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Essential for society but not equally deserving of preferential treatment? A discrete-choice experiment regarding COVID-19 healthcare

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ABSTRACT

Workers' risks of contracting COVID-19 vary according to individual behaviors, occupations and job characteristics. Therefore, persons may consider different groups of workers more or less deserving of COVID-19 healthcare. To evaluate such preferences, we conducted an online conjoint experiment on the precedence of ICU treatment and COVID-19 vaccination. Our results demonstrate that working in essential occupations increases the likelihood of being considered deserving of vaccination and ICU treatment. We also find differences in how essential workers are prioritized, yet these differences cannot be clearly attributed to risk exposure or occupational prestige. Furthermore, we show that age, asthma, household context and compliance with COVID-19 measures significantly affect respondents' choices, while weight matters only for vaccination priority. Our results therefore contribute to research regarding the characteristics that are salient to fair distributions of scarce resources among workers during a health crisis.

1. Introduction

Over the course of the COVID-19 pandemic, policy-makers have had to weigh the costs and benefits of measures to contain the pandemic while considering the needs of different interest groups. An important aspect of this is how scarce resources are distributed in the healthcare sector. During the beginning of the pandemic, there was widespread concern that hospitals would be overwhelmed by the number of patients in need of treatment for severe COVID-19 symptoms. Given the associated crises in hospitals, several European societies for intensive care published triage recommendations to aid medical decision-makers to address scarcities in intensive care treatment (see Ehni et al. (2021) for an overview).

Similar decisions had to be made when vaccination campaigns were initiated in late 2020, since the supply of COVID-19 vaccines was not sufficient to immediately meet demand. In response to this, most countries implemented prioritization strategies, giving precedence to those at highest risk of suffering from severe symptoms of COVID-19 (e.g., elderly individuals) or holding essential positions in society (e.g., healthcare workers; see ECDC (2021) for an overview of vaccination prioritization strategies in EU/EEA countries).

Notably, the political legitimacy of such far-reaching and ethically difficult decisions entails that they receive broad public support (Bridges et al., 2011; Reeskens et al., 2021; Silva et al., 2012). The sociological and social policy literature argues that it is important for state policies to be seen as legitimate and accepted (Liebig and Sauer, 2016; Sachweh, 2016; Rothstein, 1998) and that perceptions of reciprocity and fairness play an important role in this context (Mau, 2004). It is argued that open, transparent decision-making by the state is important to maintain compliance with policy measures. Further, it is vital to include affected stakeholders to ensure public trust, especially during rare events such as pandemics (Emanuel et al., 2020; Norheim et al., 2021). Otherwise, collective efforts to contain the pandemic might fail because the public no longer supports introduced measures (e.g., contact restrictions or quarantine orders). For example, Bargain and Aminjonov (2020) find that mobility was significantly reduced in regions with high political trust during the first lock-down period and that the reduction was especially pronounced in non-necessary activities. Yuan et al. (2022) find an inverse relationship between institutional trust and COVID-19 case fatality. Thus, considering the opinion of the general population in the decision-making process and also understanding the aspects that the public considers important when distributing scarce resources is highly relevant, especially when discussing future crises.

Accordingly, we use a discrete-choice experiment (DCE; synonymously: conjoint experiment) to investigate the criteria that impact decisions regarding (a) who should receive intensive care treatment first

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or (b) who should be vaccinated first. The DCE is part of a high-frequency online person panel ("HOPP") established at the Institute for Employment Research (IAB) in Germany. The design of our DCE is similar to those of Reeskens et al. (2021), Larsen and Schaeffer (2021) and Stoetzer et al. (2021). However, while those studies focus on a general population, we analyse how respondents prioritize different types of *workers* with different social positions in a labor market. These workers differ in terms of their occupational exposure to COVID-19. We investigate this particular aspect and evaluate whether occupational prestige is an important driver of perceived "deservingness".

The paper is structured as follows: **Section 2** describes our theoretical approach and hypotheses. **Section 3** presents our method and the data. **Section 4** discusses our empirical findings. **Section 5** concludes the study.

2. Theoretical considerations and hypotheses

There exists a plethora of allocation principles for scarce healthcare resources, and no single principle can be characterized as inherently sufficient and/or completely "just" (Persad et al., 2009). Some criteria are treating people equally, prioritizing the most impacted individuals, maximizing total "benefits" and supporting "social worth" or "social usefulness". However, no scientific allocation decision is completely free of value judgements.

We use the deservingness approach as theoretical framework and supplement it with fairness considerations. Building on previous work (e.g., Cook, 1979), the deservingness approach addresses the following questions: (1) how worthy are different social groups to receive institutional support (in this context: a health system)? and (2) what criteria are these decisions based on? The so-called CARIN model (Meuleman et al., 2020; van Oorschot, 2000; van Oorschot et al., 2017)—an acronym for the first letters of these criteria—summarizes five important criteria:

(1) The perceived degree of *control* over the occurrence of or overcoming a situation: the less perceived control, the more deserving certain persons or groups are and vice versa.
(2) *Attitude* is the level of gratitude for or compliance with necessary measures. A "better" attitude, increased humility or a high degree of compliance makes people more deserving than those who exhibit noncompliant or defective behaviors.
(3) *Reciprocity* reflects the perceived extent to which people "give" something to society in return for solidarity with others. The more they give or have given in the past, the more deserving they are. Following Meuleman et al. (2020), reciprocity echoes the concept of equity, which underlies most social insurance schemes.
(4) *Identity* refers to perceived group membership: being an "insider" makes people more deserving than "outsiders".
(5) Perceived *need* is associated with special conditions, such as physical handicaps and mental health problems, or with certain factors, such as having relatives in need of care or young children. Need is especially relevant in a public health context (Reeskens et al., 2021; van der Aa et al., 2017). The needier a person, the more deserving he or she is.

Heuer and Zimmermann (2020) recently added a sixth criterion, *social investment,* referring to potential future gains of investments. The higher these returns are, the more deserving an individual is. The underlying assumption of the deservingness approach is that people use these criteria as heuristics in their judgements, especially when no other information is available (Larsen and Schaeffer, 2021; van Oorschot, 2000).

