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Global COVID-19 vaccine inequity: Preferences for overseas vaccine donations over booster shots

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ABSTRACT

As the supply of COVID-19 vaccines to low-income countries (LICs) remains limited, governments of high-income countries face a trade-off between domestic containment through booster shots and global containment by helping LICs acquire first doses ("vaccine nationalism" vs "vaccine internationalism"). We provide empirical evidence on how residents of a high-income country view this ethical dilemma by surveying 1527 UK adults recruited online. Support for vaccine donations to LICs is high. On average, study participants chose to donate 65% of UK's COVID-19 vaccines, which were ordered for booster shots, to LICs. Holding all other factors constant, women, younger individuals, and those who are not fully vaccinated preferred to donate a larger percentage to LICs. The UK public's preferences for prioritizing vaccine donations over booster shot programs suggest broad support for national policies that strike a balance between domestic containment and global philanthropy.

1. Introduction

The global distribution of COVID-19 vaccines is highly unequal. While most adults in high-income countries (HICs) have been fully vaccinated, as of February 17, 2022, only 10.6% of people in low-income countries (LICs) have had at least one COVID-19 vaccine dose (Ritchie et al., 2020). The constraints on producing and distributing COVID-19 vaccines in 2021, such as the limited supply of essential inputs and manufacturing infrastructure (Feinmann, 2021; Wouters et al., 2021), mean that countries without existing deals with vaccine manufacturers will face a long wait. As of January 2022, LICs have only received 1% of the global vaccine supply and predictions from mid-2021 indicate that LIC residents may not receive a COVID-19 vaccine until early 2023 (Padma, 2021; Yamin, 2022).

In response to the highly transmissible delta variant, France, Germany, Israel, and many Middle Eastern countries started giving booster shots (an additional dose to fully vaccinated people) in summer 2021 (Schaefer et al., 2021), followed by other HICs, such as the US and UK, in late 2021. Given findings on the efficacy of boosters in protecting against new variants (Bar-On et al., 2021; Garcia-Beltran et al., 2022) and declining immunity among the fully vaccinated (Tartof et al., 2021; Levin et al., 2021), several other countries implemented booster programs, and some countries are considering an additional booster in late 2022 (Iacobucci, 2022).

The decision to offer booster shots while LICs struggle to secure enough first doses for their populations is controversial. Given the unequal global distribution of COVID-19 vaccines, "vaccine nationalism" – a "my country first" approach (Bollyky and Bown, 2021) where governments unilaterally secure vaccines for their own populations, to the detriment of other countries (Gruszczynski and Wu, 2021) – is a key issue in this vaccine allocation debate. In August 2021, the World Health Organization (WHO) issued a statement advocating "vaccine internationalism", where vaccines are distributed internationally according to need, such as through the WHO's COVAX program (Vanderslott et al., 2021). Governments of HICs therefore face a trade-off between domestic containment through booster shots, and global containment by helping LICs acquire first doses (Wouters et al., 2021; Callaway, 2021). This decision has political and public health implications (Fidler, 2020), so understanding domestic support for booster shot programs versus international donations is important (Clarke et al., 2021).

This study contributes to the growing debate on vaccine nationalism by providing empirical evidence on how residents of a HIC (the UK) view this ethical and public health dilemma. We measure public preferences over booster shots for domestic use versus vaccine donations to LICs. We then investigate how support for donations varies with various individual-level factors including pro-social motivations, perceived need for vaccines, and perceived efficacy of booster shots and global donation policies for COVID-19 containment.

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2. Methods

2.1. Data

We collected survey data in late August 2021, when 76.4% of the UK population aged 16 and over were fully vaccinated (UK Government, 2021), while only 1.3% of LIC residents had received at least one vaccine dose (Ritchie et al., 2020). The UK's booster shot program details had not been confirmed, but it was a prominent topic of discussion, with several media outlets reporting on the government's purchase of 60 million extra Pfizer-BioNTech vaccine doses for booster shots (BBC Visual and Data Journalism Team, 2021). Supplementary Appendix, Sections 1 and 2 provide more details about our data collection.

We used the survey platform Prolific to recruit 1527 individuals who were over 18 and were normally resident in the UK (defined as usually living in the UK for 6 or more months per year). Prolific is a reputable survey company used primarily by academic researchers, and has been shown to deliver higher or comparable data quality compared to in-person data collection methods or similar platforms such as MTurk (Palan and Schitter, 2018; Peer et al., 2016). To improve the generalizability of our results, we used Prolific's "representative sample" feature, which recruits a sample of study participants that matches the gender, age, and ethnic composition of the UK population (Prolific Team, 2022).

