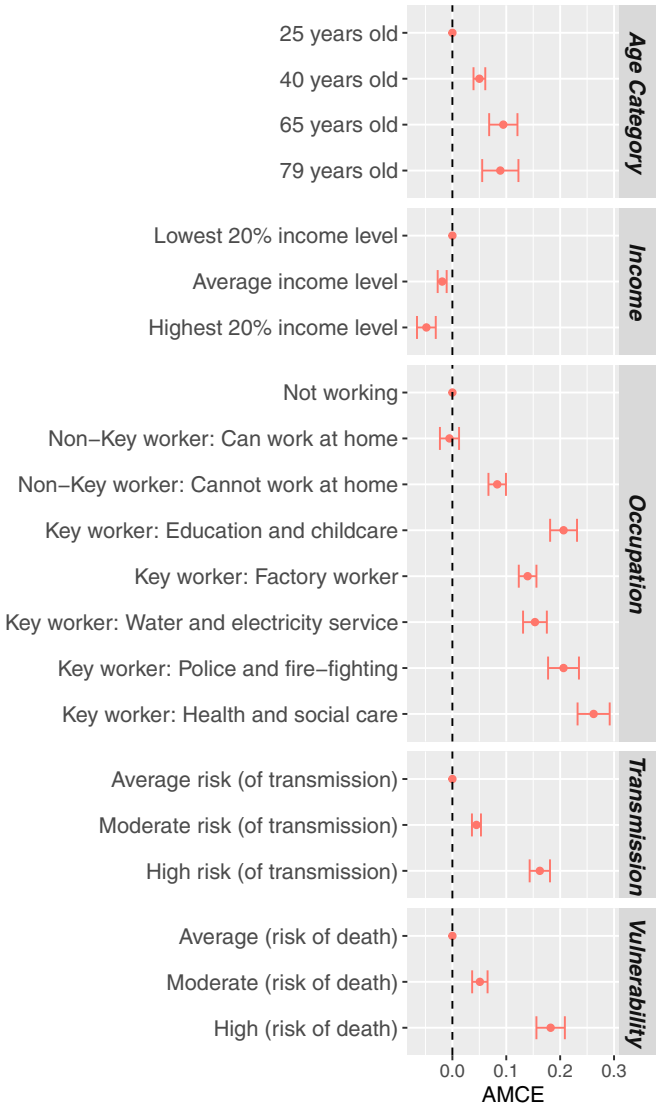

Fig. 1. Vaccine candidate decisions pooled across the 13 countries. AMCEs are reported for each attribute value. The 95% CIs are shown for each point estimate, clustered by country.

As our review summarized in Table 1 indicated, many of the governments of our sampled countries have prioritized COVID-19 vaccination for individuals who are at high risk of death from the virus and to a lesser extent, those at high risk of contracting and transmitting the virus. Similarly, in Fig. 2, we see that vaccine allocation profiles with "high risk of COVID-19 death" and high risk of "COVID-19 contracting and transmitting" were significantly more likely to be selected by respondents in all 13 country samples.

Segments of the population may display quite different views on vaccine allocation priorities. Fig. 3 explores this possible heterogeneity by breaking down the main conjoint analysis by age, income, and left–right political self-identification (since we pool observations across countries and estimate conditional effects, these models do not weight observations). Overall, the effects of the attributes were broadly similar across the different subgroups. As to which vaccine recipient attributes should be prioritized, there is a general consensus among those identifying with the left and the right, young and old, less and more highly educated, and richer and poorer citizens. *SI Appendix*, Fig. S3 presents results from additional subgroup analyses that indicate that women and men; those who are high and low educated; and those with high, moderate, and low concerns about COVID-19 vaccine side effects all agree on the vaccine recipient attributes that should be prioritized. This is a diverse set of possible sources of heterogeneous treatment effects. This absence of heterogeneity here suggests that preferences regarding vaccine priorities are not affected by self-interest, political partisanship, concern about vaccine side effects, or educational attainment. Instead, they reflect broad societal consensuses on who should be vaccinated.

Global COVID-19 Allocation Mechanisms

Implementing COVID-19 vaccination programs is challenging. The COVID-19 vaccines are a public good, and the general public has expectations regarding how this public good should be provided, specifically what vaccine allocation mechanisms are appropriate or acceptable. The global survey included questions measuring preferences for how governments should implement the vaccination program. The results, summarized in Fig. 4, suggest that the public is not indifferent to the allocation mechanisms put in place.[††]

First, there is evidence of a global consensus on the important role of government distribution. Respondents in the survey were asked whether COVID-19 vaccines should be made available through government distribution alone, government distribution and private sale, or only private sale. Fig. 4*A* confirms that a very large majority of the public believes the government should assume the lead role in the distribution of COVID-19 vaccines. Moreover, this result is consistent across each of the 13 countries; at least two-thirds of the population in each country said that distribution should only be available via government schemes. Nevertheless, in most countries there are still substantial percentages of the population who feel there should be at least some role for private distribution; this ranges from 13% in Canada to 28% in Chile.