Regarding labor market-related risks, the burdens associated with COVID-19 vary considerably among different industries, occupations and job characteristics. Zhang (2021) shows that disease exposure and physical proximity can predict almost half of the prevalence variance in an occupational context. High-risk occupations are in the healthcare sector but workers in non-healthcare jobs are also vulnerable. Mutambudzi et al. (2021) show that relative to nonessential workers, healthcare, social and education workers, especially medical support staff and social care and transport workers, have a higher risk of severe COVID-19 courses. In addition, most essential positions cannot be performed remotely. Bauer et al. (2021) find that occupational risk factors such as contact with infected people, close physical proximity or frequent use of disinfectants are associated with a higher probability of COVID-19 infection.

First, exposure to medical risks entails a high level of *need*. Second, workers in healthcare and many essential non-healthcare jobs are important to maintain critical infrastructure, yet these workers face disadvantages including low pay or unfavorable working conditions, such as shift work (Koebe et al., 2020). This suggests high *reciprocity*. As Persad et al. (2009) argue, prioritizing essential workers "does not treat them as counting for more in themselves, but rather prioritizes them to benefit others". This is also a form of rewarding "social usefulness". In their study of patient triage dilemmas, Wilkinson et al. (2020) find that respondents indicate a higher willingness to give precedence to healthcare workers and to patients with young children. Reeskens et al. (2021) and Stoetzer et al. (2021) find that respondents prioritize individuals working in essential sectors for both vaccination and intensive care treatment.

Third, some occupations in essential sectors are associated with low or average occupational prestige (de Camargo and Whiley, 2020). Due to high risks of exposure, reciprocities based on high job relevance and occupational prestige are not theoretically and empirically mutually exclusive; rather, they overlap with each other. Including different combinations of need, reciprocity and occupational status may help identify what drives preferences for prioritizations.

Accordingly, we select different occupations that vary in risk exposure, occupational prestige and relevance for society. For an empirical measure of risk exposure, we rely on Magnusson et al. (2021), discussing occupational risks of COVID-19 infection during the first pandemic wave. The International Socio-Economic Index (ISEI; see Ganzeboom et al., 1992) is a common index used in the literature on occupational status. Following this literature, we use the ISEI as a proxy for occupational status (see section 3 for our empirical strategy):

- Supermarket cashier (low exposure, low prestige)
- Bus driver (high exposure, low prestige)
- Office worker (low exposure, average prestige)
- Nurse (high exposure, average prestige)
- Teacher (low exposure, high prestige)

H1a. Respondents prefer that workers with a high risk of exposure and high perceived reciprocity are vaccinated before others.

H1b. Respondents prefer that workers with a high risk of exposure and high perceived reciprocity receive intensive care before others.

Currently, it is common knowledge that older people have an increased risk of a severe course of COVID-19, even after controlling for comorbidities (Romero Starke et al., 2020). This higher risk is associated with a higher level of *need*. Older workers have, on average, contributed to social securities, such as unemployment and health insurance, for longer periods than younger workers. This indicates a higher degree of *reciprocity*. Both their need and reciprocity suggest that older workers should be prioritized for vaccination and intensive care treatment. However, following the CARIN model, there is also an opposite theoretical effect: younger individuals have a higher potential to continue paying into social securities, reflecting the criterion of *social investment* (Heuer and Zimmermann, 2020) or the principle of *youngest first* (Persad et al., 2009). Thus, protecting younger workers might preserve the life

years and future contributions of these individuals.

Studying public allocation decisions in a hypothetical case of an overwhelmed healthcare system, Biddison et al. (2018) find that principles such as "save the most *lives*" (i.e., survive a current illness) and "save the most *life years*" (i.e., higher life expectancy) are important allocation factors. Using cross-country data, Jin et al. (2021) show that people have the strongest preference for saving young (vs. elderly) patients and those who are more likely to survive. Hence, *need* may be associated with saving *lives* and *social investments* with saving *life years*.

Reeskens et al. (2021) provide divergent results for perceived priority access to intensive care units (ICUs) and vaccines: participants prioritized younger people (27 years) for ICU treatment and middle-aged people (52 years) for vaccination. Both outcomes might reflect the intent to save the most *life years*. A majority in the study by Wilkinson et al. (2020) prioritized patients with a higher survival chance and a longer life expectancy after treatment. Respondents also preferred patients with shorter treatment durations who were younger or less frail. Overall, we have theoretical effects in different directions: on the one hand, prioritizing need by saving most lives, and on the other hand, prioritizing social investments by saving most life years. In the case of public health, we expect need to be more important than social investments. Therefore, middle- and higher-aged workers should be given greater priority regarding vaccination and ICU treatment.

H2a. Respondents prefer that middle- and higher-aged workers are vaccinated before others.

H2b. Respondents prefer that middle- and higher-aged workers receive intensive care treatment before others.

Higher weight is associated with a higher risk of hospitalization due to COVID-19 (Kompaniyets et al., 2021). This entails a higher *need* when higher weight results from factors that an individual cannot control, such as a metabolic disease. In contrast, being overweight can be considered as a person's "own fault", resulting from an unhealthy lifestyle. In this case, individuals with higher weight would be deemed less deserving because they are perceived to have *control* over their situation. In line with the latter, Reeskens et al. (2021) find that respondents give precedence for vaccination and ICU treatment to individuals with a lower body mass index. Accordingly, we assume that increased control outweighs need. We therefore expect higher weight to be associated with lower deservingness.

To demonstrate whether weight may be considered controllable, we added asthma, a pre-existing condition that is beyond an individual's control. According to recent research, asthma does not seem to be a risk factor for increased mortality from COVID-19 (Wang et al., 2021). Nevertheless, individuals suffering from asthma have a higher official priority for receiving a vaccine in Germany (STIKO (Ständige Impfkommission), 2021) and hence might be perceived to be more vulnerable. We therefore expect the following effects:

H3a. Respondents prefer that normal-weight workers are vaccinated before others.

H3b. Respondents prefer that normal-weight workers receive intensive care treatment before others.

H3c. Respondents prefer that workers with asthma are vaccinated before others.

H3d. Respondents prefer that workers with asthma receive intensive care before others.