This project was approved by the Institutional Review Board at Oxford University (approval code ECONCIA 21-22-08). All study participants provided written informed consent to take part in the study, on the first screen on our online survey. We preregistered our analysis plan on AsPredicted.org (https://aspredicted.org/387_51Y).

2.2. Measuring preferences over vaccine distribution

The preferred distribution of COVID-19 vaccines between the UK and LICs was measured as the percentage of the UK's COVID-19 vaccines, ordered for use in late 2021, that should be donated to a LIC instead of being used as booster shots for fully vaccinated UK residents.

Study participants were told that the UK government had already ordered 60 million Pfizer-BioNTech vaccines for booster shots in late 2021 (BBC Visual and Data Journalism Team, 2021), and were then asked the following question: "Suppose you could choose how to distribute these 60 million vaccine doses between (a) a randomly selected group of individuals living in a low-income (COVAX recipient) country, all of whom have not received their first shot, and (b) a randomly selected group of UK residents who are fully vaccinated (received both shots). How would you choose to distribute these vaccines between groups (a) and (b)?"

Study participants used a slider to indicate their choice, ranging from 0% to 100%. To minimize potential biases from the framing of the question, half of the study participants were shown a slider where 100% meant all vaccines were donated, and half of the study participants were shown a slider where 100% meant all vaccines were kept in the UK as booster shots.

Given the prominence of vaccine nationalism in the current policy and media debates, we focused on the domestic versus international dimension rather than the time dimension (have a booster shot now versus later). This framing is consistent with that of previous studies on public support for vaccine donations (Clarke et al., 2021; Institute of Global Health Innovation, 2021), which also focus on a single aspect of the policy debate, but a crucial difference is that our measure is continuous rather than binary, allowing us to investigate sources of variation in preferences for vaccine distribution.

2.3. Covariates

We examine how preferred distribution of vaccines is correlated with the following covariates:

- **Socio-demographic characteristics.** Age, gender, ethnicity, educational attainment, and monthly before-tax income. These characteristics are strongly correlated with COVID-19-related behaviors such as vaccine uptake (Robertson et al., 2021).
- **Other factors that affect an individual's protection against COVID-19.** Previously confirmed COVID-19 infection via PCR test, being in a vaccine priority group, number of vaccine doses received (all approved vaccines in the UK require two doses).
- **Attitudes towards COVID-19 policies.** The extent to which the study participant agrees that COVID-19 is a global rather than a national problem, and opinions about which policy (vaccine donations or booster shots) will be more effective in containing COVID-19 in the UK, and globally.
- **Preferences for equality.** The extent to which study participants prefer equal allocations over economically efficient allocations (inequality aversion) (Engelmann and Strobel, 2004), and care about and trust foreign strangers as much as domestic strangers (foreign universalism) (Enke et al., 2021).
- **Risk and time preferences.** Study participants' general willingness to take risks (risk tolerance) and forego current benefits for greater future benefits (patience) (Falk et al., 2018). These measures have been experimentally validated and robustly tested on representative samples of the population worldwide to ensure they are reliable and accurate predictors of actual behavior, such as choices over lotteries with real stakes, and choices over early or delayed real payments, respectively (Falk et al., 2018).

Supplementary Appendix, Section 3.2-3.7 contains full details about the definition and construction of these variables. Supplementary Appendix, Section 3.1 contains a link to the survey questions used to measure these covariates.

2.4. Regression specification

Our regression specification investigates predictors of vaccine donation to LICs, D_i, measured as a percentage from 0 to 100:

$$D_i = \alpha + \gamma' \boldsymbol{B}_i + \delta' \boldsymbol{S}_i + \varepsilon_i$$

$\boldsymbol{B}_i$ is a vector of binary variables indicating study participants' demographics and protection from COVID-19; $\boldsymbol{S}_i$ is a vector of standardized variables (original variables rescaled to have a mean of 0 and standard deviation of 1), defined in Section 2.3: attitudes towards COVID-19 policies, foreign universalism, inequality aversion, risk tolerance, and patience. We standardize these variables to account for differences in measurement scales and facilitate interpretation of regression coefficients. All analyses use robust standard errors to construct 95% confidence intervals.

2.5. Data and code availability

Data and code supporting the findings of this study are available at https://tinyurl.com/2d9n5ndt.

Re-weighted analyses use weights constructed from the UK's Understanding Society Survey, provided by the UK Data Service (https://beta.ukdataservice.ac.uk/datacatalogue/studies/study?id=6614).

This study uses analytical techniques standard in all statistical packages.