While a majority in all countries think COVID-19 vaccine distribution should be solely via government schemes, there is evidence that a large proportion would be willing to pay for a vaccine if it was available privately. We asked respondents, "If a COVID-19 vaccine was also available for private purchase and you could receive it immediately [rather than wait 6 mo], would you considering buying it?" Fig. 4*B* suggests that roughly half of our global sample would be willing to purchase a COVID-19 vaccine on the private market, ranging from 18% in France to 79% in India and Uganda. The low- and middle-income countries were particularly enthusiastic about purchasing the vaccine on the private market (while at the same time, strongly favoring government provision).

Fig. 4 indicates that there are countries in which public support for some private provision of COVID-19 vaccines is relatively high—exceeding 20% of the sampled respondents. It does appear that support for private provision is particularly high in countries that are typically characterized as having weak state capacity and hence, where citizens might be skeptical about the government's ability to efficiently allocate COVID-19 vaccines. We explored this conjecture by measuring state capacity for 13 countries with the 2019 government efficiency metric from the Worldwide Governance Indicators (WGI) (33). As we would expect, there is a negative correlation between the WGI indicator (that varies between a low score of −2.5 and a high score of 2.5) and the percentage of the sample favoring either private or a mix of government and private provision of the vaccine. The correlation is −0.30 for the whole sample of 13 countries. Uganda is an outlier in that it has a surprisingly low preference for private provision. Excluding Uganda, the correlation is −0.62. These

[††]The exact wording of these questions is reported in *Materials and Methods*.

Fig. 2. Vaccine candidate decisions by country. AMCEs are reported for each attribute value. The 95% CIs are shown for each point estimate, clustered by subject. Models are weighted to reflect the respective national populations, excluding India and Uganda, which represent primarily urban samples.

correlations are suggestive; the public in weak-capacity states seem to be more enthusiastic about private provision than is the case in the higher-capacity states in our sample.

There is no consensus as to whether the COVID-19 vaccine should be mandatory, either across the national samples or within countries. We asked respondents to indicate on a scale from 0 (very much disagree) to 100 (very much agree) how much they agreed or disagreed with the statement "the government should make the COVID-19 vaccine mandatory for everybody."

As Fig. 4*C* indicates, opinion overall is skewed toward making COVID-19 vaccination mandatory. However, there is evidence of some polarization. In a number of countries, there is substantial clustering of responses at both ends of the scale. About 24% of our global sample were strongly opposed to mandatory vaccination, while about 38% were strongly in favor. There was variation among countries. In France, there was a broad consensus of opinion strongly opposing mandatory vaccination (about 60% opposed mandatory vaccination). Opinion was highly polarized in the United States and the United Kingdom, with the majority of people either strongly opposed to mandatory vaccination or strongly supportive. Opinion was also somewhat polarized, with little middle ground, in Australia, Brazil, Chile, and Colombia—but with a much larger cluster supporting mandatory COVID-19 vaccination. In China, India, and Uganda, very few people were strongly opposed to mandatory vaccination, and the majority were strongly supportive. France stands out in that most of the sample was opposed or indifferent to mandatory vaccination.

Discussion

This study undertook an online survey, based on quota sampling, of 15,536 members of the general public in a diverse range of countries to understand preferences and opinions regarding the allocation of COVID-19 vaccines. To elicit preferences, we undertook a large-scale conjoint experiment in which respondents were asked to evaluate profiles of candidate recipients for a COVID-19 vaccine. The profiles varied on a set of randomly assigned attributes that corresponded to the major vaccine allocation priorities being considered by policy makers. We found that the public would prioritize people for vaccination based on a broad range of factors. Not surprisingly, these include features directly related to contracting COVID-19 or developing severe symptoms, such as age, vulnerability, and risk of transmission. Notably, however, the public would also prioritize according to what might be deemed more economic factors, including low-income groups and quite a wide range of nonhealth-related key occupations (e.g., teachers) and nonkey workers who cannot work from home. While there is substantial variation in COVID-19 vaccine allocation policies in our sample of countries