Noncompliance with low-threshold containment measures, such as social distancing or wearing face masks, can be considered a "bad" *attitude*. In many cases, a state can only minimally monitor compliance. This reflects the *control* criterion. Especially at the beginning of the COVID-19 pandemic, vacations in risk areas have been considered socially undesirable. In Germany, skiing vacations in Austria were a frequent topic in the media (Deutsche Welle, 2021; Hofer, 2020). Reeskens et al. (2021) find that respondents give precedence to those complying with pandemic-related policy measures regarding vaccination and ICU treatment. We therefore expect the following effects:

H4a. Respondents prefer that workers who comply with pandemic-related policies are vaccinated before others.

H4b. Respondents prefer that workers who comply with pandemic-related policies receive intensive care before others.

Identity is an important criterion in both labor markets and health policies. There is evidence that Germans view immigrants as less deserving than sick, elderly, or unemployed individuals (Hänig, 2019). Larsen and Schaeffer (2021) identify reciprocity-based welfare chauvinism in Denmark towards recently immigrated COVID-19 patients, using first names as proxies. Nationality or (the lack of a) migration background thus function as signs of belonging to the "own" group. Using first names that are particularly common in certain countries or regions to approximate potential migration background is a common approach in experimental studies (see e.g., Bertrand and Mullainathan, 2004). To assess whether attitudes are heterogeneous, we chose names from countries that differ in their cultural and geographical proximity to Germany. In addition to German names, we chose names from countries whose citizens are considered more (France) or less (Turkey) trustworthy, based on results from Keita and Valette (2019). We expect the following effects:

H5a. Respondents prefer that workers with German first names are vaccinated before those with French or Turkish first names.

H5b. Respondents prefer that workers with German first names receive intensive care before those with French or Turkish first names.

Another aspect of *need* is the household context, since individuals living in a multiperson household risk infecting each other. This is especially unfavourable if household members are particularly vulnerable. Therefore, we expect that respondents consider households with vulnerable members or with members who need care more deserving.

H6a. Respondents prefer that workers with vulnerable individuals in their households are vaccinated before others.

H6b. Respondents prefer that workers with vulnerable individuals in their households receive intensive care before others.

3. Methods and data

We implemented a DCE (see e.g., Hainmueller et al., 2014) to assess which characteristics are salient in decisions regarding deservingness of scarce medical resources during a pandemic. In our design, we explicitly refer to the DCEs conducted by Reeskens et al. (2021), Larsen and Schaeffer (2021) and Stoetzer et al. (2021), which our work is based on but also contrasts with : our focus is on the deservingness of workers with different levels of occupational prestige and risk exposure since we are able to establish cross-level hypotheses involving workers' jobs and respondents' occupational statuses.

The DCE was implemented within a high-frequency online panel called "Life and Employment in Times of Corona" that was conducted at the IAB in Germany. The panel was established in May 2020 with the intention of collecting data on the impacts of the pandemic on labor market aspects. For more information on the panel study, see Haas et al. (2021). The DCE was included in the eighth wave of the panel. The field phase was from March 29, 2021, to June 9, 2021. This covered a period when the demand for vaccines in Germany and many other European countries still exceeded supply. At the time of our survey, the pace of vaccination was just beginning to increase; by the end of the survey, the vaccination rate (measured by initial vaccinations) was still below 50 percent. Moreover, in late April, rising case numbers led to more than 5000 people needing ICU treatment—the second highest number since the beginning of the pandemic (DIVI, 2021). The question module was randomly administered to half of the respondents. 1779 individuals answered the module, resulting in 3558 observations for multivariate

estimations.

We acquired information on sociodemographic characteristics such as gender, age, household context, citizenship and migration background, political party preference and whether respondents are currently caring for other persons in need. For those who agreed to record linkage, we are able to link the survey data to administrative data from the Federal Employment Agency (FEA), i.e., the "Integrated COVID-19 Biographies" (ICB; ICB V15.00.00–202009 2021). On a daily basis, the ICB cover all registered spells of unemployment benefits, means-tested welfare benefit receipt and job search as well as employment until September 30, 2020. These data allow us to include information on respondents' most recent jobs, distinguishing our research from other studies. We use this information to assign each person a value for their last job corresponding to the ISEI index. The ISEI allows us to combine information on a respondent's and a conjoint person's occupational prestige. We use the classification of occupations (5 digits) to identify instances when a person holds the same type of job. We use information regarding the most recent job if it lasted for at least 90 days and did not terminate before 2017. If a person has more than one job that fulfils this definition, we use the information that first, covers a longer time period or, second, yields a higher daily income. We then recoded occupations into ISCO-08 codes and later into ISEI scores, using the Stata package "iscogen" (Jann, 2019).

Following a short introduction, we present two different choice-sets or profiles, each comprising a comparison of two hypothetical individuals. Since we are aware that such decisions can be distressing for some individuals, we provided respondents with the option to skip this part of the questionnaire. Only a small percentage (6.9%) decided not to answer those questions. Respondents then had to make trade-offs between the hypothetical individuals' different labor market and health-related attributes. Following Reeskens et al. (2021), we asked respondents to decide who (a) should be given precedence for treatment amidst scarce capacities in intensive care units and (b) should be vaccinated first amidst scarce vaccine supplies.

Specifically, respondents were presented with this short introduction (translation by the authors):

During the COVID-19 pandemic, there have been public discussions in Germany about difficult decisions. Below, we present **two fictional scenarios**, each describing two people with different characteristics. We are interested in

- *what should be done if the healthcare system is overwhelmed by the pandemic?*
- *until the vaccine is available for the entire population, in what order should individuals be vaccinated against COVID-19?*

Some situations and individuals differ only slightly. Even in these cases, your opinion is important to us. It is **not** about "right" or "wrong". We are interested in **your** opinion.

Note: The persons differ only in terms of the listed characteristics.

On the next page, the first scenario was presented, the other respective scenario is in square brackets (see Table 1).

In your opinion, which of the two persons should receive intensive care treatment first if capacities are tight?

[In your opinion, which of the two persons should be vaccinated first?]

Note: Treatment has a good prospect of success for both persons.

