



Public support for unequal treatment of unvaccinated citizens: Evidence from Denmark

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ABSTRACT

While billions have been vaccinated against COVID-19, unvaccinated citizens remain a challenge to public health given their higher likelihood of passing on the virus. One way for governments to reduce this concern is to enact more restrictive rules and regulations for the unvaccinated citizens in order to incentivize them to become vaccinated and/or reduce their spread of the virus. However, such rule differentiation conflicts with liberal principles of equal treatment, thereby raising a trade-off between material (public health) and principled concerns. To gain legitimacy in trading off these difficult concerns, governments are likely to look to preferences in the general population. We therefore analyze to what extent unequal treatment of the unvaccinated in terms of differentiation of various rules and regulations finds support among the general public. In a pre-registered survey experiment, we investigate public support for various COVID-19 regulations (e.g., test fees, isolation pay, and hospital prioritization). In the experiment, we randomly assign respondents to evaluate regulations that either (i) apply to adults in general or (ii) only to those adults who deliberately have chosen not to be vaccinated. This design provides a valid means to assess support for unequal treatment of the unvaccinated by minimizing various concerns relating to survey responding. Furthermore, we examine how these preferences vary by individual vaccination status, trust in institutions, as well as over-time changes in severity of the pandemic. We find significantly (both statistically and substantively) higher support for restrictive policies when targeted exclusively toward the unvaccinated, which we interpret as support for unequal treatment of this group. We also uncover strong polarization in these preferences between the vaccinated and the unvaccinated, but a much more limited role for trust and severity of the pandemic.

1. Introduction

Although billions have taken up vaccines against COVID-19, significant minorities of unvaccinated citizens remain in many countries. Individual vaccination uptake to combat a contagious disease is a classic collective action (cooperation) problem in which the individually and socially desirable may be at odds (Siegal et al., 2009). Governments are therefore faced with an enforcement problem: how do they encourage non-cooperating citizens to become vaccinated for the common good of society? One solution is to impose stricter COVID-19-related regulations on the unvaccinated regarding their behaviors and access to public services, thereby animating them to become vaccinated (Mills and Rüttenauer, 2022). For example, the Canadian province of Quebec

considered plans for a special tax only to be paid by the unvaccinated (Dyer, 2022), the German government abolished quarantine wage compensation for this group (Library of Congress, 2021), and there have been discussions to deprioritize the unvaccinated in Triage situations (Schuman et al., 2022).

While unequal treatment per se is not uncommon and imposing stricter rules on the unvaccinated is justifiable from a public health perspective, as the unvaccinated carry higher risks of infection with and spreading of COVID-19, it conflicts with the liberal principle of equal treatment of citizens. To gain legitimacy in trading off considerations over public health and liberal principles, governments are likely to be at least partly guided by citizens' preferences. While there has been research into the related questions of the public's vaccine hesitancy

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(Rossen et al., 2019, Rosenfeld and Tomiyama, 2022), adherence to Corona health regulations (Hensel et al., 2021), and attitudes toward vaccine passports (Porat et al., 2021), we know little about how the general population thinks about potentially controversial regulations singling out unvaccinated citizens. This paper seeks to fill this gap by examining citizens' responses to differentiation of COVID-19-related rules and regulations by vaccination status.

We expect greater support for rules that impose tougher regulations on unvaccinated citizens compared to people more generally. For one, this might be based on self-interest; the unvaccinated pose the greatest risk of infecting others, including oneself and people in one's network, and therefore incentivizing this group to become vaccinated and/or limit activities that might accentuate their spreading of the virus is preferred. More altruistically motivated concerns for the negative consequences for vulnerable groups or society more generally might lead to a similar prediction regarding imposing harsher regulations on the unvaccinated. Lastly, support for such regulations could also stem from a desire—among the vaccinated—to punish the unvaccinated since they may be perceived as free-riders, who are not contributing to the public good of herd immunity (Fehr and Fischbacher, 2004).