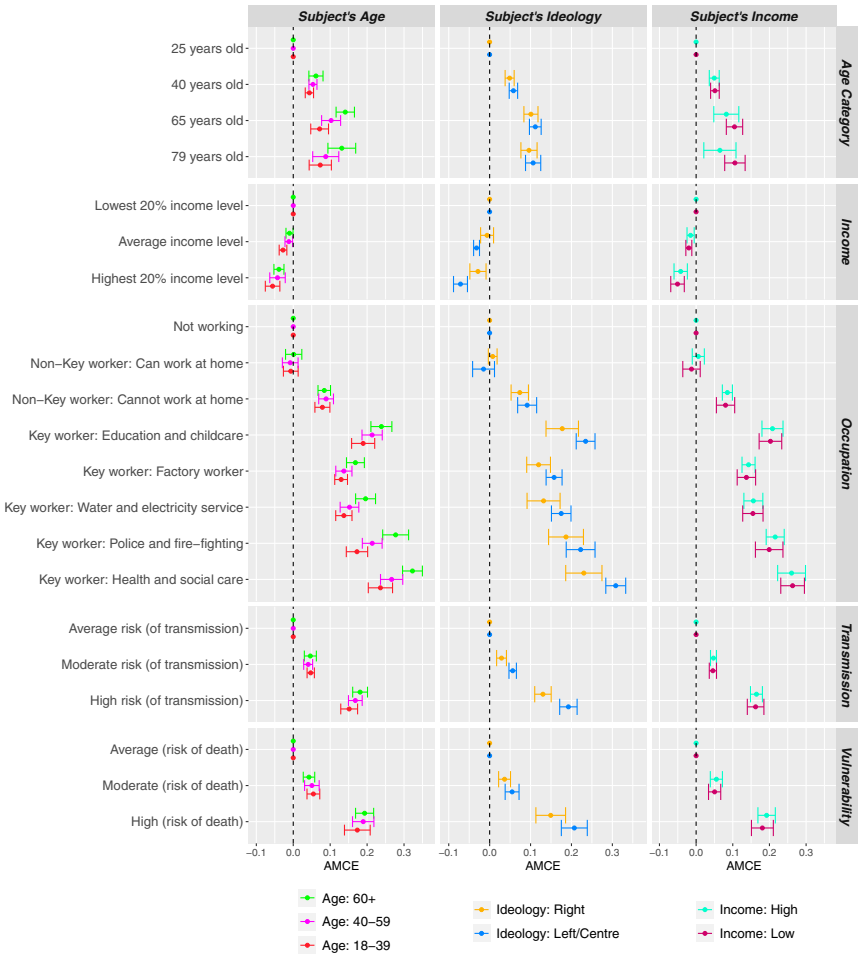

Fig. 3. Vaccine candidate decisions by age, income, and left–right self-identification. AMCE estimates are reported for attribute values (observations are pooled across countries). The 95% CIs are shown for each point estimate, clustered by country. Observation weights are not used.

(Table 1), public preferences for prioritization appear to be largely consistent across countries and larger regions. Moreover, when we estimated the conjoint model for subgroups in the samples, we found that preferences were consistent across a range of respondent characteristics, such as age and income (Fig. 3).

It is important to note that in each country, our sample consists of individuals with internet access via a computer or personal device. As we have shown, the country samples, with some exceptions that we address by weighting, reflect their populations at least on the observable measures we can benchmark against—such as gender, education, income, and region (this is documented in *SI Appendix*). Nonetheless, an important limitation here is that the online samples may differ from their populations on important unobservable variables, such as political engagement and general knowledge. This could bias our results. For example, internet samples, in all countries, may attract disproportionately policy-engaged individuals, which could contribute to the homogeneity of treatment effects we observe across the 13 countries. Although if this was the case, we would expect outcomes on other COVID-19 policy–related variables to also be similar across our national samples. This is generally not the case; the cross-national vaccine distribution preferences in Fig. 4 vary significantly across countries, as do their correlations with ideology as shown in *SI Appendix*, Figs. S5–S7.

It is interesting to note that respondents from the right and left responded remarkably similarly to this particular set of allocation priorities. This suggests that there is certainly a range of allocation policy priorities that would not be politically polarizing. This, of course, does not exclude political polarization on other aspects of the COVID-19 crisis. There is evidence, particularly from the US context, that attitudes and behaviors are correlated with partisanship (34). We observe evidence of these ideological cleavages in global preferences regarding how vaccines get distributed to the population, which are presented in Fig. 4. In *SI Appendix*, section 2, we compare left/center vs. right preferences for government-mandated vaccines, for government vs. private distribution, and regarding the purchase of COVID-19 vaccines privately. As we might expect, those self-identifying on the right, in most countries, are significantly more willing to purchase COVID-19 vaccines from a private supplier. The exception is in Brazil, where the left seems more enthusiastic about private purchases—although given the political situation in Brazil at the time, this could be perfectly consistent with the polarization narrative. Additionally, in a majority of the countries, those identifying on the left are more likely to prefer government provision of COVID-19 vaccines as opposed to some mix of private and government allocation. In the United States, for example, 77% of left/center respondents prefer a government-only option compared with 61% of right-identifying respondents. Only in India do we see this pattern significantly reversed. Government-mandated vaccines receive higher support from right partisans than those from the left—in a majority of countries, average support for mandates is higher among right-identifying respondents.