[Note: Vaccination is very effective for both persons and prevents severe COVID-19 symptoms.]

Would you have Felix or Ömer treated first?

[Would you have Felix or Ömer vaccinated first?]

Table 1
Example scenario.

Felix	Ömer
has normal weight	is heavily overweight
was on a ski vacation against official recommendations	was on a ski vacation against official recommendations
has no asthma	has asthma
works as a nurse	works as an office worker
is 60 years old	is 60 years old
lives in a household where no person has an increased risk for a severe illness if infected with COVID-19	lives in a household where no person has an increased risk for a severe illness if infected with COVID-19

Note: Table 1 shows an example scenario.
Source: Authors' own presentation.

There is a plethora of possible operationalizations of deservingness-criteria (see, for example, Buss (2019) for the case of social policy research). We tried to use dimensions and levels that reflect the CARIN dimensions well, are realistic for the description of hypothetical workers, can be randomly combined, and are common in or similar to other studies.

We included some quality checks: In each profile, with the exception of the first name, we randomized the order of attributes to address potential problems arising from attribute order effects (Hainmueller et al., 2014). In addition, we randomly varied the order of scenarios: half of the respondents received a vaccination scenario first and an ICU scenario second, and vice versa. This random assignment should prevent sequence effects.

We did not provide an opt-out option (e.g., "neither of them should be treated"), as we considered it plausible that vaccinating or treating at least one person is always preferred to vaccinating or treating no one when resources for one person are available. We use a full profile without constraints, i.e., respondents see all relevant attributes, and these attributes are completely orthogonal to each other. All possible criteria and levels are presented in Table 2. Table A1 shows the descriptive statistics for the conjoint attributes and provides first evidence, that those are balanced.

4. Empirical results

We base our analyses on 3558 observations from 1779 respondents. Table A1 in the appendix provides a descriptive overview of the variables. 50 percent are female, on average respondents are 47.2 years old. We estimate two different models using average marginal component effects (AMCEs). Each AMCE represents the marginal effect of a conjoint attribute, averaged over the joint distribution of the remaining attributes (Hainmueller et al., 2014). For our calculations, we used the Stata package "conjoint", provided by Frith (2021). Essentially, AMCEs reflect average marginal effects in OLS regressions. We estimate models for vaccination and intensive care treatment separately (see Table A2in the appendix). Model 1 includes the conjoint dimensions, and model 2 includes both the conjoint dimensions and respondents' characteristics. The effects of the levels are qualitatively similar in both models. For our main results, we report the results from model 1. Fig. 1 presents the results of the conjoint dimensions for vaccination and ICU treatment. We include point estimates and confidence intervals for each level compared to its reference category. The dashed vertical lines represent zero effects. If confidence intervals intersect the zero line, there is no statistically confirmed effect.

4.1. Vaccination preferences

The results show that there is a substantial effect of hypothetical workers' jobs on respondents' vaccination preferences. Compared to office workers, nurses are 40 percentage points more likely to be chosen for vaccination. This is by far the highest AMCE in the models for vaccinations and statistically highly significant ($p < 0.01$). The AMCEs for

Table 2
Attributes and levels of the DCE.

Attribute/ Dimensions	Theoretical criteria	Levels
Name	Identity	- German male first name: Dieter, Felix, Franz, Hannes, Klaus, Max, Michael, Wolfgang - French male first name: Antoine, Étienne, Jacques, Pierre - Turkish male first name: -Ali, Hakan, Ömer, Yusuf
Age	Need/Reciprocity/ Social Investment	- 24 years - 42 years - 60 years
Weight	Need/Control	- Normal weight - Heavily overweight
Occupation	Reciprocity/Need/ Exposure to risk	- Nurse - Teacher - Bus driver - Supermarket cashier - Office worker
Compliance	Attitude/Control	- Has cancelled planned ski vacation because of official recommendations - Was on a ski vacation against official recommendations
Relevant preexisting conditions	Need	- No asthma - Asthma
Housing situation	Need	- Lives in a household where no person has an increased risk for a severe illness if infected with COVID-19 - Lives with a person who has an increased risk for severe illness if infected with COVID-19 - Lives with a person in need of care who has an increased risk for severe illness if infected with COVID-19

Note: We oversample German names for two reasons: first, to make the survey more representative. Second, to prevent respondents from receiving profiles where both hypothetical DCE persons have the same name, i.e., we replace each name with an alternative if a single name was randomly assigned to both scenarios. Source: Authors' own presentation.

teachers, bus drivers and supermarket cashiers are lower but still substantial and highly significant ($p < 0.01$). The effect sizes for those groups are within the same range (approximately 18–21 percentage points more likely than office workers). This does not clearly support *H1a*: Although all high-risk occupations (nurses, bus drivers) in our DCE are preferred to the low-risk reference group of office workers, respondents still prefer nurses to bus drivers. Moreover, low-risk supermarket cashiers and teachers are also preferred over office workers. In addition, occupational prestige does not seem to explain the differences in treatment preference. Nurses with average prestige and high exposure are preferred over teachers (low exposure, high prestige); bus drivers (high exposure, low prestige) are treated similarly to teachers. However, there are potential alternative explanations. First, it is possible that respondents have different subjective perceptions of occupational risks of exposure. Second, respondents might prioritize essential jobs, particularly accounting for the importance of healthcare workers during a pandemic.

Respondents consider need and reciprocity in regard to age. That is, they prefer to prioritize workers for vaccination who are middle-aged or near retirement: workers who are 42 years or 60 years old are more likely to be chosen for vaccination than 24-year-old workers. The effect is approximately 5 percentage points for 42-year-old workers ($p < 0.05$) and 11 percentage points for 60-year-old workers ($p < 0.01$). This supports *H2a*.

Moreover, we find that respondents prefer to vaccinate workers who are overweight more than workers who are not. The effect size is around 4 percentage points and significant ($p < 0.01$). This result contradicts *H3a* and the results of Reeskens et al. (2021). Hence, contrary to our expectations, this may suggest that respondents perceive risk factors, such as weight, as uncontrollable or that *need* outweighs *control*. The effect for workers with asthma points in the same direction and is even more pronounced (+20 percentage points, $p < 0.01$). This supports *H3c*. Individuals with asthma are preferred to those who are overweight. This may indicate that control plays a role in the decision process and is at least perceived to be more relevant for overweight in comparison to asthma. It might also suggest that respondents interpret asthma as a risk factor even though medical data do not support this hypothesis.