Beyond the first-order question of the extent to which people support rule differentiation or not, it is relevant to understand who (dis)approve of such initiatives and under which conditions. We investigate three such potential moderators. First, given their self-interest in not facing more restrictive rules and regulations, it is natural to expect that unvaccinated citizens themselves approve less of unequal treatment of unvaccinated citizens. Second, as the societal consequences of individual vaccine hesitancy worsens with “pandemic pressure” (i.e., greater number of infected with and hospitalized due to COVID-19), we expect the public to become more supportive of stricter regulations asymmetrically targeted at unvaccinated citizens. Third, because the differential rules are enacted by politicians and enforced by the state, trust in political institutions and state authorities may lead to higher acceptance of such unequal treatment of unvaccinated citizens.

We investigate these questions using a pre-registered survey experiment implemented in two waves of a panel survey conducted in Denmark in August/September as well as December 2021. Specifically, we randomized whether potential rules should be applied to the adult population in general or *only* to unvaccinated adults. By not asking directly about support for unequal treatment of a specific group, we bypass likely problems of social desirability (e.g. unwillingness to admit a preference for singling out specific groups) and therefore obtain a valid measure of support for unequal treatment of the unvaccinated.

Denmark is a country with a high vaccination rate even without a mandate (81% of the population were vaccinated as of February 7, 2022, Ritchie et al., 2022). The country is distinguished by exceptionally high levels of generalized social trust (trust in unknown others) (Sønderskov and Dinesen, 2014), and this strong social cohesion makes it a least-likely case in which to find public support for the unequal treatment of unvaccinated co-citizens.

2. Methods

2.1. Data and sample

The data used were collected as wave seven of an online seven-wave panel survey (Sønderskov, 2020). To test the role of pandemic pressure in willingness to differentiate between vaccinated and unvaccinated citizens, we also use data from wave six of the survey (Sønderskov, 2022). The sample was stratified on gender, age, region, and education (further information can be found in the pre-registration at the Open Science Framework: https://osf.io/zvqxx/?view_only=db95b7967d904cc6ba5f0a36a2a36b2f).

2.2. Outcome variables

Our main outcome variable is support for five proposals for additional Corona regulations. These are inspired by political and scientific discussions (Dyer, 2022, Library of Congress, 2021; Schuman et al., 2022), but were not in place in Denmark at the time of the surveys. They are as follows:

- Paying a small fee for Corona tests (“Fee for Test”)
- Discontinuing the less reliable quick tests as proof of infection status (“Quick Test as Proof”)
- Abolishing the possibility to say one is exempt from showing the Corona passport (“Corona Pass Exemptions”)
- Abolishing wage compensation during mandatory isolation for public employees (“No Isolation Pay”)
- Giving lower priority to COVID-19 patients compared to other patients if there is a shortage of hospital beds (“Lower Priority in Hospitals”)

At the time of the two survey waves, the “Corona Pass Exemption” (the possibility for citizens to simply state that they are exempt without proof) were already discontinued. We expect this to induce limited measurement error leading to a conservative estimate of differences in preferences for imposing stricter regulations on the two target groups.

We measured support for each of these regulations on an ordinal scale from 1 (“strongly disagree” that the rule should be imposed) to 5 (“strongly agree”), with 3 representing “Neither agree nor disagree”. Finally, from these five items, we constructed an additive index of general support for additional restrictions, scaled to range from 1 to 5 (“Overall Index”).

2.3. Independent variable and randomization

Crucially, to examine to what extent people support unequal treatment in terms of imposing tougher regulations on the unvaccinated vis-à-vis the population at large, we randomized across respondents whether the rules in the proposals applied to all adults or only those adults who freely chose not to be vaccinated (in the following, we refer to these as “the unvaccinated”, acknowledging that, more generally, people might be unvaccinated for medical reasons or other official exemptions). There is some evidence suggesting that social desirability is inconsequential when individuals report their adherence to Corona regulations (Larsen et al., 2020). However, we are interested in differential treatment of different groups vis-à-vis corona regulations for which we suspect that the potential for bias is larger. If respondents were explicitly asked to state whether they want rules to be applied to the unvaccinated rather than all adults, some respondents would likely be uncomfortable with singling out a specific group as this would violate the liberal principle of equal treatment that is widespread in many Western societies including Denmark. Such responding based on social desirability would lead us to underestimate support for unequal treatment. By comparing the level of rule support across two randomly assigned groups, we instead obtain an unobtrusive measure of the extent to which people prefer unequal treatment (Auspurg et al., 2015).