Conjoint methods have been widely used to understand preferences for other types of health care, including influenza

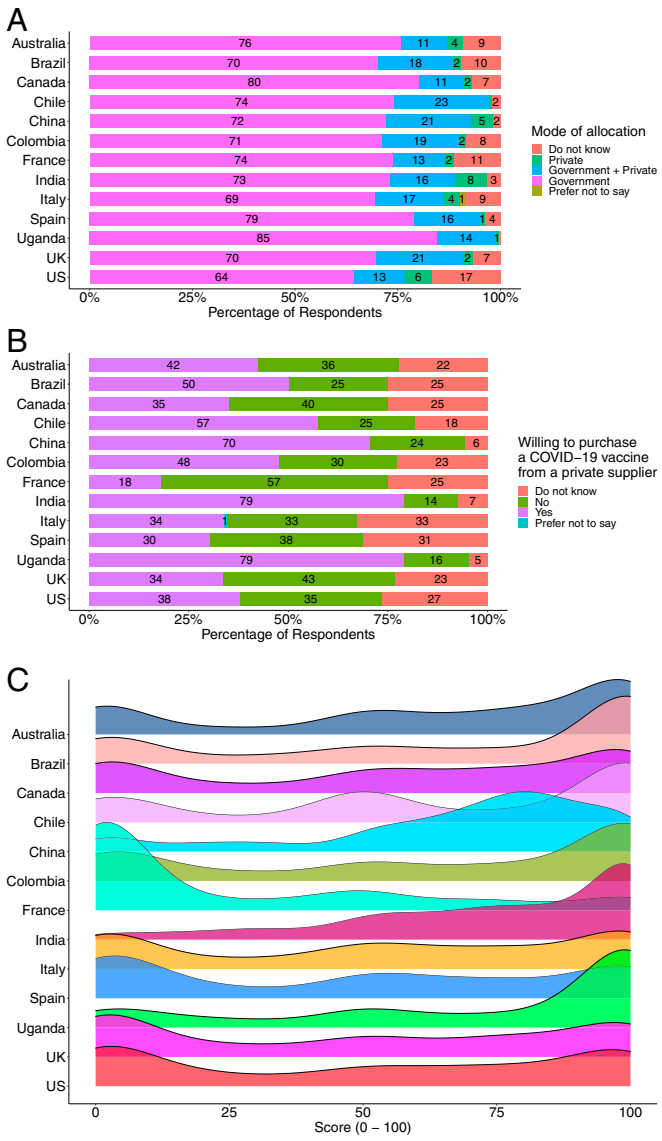

Fig. 4. Allocation mechanism. Results are weighted to match national population distributions. (*A*) Preference for government vs. private COVID-19 vaccine distribution. (*B*) Willingness to purchase the COVID-19 vaccine privately. (*C*) Agree that the government should mandate the COVID-19 vaccine.

vaccination, and have been shown to mimic real-world decision making. However, it is important to note that our conjoint experiment is largely intended to capture preferences for prioritizing the access of others. Our analyses of heterogeneity indicate that in many instances, respondents are willing to prioritize individuals who do not share their own characteristics. For example, those aged over 65 were found to have strong preferences for prioritizing many types of essential workers. It is difficult to disentangle the degree to which these preferences are due to altruism; to a desire to reduce the likelihood of being infected through interaction with unvaccinated individuals; or more broadly, to a desire to choose an optimal vaccination program that would help end the pandemic and bring life back to normal sooner.[‡‡]

[‡‡]In related work that analyzes this 13-country survey, we also find what appears to be altruistic attitudes regarding vaccine allocations. It is interesting to note that we find that a majority of respondents from the developed economies in our sample expressed support for donating at least 10% of their vaccine supplies to countries in need (35).

A limited number of studies have examined COVID-19 vaccine preferences at a national level. For example, a recent survey of the Belgian population (15) found a preference for vaccination of essential workers, those more likely to transmit the virus, and those at high risk. Unlike our study, it did not find any preference for allocation to those aged over 60. An advantage of conducting comparative international studies of preferences and opinions is the ability to provide evidence on the degree to which public views are consistent across geographically, economically, and culturally diverse countries. While there have been efforts to understand preferences for different methods of social distancing (36) and the likely uptake of COVID-19 vaccines (37), we have not found other comparable international surveys that can help inform COVID-19 vaccine allocation.

Our study also has important implications for vaccine prioritization policies. Importantly, in the countries in our sample, there appears to be much greater heterogeneity in national policies (Table 1) than in public preferences. While policies have typically included some of the groups that the public thinks should be given priority (e.g., those at high risk of mortality), there are only a minority of countries that have given priority to vaccinating groups of key workers (such as teachers). Further, our study indicates that the public feels that a broader set of economic factors should be taken into account in prioritization policies—these include low-income groups and nonessential workers who cannot work from home. With regard to the former, while some countries have stressed the importance of ensuring good vaccine uptake among deprived groups, we are unaware of any countries that are explicitly targeting people according to levels of income or other markers of deprivation (7). Beyond helping prioritize access in the initial rollout of COVID-19 vaccines, it is likely that additional doses (potentially on an annual basis) will be required for the foreseeable future. Hence, there is a need for all countries to consider such factors when developing ongoing policies to prioritize COVID-19 vaccine access.