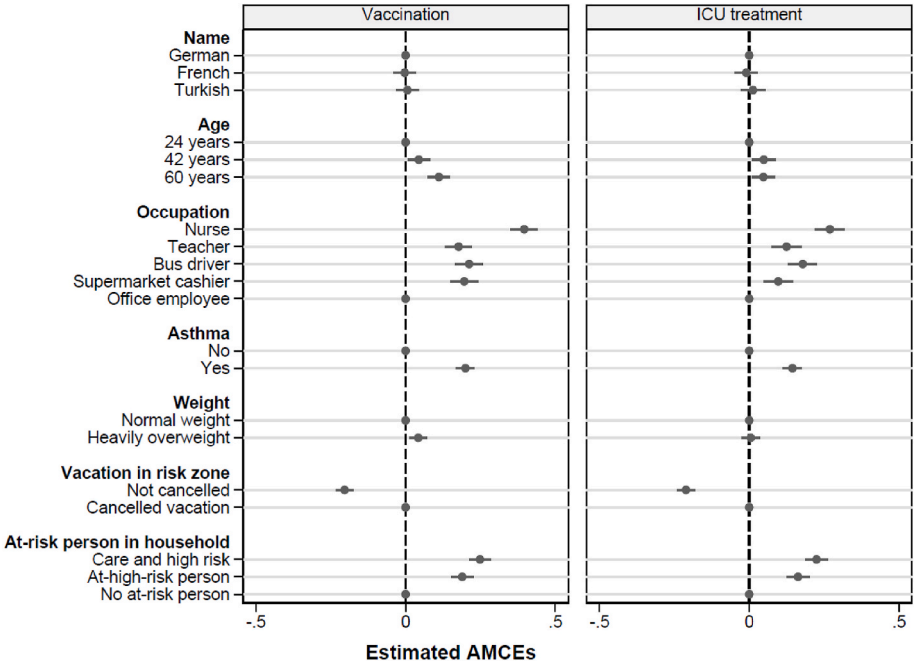

Fig. 1. Effects of conjoint attributes on vaccination and intensive care treatment priority.
Notes: N(respondents) = 1,779; N(observations) = 3,558; average marginal component effects (ACMEs) with 95% confidence intervals. Reference person DCE: German name, 24 years old, office employee, no asthma, normal weight, cancelled vacation in risk zone, no at-risk person in household. Source: Own calculations

Respondents punish workers who do not comply with COVID-19 policies and show a "bad" attitude by deliberately hindering collective actions to contain the pandemic. Respondents are 20 percentage points less likely to vaccinate individuals who went skiing during the pandemic despite official travel recommendations. The result supports *H4a* and is highly significant ($p < 0.01$).

Our results show no significant effect of the *identity* criterion. Respondents do not discriminate between workers with Turkish, French, or German first names. This finding contrasts with *H5a* and is also different from Larsen and Schaeffer (2021). This might suggest that identity is not considered an important factor for decision-making when other attributes are presented.

Finally, need in a household context is relevant. Respondents strongly prefer to vaccinate people with a high-risk person in their households (+19 percentage points, $p < 0.01$). This AMCE becomes even more pronounced if the person at risk is also in need of care: the effect size increases to 25 percentage points ($p < 0.01$). Both results support *H6a*, although there is no significant difference between the two categories of "high-risk person" and "high-risk person in need of care".

4.2. ICU treatment preferences

Compared to preferences for vaccination, we observe both similarities and differences in the results regarding ICU treatment preferences. Reflecting their decisions about vaccines, hypothetical workers' jobs also affect respondents' preferences. Compared to office workers, nurses are 27 percentage points more likely to be chosen for ICU treatment. In terms of magnitude, this is the largest effect and is also highly significant ($p < 0.01$). The second largest AMCE regarding occupations is the coefficient for bus drivers (+18 percentage points, $p < 0.01$), followed by teachers (+13 percentage points, $p < 0.01$) and supermarket cashiers (+10 percentage points, $p < 0.01$). No effect is clearly attributable to occupational prestige or risk exposure.

Moreover, there is only a small effect of age: respondents prefer to treat middle-aged or near-retirement workers. The effect size is 5 percentage points for both 42-year-old and 60-year-old workers and not significant for both categories. Therefore, the effect points in the same direction as H2b suggests, but it is not clearly supported by the statistical analysis. We observe no additional positive effect for 60-year-old workers, which is in contrast to vaccination preferences. One possible explanation for this small effect is that preferring older workers might save more lives.

Overweight workers are not treated differently than workers with normal weight. This contradicts both *H3b* and the scenario about vaccine preference. A possible explanation for the differences between the vaccination and ICU treatment preferences might be that ICU treatment is considered as a substantially more severe intervention with more immediate consequences. Hence, respondents may deem it inappropriate to "queue" persons when confronted with a more far-reaching decision.

The AMCE for workers with asthma is substantial and highly significant (+14 percentage points, $p < 0.01$). Respondents thus clearly prefer to treat workers with asthma in need of intensive care. This supports *H3d*. Once more, this may indicate that control is relevant to at least some degree because individuals with asthma are preferred to those who are overweight. It might also suggest that respondents interpret asthma as a risk condition even if this might not be substantiated by medical data.

Workers who do not comply with measures are penalized. Respondents would be 21 percentage points less likely to treat people who went skiing during the pandemic than those who did not. This result supports *H4b* and is highly significant ($p < 0.01$). Respondents seem to have particularly strong feelings of resentment for this type of behavior, given that we did not indicate that the DCE person contracted COVID-19 during his or her vacation. Once again, we find no effect of nationality; this contrasts with *H5b*.

However, *need* in the household context remains relevant. Respondents have a strong preference to treat people with a high-risk person in their households. The effects are slightly lower than those for vaccination but nonetheless substantial (+16 percentage points for people with high-risk persons in their households, +22 percentage points for high-risk persons in need of care; both effects $p < 0.01$). This supports *H6b*.