2.4. Prior results and pre-registration

We already implemented the survey experiment in wave 6. The results from this analysis (shown in the pre-registration) are very similar to those reported here (we discuss minor differences below). However, we had not pre-registered our expectations before the analysis of wave 6. After having obtained the data from wave 6, we therefore pre-registered the data collection for the seventh wave and the empirical analyses that we report in this article. There were no deviations from the pre-analysis plan.

2.5. Moderator variables

The panel survey also measured a set of socio-demographic, health-related and attitudinal variables. This includes our two moderators: vaccination status (1 = vaccinated or planned to vaccinate; 0 = not vaccinated) as well as trust in parliament, the judiciary, the police, and the government, which we summate to form an index of trust in these institutions (ranging from 0 to 10, where higher values signify higher trust).

Repeating the survey experiment in the second of the two waves enabled us to test the difference in support for imposing stricter regulations on the unvaccinated vis-a-vis the population in general under worsening conditions. The first wave (wave 6) was collected between August 30 and September 15, 2021, when COVID-19 cases in Denmark were low (average number of new cases per day per 1,000,000 = 95), while the second wave was collected between December 10 and December 23, during a wave of record highs at the time (average number of new cases per day per 1,000,000 = 1691) (Ritchie et al., 2022).

2.6. Methods

We estimated the effect of the treatment (target group in question) by means of ordinary least squares regression with heteroscedasticity-robust standard errors. We report results for support for each rule separately as well as for the overall index. We used a dummy variable to indicate treatment status (0 = rule applies to all adults; 1 = rule applies only to unvaccinated adults). Any statistically significant difference then indicates that people differentially support these policies based on vaccination status of the groups in question. To test the follow-up questions regarding for whom such differentiation occurs, we interacted (separately) the treatment variable with a dummy for vaccination status and the index of institutional trust. Lastly, we tested whether a potential differentiation varied by “pandemic pressure” by including data for both waves and interacting a binary wave indicator with the treatment (clustering standard errors on the level of respondents).

We included some basic control variables in our models to increase statistical efficiency (gender, age, education; vaccination status; trust in other people; trust in political institutions; see the pre-registration for details). Our analytical sample consists of around 1300–1400 observations depending on the model (this is a slight reduction compared to the full sample (N = 1429) stemming from listwise deletion of respondents with missing data). For the models that incorporated both waves, the number of observations is around 2700–2800.

We employed two-sided hypothesis tests and $p < 0.05$ as the decision criterion throughout. Due to the large number of planned hypothesis tests, all p-values reported here are adjusted using the Benjamini and Hochberg (1995) procedure, controlling the “false discovery rate”.

2.7. Power analysis

We used the data from wave six to estimate statistical power for our hypothesis tests in the seventh wave (described in detail in the pre-registration). Based on this, we found that we had high statistical power, with the possible exception of the between-wave differences. Specifically, we expected to be able to detect statistically significant treatment effects for “Fee for Test”, “No Isolation Pay”, as well as the “Overall Index”, but not necessarily for “Quick Tests as Proof” and “Corona Pass Exemptions” (power differs across outcomes due to variation in their standard deviations). Our power analysis for the effect moderation by vaccination status as well as institutional trust contained an error. Nevertheless, our standard errors in wave seven turned out to be about as large and often smaller than in wave six, giving us very high power to replicate the many significant estimates. Finally, our power analysis for between-wave differences indicated that this analysis might be slightly underpowered because 80% power to detect increases in

support of unequal treatment requires a substantial increase of 25% or higher across the waves.

2.8. Ethics approval

Participation in the survey was based on consent. Under Danish Law, ethical review board approval is not required for this type of studies. Data were stored and handled in accordance with the European Union’s General Data Protection Regulation.