Regarding the mode of allocation, there is a remarkably consistent preference for government-only allocation across all countries (Fig. 4). Nevertheless, the public will pay for a COVID-19 vaccine if it does become privately available. We saw in Fig. 4 that in many countries, a significant proportion indicated a willingness to purchase it on the private market in order to receive the vaccine faster. The highest proportions of those willing to purchase privately are in low- and middle-income countries, such as Brazil, Chile, India, and Uganda. Given the emergence of companies that are gearing to supply privately (16), understanding implications for both coverage and affordability should be a priority. If COVID-19 vaccines are to be allocated privately, it will be essential to develop policies to ensure that private allocation does not jeopardize a country's ability to acquire the doses necessary for government-managed vaccination campaigns. Ideally, any private access would complement public provision to maximize the health and economic gains of vaccination and minimize the potential for corruption (38).

Successful vaccination policies for other diseases have sometimes involved incentive payments, penalties (39), or restrictions (such as refusing attendance to schools without vaccination) (20). Our survey shows that mandating COVID-19 vaccination commands considerable support in our global sample. Mandated COVID-19 vaccination, however, does polarize public opinion in a number of countries, including in the United States and the United Kingdom. In one sampled country, France, the public is overwhelmingly opposed to mandated COVID-19 vaccination. The development and communication of policies that in any way mandate COVID-19 vaccination should carefully consider the possible risk of creating a politically polarizing issue, as occurred with the wearing of masks in the United States.

Our survey finds that a very diverse set of allocation priorities is expressed by the general public. These encompass a concern for protecting the most vulnerable and reducing transmission while allowing life to return to normal and allowing productive sectors of the economy to open. These preferences could be used to help weight the multiple criteria on which to assess various vaccination strategies.

These results should help inform the ongoing debate over how COVID-19 vaccination programs should be implemented. In particular, they identify opportunities for policy makers, who have often struggled during the COVID-19 pandemic to meet their obligations to protect public health and the economy while simultaneously respecting the public will. While approaches to lockdowns have been divisive and politicized, a positive message from this study is that, with the exception of mandatory vaccination, the public has generally consistent preferences regarding vaccination programs, and these hold across political and geographic divides.

This does not mean that government vaccination programs should fully accord with public preferences. Designing optimal vaccination programs is complex; there are many externalities to consider, and there is a clear role for expert input (40). Yet, these programmatic choices incorporate important implicit value judgements, and the diversity of actual policies across countries emphasizes the scope for experts to reach different conclusions. At a minimum, governments should take stock of public opinion. Governments, acting in the public interest, may enact vaccination programs that prioritize groups differently than would the general public. It is important, however, that governments recognize these differences between policy choices and public preferences and that these differences inform their efforts to gain public acceptance of their COVID-19 vaccination programs.

Materials and Methods

Sample. The Oxford CANDOUR Project conducted online surveys of adults over 18 y of age from 13 countries. The sample of countries included Australia, Brazil, Canada, Chile, China, Colombia, France, India, Italy, Spain, Uganda, the United States, and the United Kingdom. They account for about half the global population and represent very diverse social and economic contexts. In each country, we interviewed between 1,000 and 1,500 respondents during the period 24 November 2020 to 14 January 2021.

In all but Chile and Uganda, respondents were sampled by the sampling firm, Respondi.[§§] The Respondi participants were compensated for completing the survey. For these 12 countries, the modal incentive was $3.50 for a median length of interview of 25.53 min. In Chile and Uganda, the respondents were sampled using Facebook Ad Manager (41).[¶¶] Respondents in Chile received payments of $3.00, and in Uganda, they received $2.25.

We implemented a quota strategy that generated samples that roughly matched the populations on age, education, gender, and region. Poststratification weights were constructed to account for remaining imbalances, as explained below. Among the panelists invited to take our survey, the response rate (calculated as the fraction of complete responses over invited, eligible participants) was 21.3%, averaged across all countries. The final sample included an average of 1,195 respondents per country (15,536 respondents overall). *SI Appendix* provides a detailed account of sampling and weighting procedures along with descriptive statistics for the resulting sample.

The survey was conducted according to the University of Oxford's policy for human subjects research and approved by the University of Oxford Medical Sciences Interdivisional Research Ethics Committee (approval ID: R72328/RE001). Informed consent was obtained from each participant at the beginning of the survey.

Experimental Design. A conjoint experiment was embedded at the beginning of the CANDOUR questionnaire on the theme of the COVID-19 vaccine. The experiment aimed to identify public preferences for which groups should be prioritized to receive limited available doses of COVID-19 vaccine. As an introduction to the overall survey, respondents were presented with a short definition of vaccines and how they work. Conjoint survey experiments are frequently employed to identify the importance that individuals attribute to different features or characteristics of choices (24). Examples include environmental migrants (25), asylum seekers (26), and migration destinations (27). Awad et al. (28) employed conjoint experiments that generate 40 million decisions to determine the ethical principles the public thinks should guide machine behavior.[##] We implemented a standard fully randomized paired profiles conjoint design (*SI Appendix*, Fig. S1 shows an example) in which each respondent was shown profiles of two different hypothetical vaccine recipients displayed side by side (42). 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 the population would make in real-world decisions, such as referendums (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 that are being used or have been proposed as being important criteria for vaccine allocation.