4.3. Differences across subgroups and sensitivity checks

To assess whether respondents' characteristics influence their decisions, we estimate an extended version of model 1 and include personal characteristics (see Table A2). Overall, our main results in Fig. 1 remain robust when we include respondents' characteristics. The effects for individual characteristics are less pronounced and often only weakly significant ($p < 0.1$). Specifically, compared to the reference respondent, individuals with no vocational degree and individuals with a college degree have a slightly higher probability of choosing the reference person in the vaccine DCE (+2 to 4 percentage points; $p < 0.01$ and $p < 0.1$). In contrast, respondents with no vocational degree have a by 3 percentage points ($p < 0.1$) lower probability of choosing the reference person in the ICU DCE than respondents with a vocational or upper secondary degree. Household size affects the decision on vaccine priority (+3 percentage points for households with 4 persons; $p < 0.01$, and more than 5 persons respectively, $p < 0.1$), while caring for relatives (+2 percentage points; $p < 0.1$) and age (+2 percentage points for the age group above 60 years; $p < 0.05$) has some influence on decisions regarding the ICU treatment.

To analyze whether respondents prefer individuals working in occupations with similar levels of prestige, we estimate a separate model with interaction effects between a respondent's occupational status and the occupation of the chosen DCE person (see Table A3). We distinguish between respondents with low, medium, and high occupational status by defining medium occupational statuses as ISEI values within a standard deviation above and below the arithmetic mean of the ISEI.

Our results show that there are no significant interactions between respondents' occupational statuses and that of the DCE person regarding vaccination. For ICU treatment, we observe a small effect of the simple main effect of low prestige, i.e., compared to respondents with medium prestige, low-prestige respondents have a somewhat lower probability of choosing the office clerk for ICU treatment (−7 percentage points, $p < 0.1$). Moreover, there is a positive effect of the interaction between "low prestige # bus driver", i.e., compared to respondents with medium prestige, low-prestige respondents prefer the bus driver to the office worker (+23 percentage points, $p < 0.05$).

Our results remain robust when we estimate a model where we also include calendar week dummies. Finally, controlling for the order of attributes (Hainmueller et al., 2014) and for the order of the tasks, i.e. deciding first on who should receive the vaccine and then on ICU treatment or vice versa, does neither change the interpretation of our main results nor their statistical significance (results are available on request).

5. Conclusion

Workers' risks of contracting COVID-19 vary by individual behaviors, occupations and job characteristics. Therefore, different groups of workers can be considered more or less deserving of COVID-19 healthcare. Based on the deservingness approach and additional theoretical considerations, we formed hypotheses regarding what groups individuals will prioritize for vaccination and ICU treatment amidst scarce medical resources. We conducted a DCE in a high-frequency online panel survey in Germany to test these hypotheses.

Our empirical results show that respondents prefer certain social groups. Employment in essential occupations, such as nurses or bus drivers, increases the likelihood of receiving both COVID-19

vaccinations and ICU treatments compared to employment in a nonessential position, such as an office worker. However, the order of preferences does not allow a clear conclusion regarding whether occupational prestige or risk exposure are the drivers of these effects. Moreover, we find that need (measured by age or a pre-existing condition) and attitude and control (measured by compliance with COVID-19 measures) significantly affects respondents' preferences for vaccinations. Weight matters for vaccination priority but not for ICU treatment and seems to reflect need rather than control. Identity (measured by different first names) has no significant effect on respondents' choices. Interaction effects between respondents' occupational statuses and the occupation of the DCE person demonstrate no effects regarding vaccination priority and only weak effects with regard to ICU treatment. Note however, that our findings on preferences indicate a direct link to characteristics associated with those at high risk of infection and severe progression or death in case of infection with COVID-19. Respondents' preferences might therefore differ for other diseases, e.g. the Spanish Influenza, that caused particular high death rates among younger people in the age of 15–44 years (Erkoreka, 2010). In addition, we want to stress that during a pandemic, individuals may pursue their own interests. Therefore, we argue that the opinion of the general public should not replace recommendations from experts, but rather represents a complement to this. Our study therefore provides important insights to guide policy makers in making such decisions.

Our contribution to the scientific and political discussion is threefold. First, our results highlight the importance of deservingness criteria for decisions concerning the healthcare system when scarce resources have to be distributed among social groups. During pandemics, such shortages may be particularly salient. Second, our study complements previous findings from other countries with somewhat different research questions (Reeskens et al., 2021; Larsen and Schaeffer, 2021; Stoetzer et al., 2021). Third, the results are relevant to intersections of health and labor market policies. If political actors have to make future decisions about prioritizations among different groups of workers—while keeping potential implications for the legitimacy of such political decisions in mind—we provide clear indications of how society evaluates such prioritizations. That is, our results indicate preferences for workers in essential occupations, elderly individuals and/or persons with pre-existing conditions and individuals living in pandemic-relevant household contexts.

Author contribution

Anna Heusler: Conceptualization, Methodology, Data analysis, Writing. Christopher Osiander: Conceptualization, Methodology, Writing. Julia Schmidtke: Conceptualization, Methodology, Writing.

Declaration of competing interest

None.

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Appendix

Table A1
Descriptive statistics of the survey sample and conjoint attributes

Variable	Mean
Survey sample	
Female	0.50
Age (in years)	47.19
ISEI value of last job	50.63
Age groups	
18–29 years	0.09
30–39 years	0.21
40–49 years	0.22
50–59 years	0.27
60 years or above	0.20
Household size	2.46
Household size (in groups)	
Single household	0.18
2 persons	0.44
3 persons	0.17
4 persons	0.15
5 or more	0.05
Foreign	0.03
Born in Germany	0.96
Vocational degree	
No vocational degree	0.04
Vocational degree or upper secondary degree	0.49
University degree	0.47
Current employment status	
Employed >450 Euro	0.76
Employed <450 Euro	0.01
Self-employed	0.02
Unemployed	0.02
Maternity/Parental leave	0.02
Retired	0.08
School, VET, university	0.05
Other employment status	0.04
Political party preference	
Conservative party	0.25

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Table A1 (*continued*)