3. Results

Fig. 1, top panel shows average support for the hypothetical COVID-19 regulations depending on the target group. There is very wide variation on the 1–5 scale (higher values indicate higher support) across outcomes and treatment groups. Specifically, introducing a fee for tests (“Fee for Test”) for all adults had very low support (mean = 1.9), while a fee for the unvaccinated received considerably higher support (mean = 3.2). We find some support for discontinuing quick tests as official proof of infection status (“Quick Test as Proof”), especially if that rule would apply only to the unvaccinated (mean = 3.4 versus mean = 3.1 for all adults). Abolishing Corona passport exemptions (“Corona Pass Exemptions”) had the highest support with little difference across the target group (mean = 4.1 for all adults and mean = 4.3 for the unvaccinated). Abolishing wage compensation during isolation (“No Isolation Pay”) was very unpopular (mean = 1.8) when applied to the public at large, while the same rule applied only to the unvaccinated was considerably more popular (mean = 3.2). Finally, giving lower priority to COVID-19 patients (“Lower Priority in Hospitals”) had relatively low support, especially when applied indiscriminately to everyone (mean = 2.4 versus mean = 2.7 for unvaccinated adults). Corresponding to the pattern across regulations, the results for the overall index indicate that the respondents were generally on the unsupportive side when it comes to tightening the rules for all adults (mean = 2.7), while they were, conversely, slightly on the supportive side when this would apply only to the unvaccinated (mean = 3.4).

Addressing our main research question—public support for additional regulations targeted specifically at the unvaccinated—point estimates of the difference in support between the two target groups and associated confidence intervals are reported in the bottom panel of Fig. 1. We find that respondents show significantly higher support for almost all rules if they would apply only to the unvaccinated rather than to all adults (p-values adjusted for multiple testing are < 0.05 in all cases except for “Corona Pass Exemptions”, $p = 0.07$). Most differences are quite large, exceeding one scale point on the 1–5 scale in the case of the test fee and abolishing wage compensation when in isolation.

Taken together, people on average support imposing stricter rules only for unvaccinated adults vis-a-vis all adults in general, when these rules incur low to medium economic costs (“Fee for Test” and “No Isolation Pay”). They are less supportive of differential treatment when it comes to the remaining rules. The small difference with respect to “Corona Pass Exemptions” may be due to the fact that the rule already (implicitly) only applies to the unvaccinated in the control condition. Perhaps most notably, support for imposing stricter rules on hospital prioritization—arguably the most potentially consequential rule—on the unvaccinated compared to the population at large is only slightly higher.

Support for COVID-19 regulations applying to the unvaccinated and the general population based on people’s own vaccination status are shown in Fig. 2. Even though the group of unvaccinated respondents is small (N = 51), we find large and statistically significant ($p < 0.05$) differences of between 1.1 and 1.7 scale points in support for stricter rules targeted at the unvaccinated between those who themselves are vaccinated and those who are not for (i) “Fee for Test”, (ii) “No Isolation Pay”, (iii) “Lower Priority in Hospitals”, as well as (iv) the “Overall Index”. This indicates that there is strong polarization in support for