Outcomes. As *SI Appendix*, Fig. S1 indicates, respondents were shown two potential vaccine recipients (Person A and Person B). Respondents were first asked to choose which of the potential recipients should receive the COVID-19 vaccine immediately. The resulting choice outcome variable has a value of one for the preferred profile and zero for the profile that was not selected. *SI Appendix*, Table S2 presents the attributes and summarizes the distribution of the randomly assigned attribute values for the global sample (the wording matches the English versions of the survey that were administered in Australia, Canada, India, Uganda, the United Kingdom, and the United States).

Survey Text. The conjoint experiment is the first section of the survey. The experiment had a prelude introducing the vaccine allocation policy issue. Respondents were then informed of the profile attributes. Following this, respondents were asked a series of questions in which they were presented with a pair of profiles. In each question, they were asked to choose between the two profiles and then, to evaluate the extent to which their selected profile should be prioritized on a seven-point Likert scale. The wording of the items is as follows.

Prelude. Across the world, COVID-19 has infected tens of millions; killed more than 1 million; and resulted in loss of jobs, school closures, and overall economic loss. A vaccination would prevent people from being affected by the virus. It is like the flu vaccine. Some people who get the vaccine could still get COVID-19 because it is not 100% effective, the protection could last a few months or for years, and it could have side effects. Once a reliable COVID-19 vaccine is available, health officials will give some individuals priority over others. Some individuals will get the COVID-19 vaccine immediately, and other individuals will have lower priority. We are interested in your opinion about these decisions. In the next screens, you will be shown two individuals (Person A and Person B) who have different characteristics that are related to COVID-19. When each screen comes up, you will be asked to choose the person (Person A or Person B) who should get the COVID-19 vaccine immediately. You will be provided with five characteristics for each individual, Person A and Person B. These five characteristics are the following: if infected, the person's risk of COVID-19–related death compared with an average person; the person's risk of catching and transmitting the COVID-19 virus; the income level of the person; the occupation status of the individual; and the age category of the person. We would like you to indicate which of the two persons (Person A or Person B) should have priority and receive the vaccine immediately.

Questions.

1) (Choice) As you can see, each of the persons (Person A and Person B) differs on our five characteristics: risk of COVID-19–related death, risk of catching and transmitting the COVID-19 virus, income level, occupation status, and age category. This vaccine could be given to one of these persons (Person A or Person B) immediately. Please indicate the person you think should get the vaccine immediately. Which of the persons do you think should get the vaccine immediately? Select one of them: Person A or Person B.

[§§] Further information on Respondi is available at https://www.respondi.com/EN/.

[¶¶] The recruitment advertisement is available with the replication materials available on Harvard Dataverse (https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/PMV0TG).

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

2) (Rating) Person A. On a scale from one to seven, where one indicates that you think Person A should get very low priority for the vaccine and seven indicates that you think Person A should get very high priority for the vaccine, what vaccine priority would you give Person A?

The survey instrument included a number of different themes in addition to the conjoint experiment. A full version of the survey instrument is available with the replication materials available on Harvard Dataverse (https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/PMV0TGhttps://doi.org/10.7910/DVN/PMV0TG). Here, we present the wording of the questions presented in Fig. 4.

- Talking about vaccines in general, in some countries vaccines are only available from the government either at low or no cost. In some countries, vaccines are only available for private purchase. Additionally, in some countries, vaccines are available from the government, but citizens can pay privately to gain early access. Which of these three approaches do you think should be applied to the COVID-19 vaccine? Would you prefer
  –vaccines only made available by the government at low or no cost?
  –vaccines only available for private purchase?
  –vaccines made available by the government but citizens can pay privately to gain access?
- Consider the following situation. A COVID-19 vaccine becomes available and is provided by government health agencies. For 80 of 100 people, the vaccine would provide protection for at least 18 mo. However, there are limited initial supplies of the vaccine. For this reason, you would have to wait 6 mo before you could receive it. If a COVID-19 vaccine was also available for private purchase and you could receive it immediately, would you considering buying it?
  –Yes
  –No
  –Do not know
- We are interested in your opinion about the implementation of the COVID-19 vaccine after it is available. Please use the sliding scale to indicate how much you agree or disagree with the statements. You can move the pointer from 0, which means very much disagree, to 100, which means very much agree.
  –The government should make the COVID-19 vaccine mandatory for everybody.

Survey Translations. The survey was translated from English into five languages: Chinese, French, Italian, Spanish, and Portuguese. These translations were conducted by professional translators. They were reviewed by a number of native speakers. They were then translated back to English.