Variable	Mean
Social-democratic party	0.11
Right-wing populist party	0.02
Liberal democratic party	0.06
Left-wing party	0.05
Green Party	0.31
Other party	0.03
No Party	0.12
Nonpolitical	0.05
Worries about current situation: Health of relatives	0.70
Care of relatives	0.09
Agreement: Do not agree with any Covid-19 prevention measure	0.02
Conjoint attributes	
German name	0.60
French name	0.20
Turkish name	0.20
24 years old	0.33
42 years old	0.33
60 years old	0.34
Nurse	0.20
Teacher	0.20
Bus driver	0.21
Supermarket cashier	0.20
Office employee	0.20
No asthma	0.49
Asthma	0.51
Normal weight	0.49
Heavily overweight	0.51
Went on skiing holiday	0.51
Cancelled skiing holiday	0.49
Others in household in need of care and at-high-risk person	0.33
Others in household at high-risk person	0.34
Others in household not at-risk person	0.34
First module Vaccination	0.49
First module ICU treatment	0.51

Note: N(respondents) = 1,779, N(observations) = 3558. The table shows the descriptive statistics for the survey
sample and the conjoint attributes. For the conjoint attributes, the table shows the mean over both scenarios.
Source: Own calculations.

Table A2
Multivariate analysis with respondents' characteristics

	Vaccination		ICU	
	(1)	(2)	(3)	(4)
French name	−0.003	−0.002	−0.010	−0.011
	(0.019)	(0.019)	(0.020)	(0.020)
Turkish name	0.006	0.007	0.012	0.012
	(0.020)	(0.020)	(0.021)	(0.021)
42 years old	0.044**	0.045**	0.048**	0.047**
	(0.019)	(0.019)	(0.020)	(0.020)
60 years old	0.111***	0.112***	0.047**	0.046**
	(0.019)	(0.019)	(0.020)	(0.020)
Nurse	0.396***	0.400***	0.269***	0.272***
	(0.023)	(0.023)	(0.025)	(0.025)
Teacher	0.177***	0.180***	0.125***	0.126***
	(0.023)	(0.023)	(0.026)	(0.026)
Bus driver	0.212***	0.215***	0.179***	0.179***
	(0.024)	(0.024)	(0.024)	(0.025)
Supermarket cashier	0.196***	0.198***	0.097***	0.097***
	(0.023)	(0.023)	(0.025)	(0.025)
Asthma	0.200***	0.201***	0.144***	0.145***
	(0.015)	(0.016)	(0.016)	(0.016)
Heavily overweight	0.042***	0.043***	0.005	0.005

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Table A2 (*continued*)

	Vaccination		ICU	
	(1)	(2)	(3)	(4)
	(0.015)	(0.015)	(0.016)	(0.016)
Went on skiing holiday	−0.204***	−0.206***	−0.212***	−0.214***
	(0.015)	(0.015)	(0.015)	(0.015)
Others in household in need of care and include a high-risk person	0.248***	0.251***	0.224***	0.226***
	(0.018)	(0.018)	(0.019)	(0.019)
Others in household include a high-risk person	0.189***	0.192***	0.163***	0.165***
	(0.018)	(0.019)	(0.019)	(0.019)
Female		−0.001		−0.009
		(0.008)		(0.007)
18–29 years		0.006		0.012
		(0.014)		(0.012)
30–39 years		0.000		0.006
		(0.011)		(0.010)
40–49 years		0.013		−0.004
		(0.011)		(0.009)
60 years or above		0.006		0.023**
		(0.012)		(0.010)
No vocational degree		0.036*		−0.033*
		(0.021)		(0.019)
College degree		0.022***		−0.008
		(0.008)		(0.007)
Foreign		−0.017		−0.012
		(0.023)		(0.019)
Currently not employed		0.002		−0.008
		(0.010)		(0.009)
Care of relatives		0.002		0.019*
		(0.013)		(0.011)
Worries: Health of relatives		0.012		−0.005
		(0.008)		(0.007)
Christian-democratic party (CDU/CSU)		−0.003		−0.009
		(0.010)		(0.009)
Social democratic party (SPD)		0.021		−0.004
		(0.013)		(0.011)
Right-wing populist party (AfD)		−0.044		0.010
		(0.028)		(0.025)
Liberal democratic party (FDP)		0.027		−0.028*
		(0.017)		(0.015)
Left-wing/socialist party (Die Linke)		0.025		−0.005
		(0.018)		(0.015)
Other Party		0.011		−0.008
		(0.022)		(0.020)
No Party		0.011		0.011
		(0.013)		(0.011)
Nonpolitical		0.018		−0.001
		(0.017)		(0.015)
Single household		0.014		−0.004
		(0.011)		(0.009)
3 persons		0.011		0.009
		(0.010)		(0.009)

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Table A2 (*continued*)

	Vaccination		ICU	
	(1)	(2)	(3)	(4)
4 persons		0.033***		−0.001
		(0.012)		(0.010)
5 or more		0.032*		0.005
		(0.019)		(0.015)
Agreement: Do not agree with any measure		0.018		−0.024
		(0.027)		(0.025)
Constant	0.087***	0.040	0.238***	0.248***
	(0.025)	(0.030)	(0.027)	(0.031)
Observations	3558	3558	3558	3558
R^2	0.196	0.198	0.138	0.139
Number of individuals	1779	1779	1779	1779

Note: Column 1 shows the estimates from our baseline model for vaccination preferences, where we only include the dimensions of the conjoint. In Column 2, we extend the model and include respondents' characteristics. Column 3 and 4 repeat the analysis for ICU treatment preferences. Reference person DCE: German name, 24 years old, office employee, no asthma, normal weight, cancelled vacation in risk zone, no at-risk person in household. Characteristics of reference respondent: Male, 50–59 years old, vocational degree or upper secondary degree, no migration background, employed (incl. marginally), no care work, no or few worries about relatives' health, political orientation Bündnis90/Die Grünen, household of 2 persons, agrees with containment measures. Standard errors in parentheses clustered on the individual level.

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

Source: Own calculations.