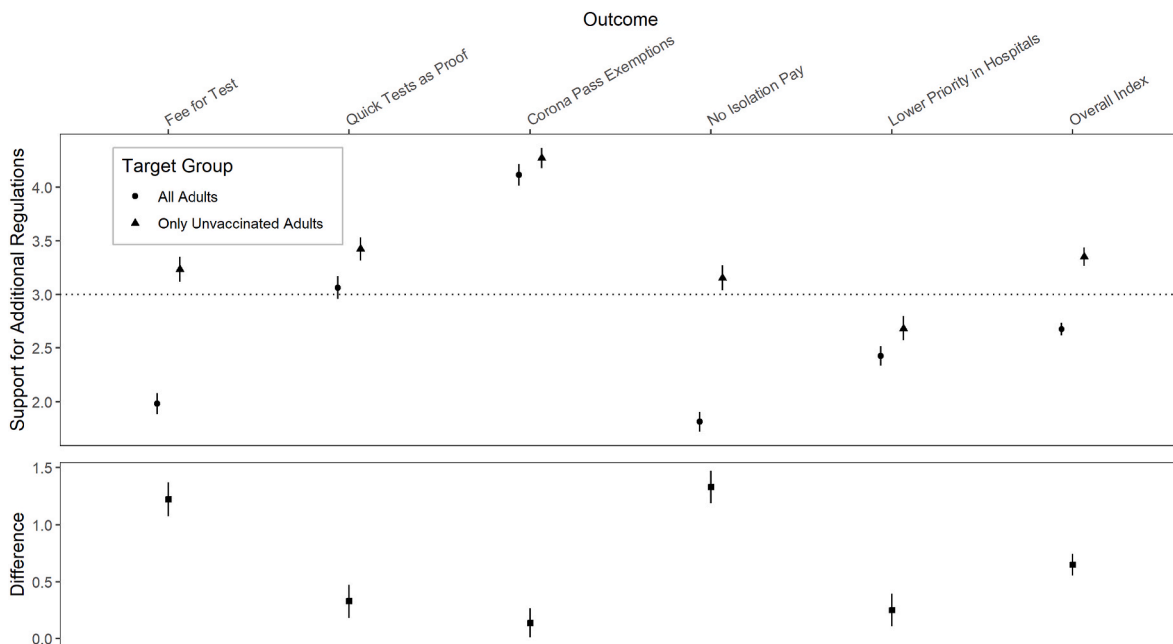


Fig. 1. Support of potential COVID-19 regulations as a function of the target group (top panel) and differences in support between treatment groups (bottom panel). Points depict means and mean differences, lines indicate 95% confidence intervals. The outcome is measured on a scale from 1 (strongly disagree) to 5 (strongly agree). The dashed vertical line corresponds to an outcome of 3 (neither agree nor disagree).

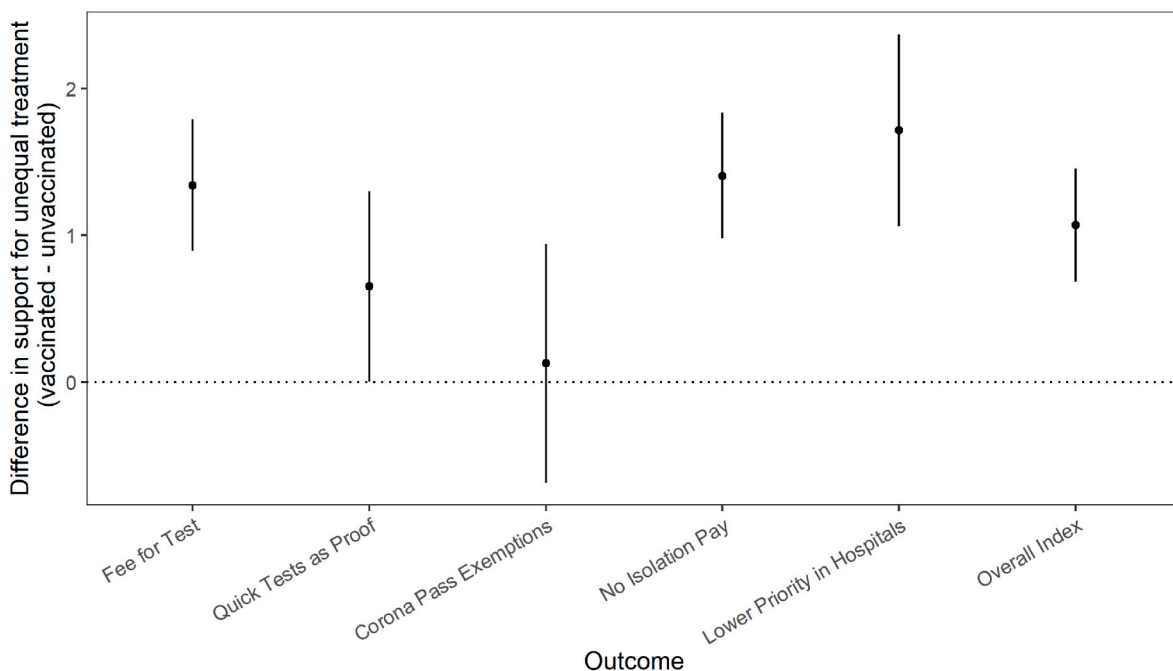


Fig. 2. Interaction between treatment and respondents' vaccination status. Reference group: Unvaccinated citizens. Values greater (lower) than zero imply that vaccinated respondents support unequal treatment compared to equal treatment more (less) than unvaccinated respondents.

these measures along the lines of vaccination status. While in the same direction, there are no significant differences (based on the adjusted p-values) for the “Quick Tests as Proof” and the “Corona Pass Exemptions” regulations. In sum, we find relatively consistent evidence in support of unvaccinated individuals being less supportive of potential regulations singling out their group relative to the general adult population.