Statistical Analysis. The 15,536 respondents from the 13-country sample viewed eight pairs of vaccine allocation profiles and made a forced choice (i.e., there was no opt-out option). This generated 248,576 profile evaluations. Our goal in the multivariable modeling of these dichotomous outcomes was simply to identify which of the attribute values were more (or less) likely to cause respondents to select a particular profile. We report in the text the AMCEs of each attribute on respondents' choice of a vaccine allocation priority, which we were able to identify due to the total random assignment of attribute values across all profiles and respondents (42). To estimate these AMCEs, we employed linear least squares regression. We regressed the forced vaccine allocation priority choice on sets of indicator variables that represent the values of each attribute while omitting one level of each attribute as the reference category. SEs are clustered by respondent in the individual country models and by country in the pooled, heterogeneous effects models. We also estimated the same forced choice model employing logistic regression—these regressions generated substantively identical results to those from the ordinary least squares regressions reported in the manuscript. The R code for estimating the logistic regression models is supplied in the replication materials available on Harvard Dataverse (https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/PMV0TG).

Data Availability. All data, code, and other materials required to reproduce the results fully are publicly available at Harvard Dataverse, https://dataverse.harvard.edu/citation?persistentId=doi:10.7910/DVN/PMV0TG (43). Previously published data were used as part of this work (33).

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1. E. Mahase, COVID-19: Vaccine candidate may be more than 90% effective, interim results indicate. *BMJ* **371**, m4347 (2020).
2. A. Majeed, M. Molokhia, Vaccinating the UK against COVID-19. *BMJ* **371**, m4654 (2020).
3. J. L. Schwartz, Evaluating and deploying COVID-19 vaccines—The importance of transparency, scientific integrity, and public trust. *N. Engl. J. Med.* **383**, 1703–1705 (2020).
4. E. J. Emanuel *et al*., An ethical framework for global vaccine allocation. *Science* **369**, 1309–1312 (2020).
5. World Health Organization, *WHO SAGE Values Framework for the Allocation and Prioritization of COVID-19* (World Health Organization, Geneva, Switzerland, 2020).
6. World Health Organization, *WHO SAGE Roadmap for Prioritizing Uses of Covid-19 Vaccines in the Context of Limited Supply Version 1.1* (World Health Organization, Geneva, Switzerland, 2020).
7. Department of Health and Social Care, United Kingdom Government, Priority groups for coronavirus (COVID-19) vaccination: Advice from the JCVI, 30 December 2020 (Independent Rep., United Kingdom Government, London, United Kingdom, 2020). https://www.gov.uk/government/publications/priority-groups-for-coronavirus-covid-19-vaccination-advice-from-the-jcvi-30-december-2020/joint-committee-on-vaccination-and-immunisation-advice-on-priority-groups-for-covid-19-vaccination-30-december-2020. Accessed 9 June 2021.
8. J. Cohen, CDC advisory panel takes first shot at prioritizing who gets the first shots of COVID-19 vaccines. Science, 1 December 2020. https://www.sciencemag.org/news/2020/12/cdc-advisory-panel-takes-first-shot-prioritizing-who-gets-first-shots-covid-19-vaccines. Accessed 9 June 2021.
9. J. Abelson *et al*., Public and patient involvement in health technology assessment: A framework for action. *Int. J. Technol. Assess. Health Care* **32**, 256–264 (2016).
10. A. M. Scott, J. L. Wale; HTAi Patient and Citizen Involvement in HTA Interest Group, Patient Involvement and Education Working Group, Patient advocate perspectives on involvement in HTA: An international snapshot. *Res. Involv. Engagem.* **3**, 2 (2017).
11. J. Lenaghan, B. New, E. Mitchell, Setting priorities: Is there a role for citizens' juries? *BMJ* **312**, 1591–1593 (1996).
12. J. A. Whitty, E. Lancsar, K. Rixon, X. Golenko, J. Ratcliffe, A systematic review of stated preference studies reporting public preferences for healthcare priority setting. *Patient* **7**, 365–386 (2014).
13. K. Subbarao, World view. *Nature* **586**, 475 (2020).
14. S. E. Gollust, B. Saloner, R. Hest, L. A. Blewett, Us adults' preferences for public allocation of a vaccine for coronavirus disease 2019. *JAMA Netw. Open* **3**, e2023020–e2023020 (2020).
15. S. Tubeuf, R. Kessels, Who should get it first? Public preferences for distributing a COVID-19 vaccine. *Covid Economics* **57**, 1–20 (2020).
16. S. Findlay, COVID vaccines will be available for private purchase in India. *Financial Times*, 6 December 2020. https://www.ft.com/content/224b13fb-1d7d-4250-a6c6-1535b30496bc. Accessed 9 June 2021.
17. C. Cookson, A. Gross, S. Neville, Health chiefs rule out private sector jumping vaccine. *Financial Times*, 2 December 2020. https://www.ft.com/content/1b8def75-9b44-4a62-991e-2711b5c578c2. Accessed 9 June 2021.
18. M. Paterlini, COVID-19: Italy makes vaccination mandatory for healthcare workers. *BMJ* **373**, n905 (2021).
19. A. Giubilini, An argument for compulsory vaccination: The taxation analogy. *J. Appl. Philos.* **37**, 446–466 (2020).
20. J. Kramer, COVID-19 vaccines could become mandatory. Here's how it might work. Nat*ional* Geog*raphic*, 19 August 2020. https://www.nationalgeographic.com/science/article/how-coronavirus-covid-vaccine-mandate-would-actually-work-cvd. Accessed 9 June 2021.
21. Euronews, How a court ruling lays the ground for mandatory covid 19 vaccination. *Euronews*, 22 April 2021. https://www.euronews.com/2021/04/13/how-a-court-ruling-lays-the-ground-for-mandatory-covid-19-vaccination. Accessed 9 June 2021.
22. C.L. Palmer, R.D. Peterson, Toxic mask-ulinity: The link between masculine toughness and affective reactions to mask wearing in the COVID-19 era. *Polit. Gend.* **16**, 1–14 (2020).
23. J. V. Lazarus *et al*., COVID-SCORE: A global survey to assess public perceptions of government responses to COVID-19 (COVID-SCORE-10). *PLoS One* **15**, e0240011 (2020).
24. P. E. Green, V. R. Rao, Conjoint measurement for quantifying judgmental data. *J. Mark. Res.* **8**, 355–563 (1971).