Table A3

Multivariate analysis with interaction effects

	Vaccination		ICU	
	(1)	(2)	(3)	(4)
French name	−0.003	−0.002	−0.009	−0.010
	(0.019)	(0.019)	(0.020)	(0.020)
Turkish name	0.006	0.007	0.012	0.012
	(0.020)	(0.020)	(0.021)	(0.021)
42 years old	0.044**	0.045**	0.048**	0.046**
	(0.019)	(0.019)	(0.020)	(0.020)
60 years old	0.112***	0.112***	0.048**	0.047**
	(0.019)	(0.019)	(0.020)	(0.020)
Asthma	0.202***	0.203***	0.144***	0.145***
	(0.015)	(0.016)	(0.016)	(0.016)
Heavily overweight	0.043***	0.044***	0.006	0.005
	(0.015)	(0.015)	(0.016)	(0.016)
Went on skiing holiday	−0.204***	−0.205***	−0.213***	−0.215***
	(0.015)	(0.015)	(0.015)	(0.015)
Others in household in need of care and include a high-risk person	0.249***	0.251***	0.224***	0.225***
	(0.018)	(0.018)	(0.019)	(0.019)
Others in household include a high-risk person	0.189***	0.191***	0.164***	0.166***
	(0.019)	(0.019)	(0.019)	(0.019)
Low prestige	−0.038	−0.036	−0.073*	−0.081*
	(0.044)	(0.045)	(0.042)	(0.043)
High prestige	0.042	0.034	−0.029	−0.023
	(0.033)	(0.033)	(0.040)	(0.040)
Nurse	0.391***	0.395***	0.252***	0.254***
	(0.029)	(0.029)	(0.032)	(0.032)
Low prestige # Nurse	0.082	0.083	0.078	0.082
	(0.072)	(0.073)	(0.068)	(0.069)
High prestige # Nurse	−0.024	−0.025	0.022	0.020
	(0.053)	(0.053)	(0.061)	(0.061)
Teacher	0.170***	0.173***	0.105***	0.105***
	(0.029)	(0.029)	(0.033)	(0.033)

(*continued on next page*)

Table A3 (*continued*)

	Vaccination		ICU	
	(1)	(2)	(3)	(4)
Low prestige # Teacher	0.093	0.087	0.075	0.079
	(0.070)	(0.071)	(0.076)	(0.076)
High prestige # Teacher	−0.020	−0.019	0.035	0.037
	(0.053)	(0.054)	(0.064)	(0.064)
Bus driver	0.233***	0.236***	0.136***	0.136***
	(0.030)	(0.030)	(0.031)	(0.031)
Low prestige # Bus driver	−0.027	−0.030	0.168**	0.173**
	(0.070)	(0.071)	(0.067)	(0.068)
High prestige # Bus driver	−0.070	−0.070	0.078	0.077
	(0.058)	(0.059)	(0.061)	(0.061)
Supermarket cashier	0.201***	0.204***	0.077**	0.077**
	(0.030)	(0.030)	(0.032)	(0.033)
Low prestige # Supermarket cashier	0.022	0.021	0.051	0.055
	(0.069)	(0.069)	(0.069)	(0.070)
High prestige # Supermarket cashier	−0.033	−0.034	0.045	0.045
	(0.053)	(0.053)	(0.062)	(0.062)
Female		−0.000		−0.008
		(0.008)		(0.007)
18–29 years		0.005		0.011
		(0.014)		(0.012)
30–39 years		−0.000		0.004
		(0.011)		(0.010)
40–49 years		0.012		−0.006
		(0.011)		(0.010)
60 years or above		0.007		0.023**
		(0.012)		(0.010)
No vocational degree		0.036		−0.032*
		(0.022)		(0.019)
College degree		0.019**		−0.013*
		(0.009)		(0.007)
Foreign		−0.017		−0.009
		(0.023)		(0.019)
Currently not employed		0.002		−0.009
		(0.010)		(0.009)
Care of relatives		0.004		0.019*
		(0.013)		(0.011)
Worries: Health of relatives		0.012		−0.005
		(0.008)		(0.007)
Christian-democratic party (CDU/CSU)		−0.002		−0.010
		(0.010)		(0.009)
Social-democratic party (SPD)		0.021		−0.004
		(0.013)		(0.011)
Right-wing populist party (AfD)		−0.045		0.008
		(0.028)		(0.025)
Liberal democratic party (FDP)		0.025		−0.029*
		(0.017)		(0.015)
Left-wing/socialist party (Die Linke)		0.024		−0.005
		(0.018)		(0.015)
Other Party		0.012		−0.009

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Table A3 (*continued*)

	Vaccination		ICU	
	(1)	(2)	(3)	(4)
		(0.022)		(0.020)
No Party		0.012		0.015
		(0.013)		(0.011)
Nonpolitical		0.016		−0.001
		(0.017)		(0.015)
Single household		0.013		−0.005
		(0.011)		(0.009)
3 persons		0.012		0.009
		(0.010)		(0.009)
4 persons		0.033***		−0.001
		(0.012)		(0.010)
5 or more		0.032*		0.004
		(0.019)		(0.015)
Agreement: Do not agree with any measure		0.022		−0.028
		(0.028)		(0.025)
Constant	0.080***	0.036	0.256***	0.269***
	(0.028)	(0.032)	(0.031)	(0.033)
R^2	0.197	0.199	0.140	0.141
Number of observations	3558	3558	3558	3558
Number of individuals	1779	1779	1779	1779

Note: Column 1 shows the estimates from our baseline model for vaccination preferences, where we include the dimensions of the conjoint and interaction effects between dimensions. In Column 2, we extend the model and include respondents' characteristics. Column 3 and 4 repeat the analysis for ICU treatment preferences. Reference person DCE: German name, 24 years old, office employee, no asthma, normal weight, cancelled vacation in risk zone, no at-risk person in household. Characteristics of reference respondent: Male, 50–59 years old, vocational degree or upper secondary degree, no migration background, employed (incl. marginally), average prestige occupation, no care work, no or few worries about relatives' health, political orientation Bündnis90/Die Grünen, household of 2 persons, agrees with containment measures. Standard errors in parentheses clustered on the individual level. Reference group occupation and ISEI: Average prestige occupation, average prestige occupation x office employee.
*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.
Source: Own calculations.

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