Fig. 3 shows how the differences in support of potential COVID-19 regulations between target groups evolved over time as the pandemic pressure increased. Aligning with our expectation in the pre-registration that this analysis may be slightly underpowered, we find only one

statistically significant and substantively modest increase in support for imposing stricter rules on hospital prioritization for the unvaccinated vis-à-vis all adults (although this harsh measure enjoys relatively little overall support). Thus, there is limited evidence for the worsening of the pandemic accentuating singling out of the unvaccinated.

Fig. 4 displays how support for differential rules depends on trust in institutions. We find some support for a moderating effect of institutional trust: Individuals with higher trust in institutions more readily support stricter rules for the unvaccinated, relative to adults in general, with respect to “No isolation pay”. The same also applies to the overall

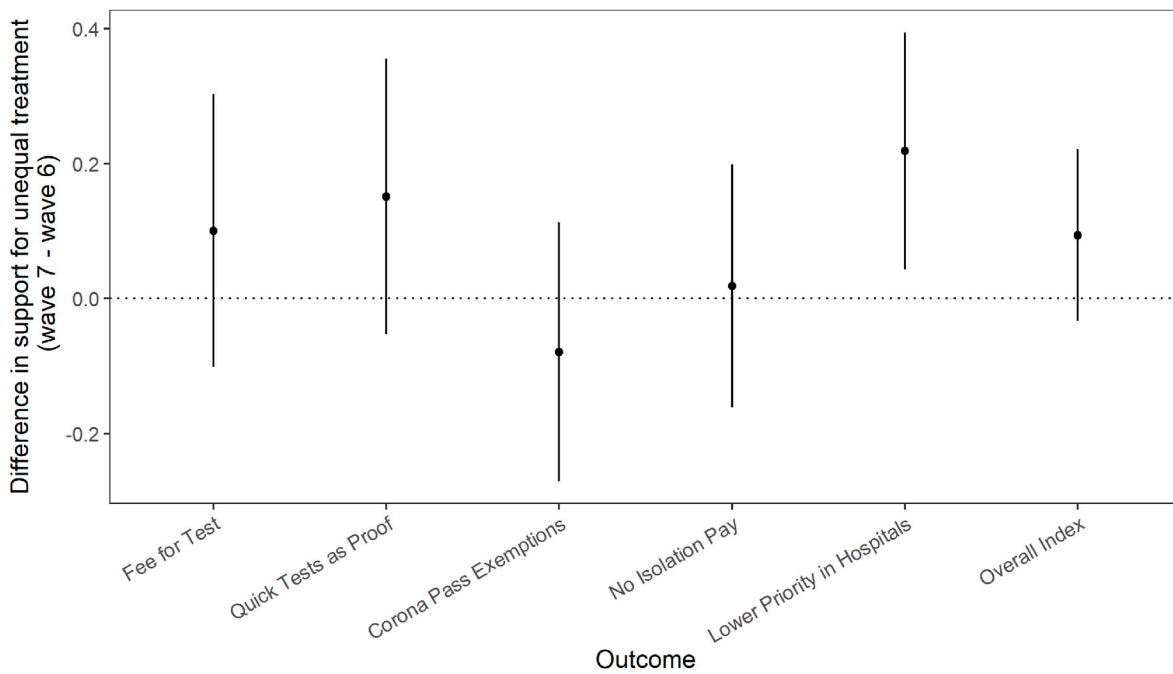


Fig. 3. Interaction between treatment and wave. Reference: Wave six. Values greater (lower) than zero imply that respondent in wave seven support unequal treatment compared to equal treatment more (less) than respondents in wave six.