3. Results

3.1. Participant characteristics

We surveyed a demographically diverse group of UK residents aged 18 and above. Of the 1627 UK adults recruited by Prolific, 1527 consented to begin the survey and completed the full questionnaire. Table S1
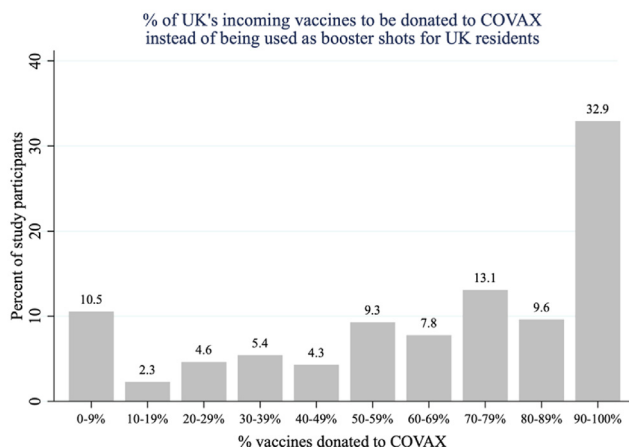
Fig. 1. Distribution of preferred vaccine donations to a LIC.

(Supplementary Appendix, Section 4) shows that this group closely matches the age, gender, and ethnic composition of the UK population, but is more educated on average. Among our study participants, 51% were female and 85% were white, compared to 51% and 88% respectively.

3.2. Vaccine distribution preferences

Fig. 1 shows that support for vaccine donations to LICs among study participants is generally high. On average, study participants chose to donate 65% of COVID-19 vaccines, ordered for booster shots, to LICs. The median percentage of vaccines that study participants were willing to donate is even higher at 72%. However, there is substantial variation in opinions: 1 in 3 participants chose to donate 90% or more of these vaccines, while 1 in 10 chose to donate fewer than 10% of these vaccines.

3.3. Variation in preferred vaccine distribution

The preferred distribution of COVID-19 vaccines varies with covariates (Fig. 2). Full regression results are presented in Table S2 (Supplementary Appendix, Section 4).

On average, preferred vaccine donations were nearly 5 percentage points (pp) higher for female study participants compared to male study participants ($p < 0.01$). The preferred percentage of vaccines donated to LICs was also higher, on average, among participants who strongly believe that COVID-19 is a global rather than national problem (3.10pp, $p < 0.01$), believe that COVAX donation is more effective in containing COVID-19 than booster shots, both globally (8.00pp, $p < 0.001$) and in the UK (6.42pp, $p < 0.001$), care about or trust people living outside the UK as much as UK residents (4.48pp, $p < 0.001$), or are more inequality averse (1.71pp, $p < 0.05$).

In contrast, fully vaccinated or older study participants were less supportive of vaccine donation: compared to study participants aged
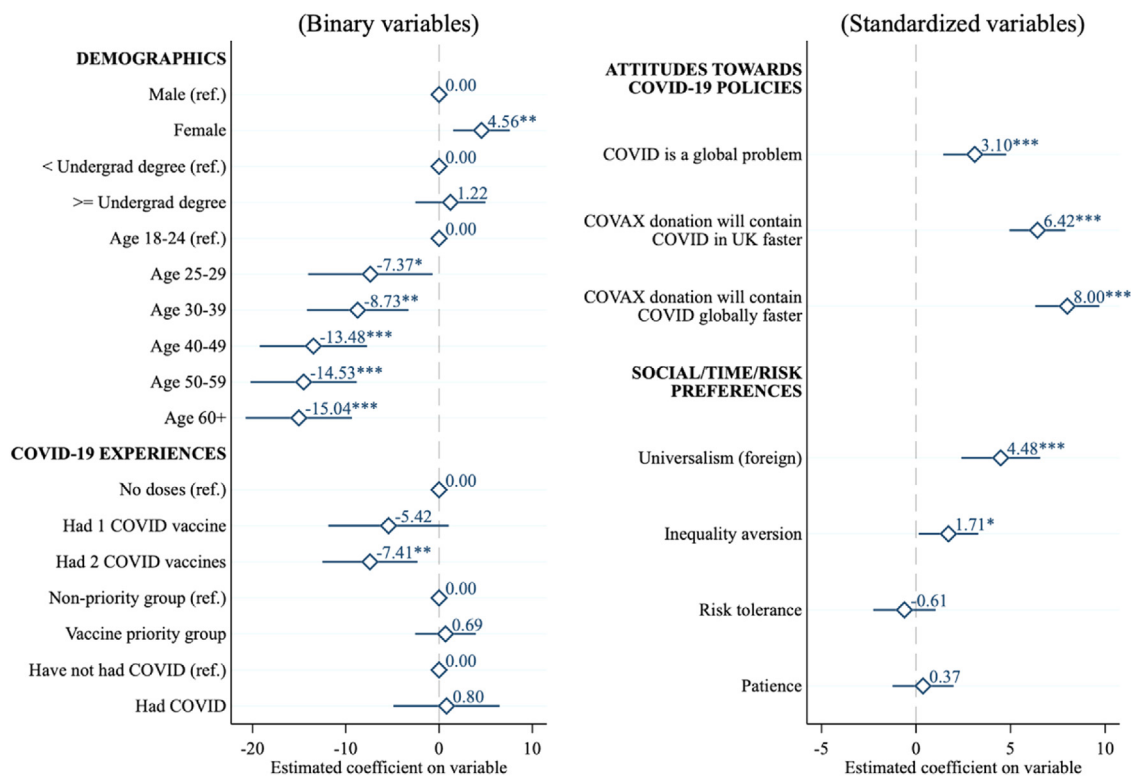