25. G. Spilker, V. Koubi, T. Böhmelt, Attitudes of urban residents towards environmental migration in Kenya and Vietnam. *Nat. Clim. Chang.* **10**, 622–627 (2020).
26. K. Bansak, J. Hainmueller, D. Hangartner, How economic, humanitarian, and religious concerns shape European attitudes toward asylum seekers. *Science* **354**, 217–222 (2016).
27. R.M. Duch, D. Laroze, C. Reinprecht, T.S. Robinson, Nativist policy: The comparative effects of Trumpian politics on migration decisions. *Polit. Sci. Res. Methods* **100**, 1–17 (2020).
28. E. Awad *et al*., The moral machine experiment. *Nature* **563**, 59–64 (2018).
29. L. F. Beiser-McGrath, T. Bernauer, Could revenue recycling make effective carbon taxation politically feasible? *Sci. Adv.* **5**, eaax3323 (2019).
30. J. Hainmueller, D. Hangartner, T. Yamamoto, Validating vignette and conjoint survey experiments against real-world behavior. *Proc. Natl. Acad. Sci. U.S.A.* **112**, 2395–2400 (2015).
31. M. M. Bechtel, K. F. Scheve, Mass support for global climate agreements depends on institutional design. *Proc. Natl. Acad. Sci. U.S.A.* **110**, 13763–13768 (2013).
32. K. Bansak, M. M. Bechtel, M. Yotam, Why austerity? The mass politics of a contested policy. *Am. Polit. Sci. Rev.* **115**, 486–505 (2021).
33. D. Kaufmann, A. Kraay, Worldwide governance indicators. World Bank (2021). https://info.worldbank.org/governance/wgi/Home/Documents#doc-intro. Accessed 8 June 2021.
34. A. Gollwitzer *et al*., Partisan differences in physical distancing are linked to health outcomes during the COVID-19 pandemic. *Nat. Hum. Behav.* **4**, 1186–1197 (2020).
35. P. M. Clarke *et al*., Public opinion on global rollout of COVID-19 vaccines. *Nat. Med.* **27**, 935–936 (2021).
36. N. W. Papageorge *et al.*, Socio-demographic factors associated with self-protecting behavior during the Covid-19 pandemic. *J. Popul. Econ.* **34**, 691–738 (2021).
37. J. V. Lazarus *et al*., A global survey of potential acceptance of a COVID-19 vaccine. *Nat. Med.* **27**, 225–228 (2021).
38. J. C. Kohler, T. Wright, The urgent need for transparent and accountable procurement of medicine and medical supplies in times of COVID-19 pandemic. *J. Pharm. Policy Pract.* **13**, 58 (2020).
39. B. P. Hull, F. H. Beard, A. J. Hendry, A. Dey, K. Macartney, "No jab, no pay": Catch-up vaccination activity during its first two years. *Med. J. Aust.* **213**, 364–369 (2020).
40. L. S. J. Roope *et al*., How should a safe and effective COVID-19 vaccine be allocated? Health economists need to be ready to take the baton. *Pharmacoeconom. Open* **4**, 557–561 (2020).
41. B. Zhang *et al*., Quota sampling using Facebook advertisements. *Political Sci. Res. Methods* **8**, 558–564 (2020).
42. J. Hainmueller, D. J. Hopkins, T. Yamamoto, Causal inference in conjoint analysis: Understanding multidimensional choices via stated preference experiments. *Polit. Anal.* **22**, 1–30 (2014).
43. R. Duch *et al.*, Replication data for: "Citizens from 13 countries share similar preferences for COVID-19 vaccine allocation priorities." Harvard Dataverse. https://dataverse.harvard.edu/citation?persistentId=doi:10.7910/DVN/PMV0TG. Deposited 25 August 2021.