Fig. 2. Estimated coefficients from a regression of percentage of vaccines donated to LICs on the variables shown and the following controls: binary indicator for "other" gender, indicators for 4 ethnicity groups, and indicators for 12 monthly income groups. For binary variables, coefficients represent the percentage-point difference in preferred donations for individuals with that characteristic, compared with the reference group ('ref.'). For standardized variables, coefficients represent the percentage-point change in preferred donations associated with a one-standard-deviation-increase in the respective variable. This regression includes a constant and uses robust standard errors. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

18–24, on average, the preferred percentage of vaccines donated was 13–15 percentage points lower among study participants aged 40 and above ($p < 0.001$). Our findings are robust to re-weighting our group of study participants to account for over-representation of more-educated people compared to nationally representative data (Supplementary Appendix, Section 4).

4. Discussion

Given the vast vaccine inequality between HICs and LICs, the allocation of vaccines between booster programs and donations is a prominent policy concern. The WHO clearly states that first doses to LICs should be the global priority, and modelling studies indicate that this strategy would prevent COVID-19 deaths and the emergence of new variants (Hogan et al., 2020; Ye et al., 2022). In contrast, vaccine nationalism can seriously affect GDP even in countries that achieve universal vaccination, due to disruptions in trade with countries with lower vaccination rates (Çakmaklı et al., 2021; Hafner et al., 2020). However, it is unclear what residents of HICs think about this trade-off.

Our study indicates that most UK residents support COVID-19 vaccine donations, though support varies with demographic characteristics, preferences about global equality, and perceived effectiveness of COVAX donations in containing COVID-19. Preferred vaccine donations decrease with age, possibly because older people are at higher risk of severe illness or death if infected with COVID-19, even controlling for other risk factors (Ho et al., 2020).

Our findings are consistent with earlier studies on support for vaccine donations in HICs (Clarke et al., 2021; Duch et al., 2021), and with studies on the importance of pro-social motivations in COVID-19-related behaviours (Heffner et al., 2021; Jordan et al., 2021). Studies conducted in late 2020, when COVID-19 vaccines were not yet widely available, found that when donation was presented as a binary choice, 78% of UK study participants were willing to donate their booster shot to LICs if an antibody test showed the participant was sufficiently protected against COVID-19 (Institute of Global Health Innovation, 2021). When donation was presented as a specific percentage of vaccines ($<10\%$, 10%, or $>10\%$), 51% of UK study participants were willing to donate any of these amounts (Clarke et al., 2021).

Our findings show that the UK public generally supports the WHO's view that vaccine donations should be prioritized over booster shot programs. Ensuring a more equal global vaccine distribution should therefore be the goal of HICs. National policies that strike a balance between domestic containment and global philanthropy may have broader support compared to a vaccine nationalism approach. For example, vaccine donations can be combined with targeted domestic booster shot programs aimed at those with the highest marginal benefits from an additional dose, such as the immunocompromised (Feinmann, 2021; Bollyky and Bown, 2021).

Our study has some limitations. First, our quantitative survey questions do not capture all the possible factors that affect vaccine donation preferences, so qualitative data is needed to better understand public opinion. Second, our survey was only accessible to users on a specific platform (Prolific), whose vaccine donation attitudes may systematically differ from non-users. Third, the emergence of the omicron variant in late 2021 may have changed public opinion on vaccine nationalism, so a follow-up survey is recommended. Finally, further cross-country research is required to assess whether our findings generalize beyond the UK public.

Author contributions

I.L. and E.T. designed research methods, performed research, analyzed data, and wrote the paper. The authors contributed equally to this work.

Declaration of competing interest

None.

Acknowledgments

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.bbih.2022.100447.

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