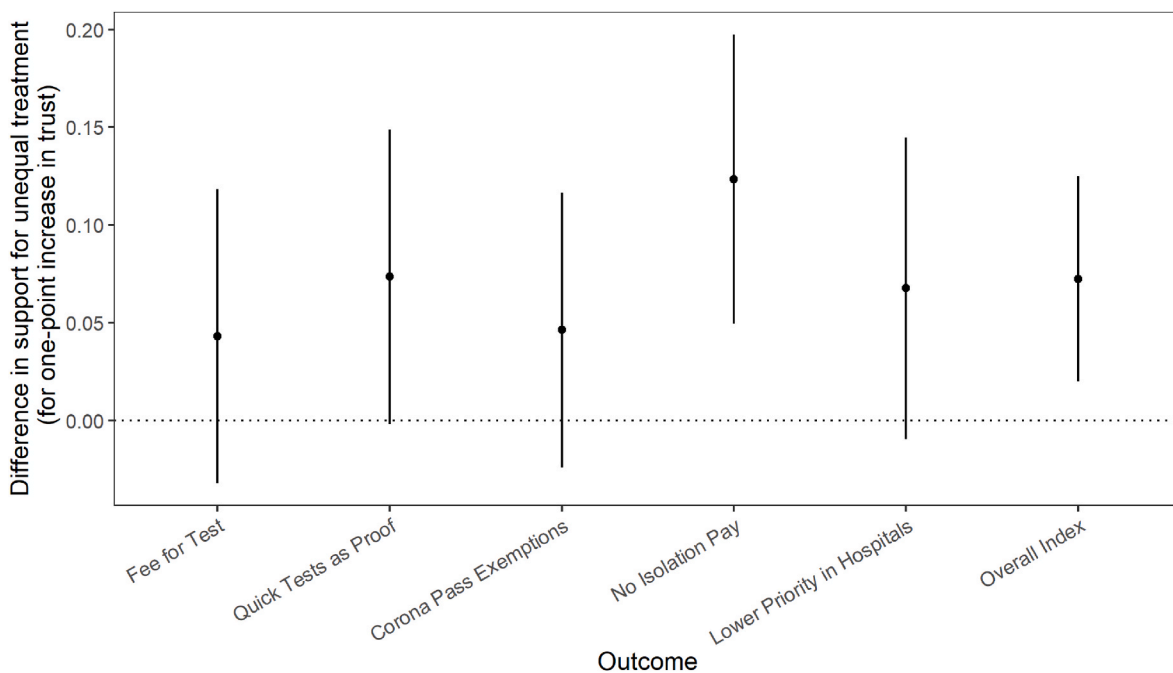


Fig. 4. Interaction between the institutional trust index (ranging from 0 = low trust to 10 = high trust) and treatment. Values greater (lower) than zero imply that respondent with higher institutional trust support unequal treatment compared to equal treatment more (less) than respondents with lower institutional trust.

index, mirroring the fact that while generally insignificant, point estimates for all rules are in the same direction. This stands in contrast to our results from wave six (see pre-registration), where we found a stronger differentiation by institutional trust, especially for test fees and hospital prioritization. On balance, there is relatively limited support for institutional trust modifying the extent to which people support stricter rules disproportionately for the unvaccinated.

Finally, we also conducted all analyses using survey weights that adjust for sample imbalances in gender, age, level of education, region and political party choice in the latest general election (5 June 2019).

This analysis was not pre-registered. The results are very similar, with the exception of the first analysis (Fig. 1) and the analysis examining changes over waves (Fig. 3). In both cases, the effect for the “Lower Priority in Hospitals” outcome turns insignificant, but is substantively unchanged.

4. Concluding discussion

Our results show that citizens in Denmark support imposing extra regulations on adults that have deliberately chosen not to be vaccinated

against COVID-19, relative to the adult population in general. This applies in particular to tightening test regulations as well as limiting wage compensation when isolating. Our analyses further reveal that opinions on this question are strongly polarized between vaccinated and unvaccinated citizens. Notably, this also extends to the case of hospital prioritizations, arguably the most severe of the potential rules we inquired about. On the other hand, we found only limited evidence for growing differential support as the pandemic worsened. In contrast to related research (Lindholt et al., 2021), we found only a limited moderating role for trust in public institutions.

Our study includes a number of strengths, including, most notably, an unobtrusive measure of support for regulations vis-à-vis different groups obtained via a relatively high-powered experimental design. Yet, our study also holds a number of limitations. First, although we suspect that we have uncovered more general patterns, we cannot know whether our results generalize beyond the Danish context. A second limitation is that the analysis of longitudinal changes in support were underpowered. Third, the interpretation of longitudinal changes is further complicated by the fact that not only pandemic pressure, but also lockdown fatigue and other relevant societal factors may have changed between the two waves.

Our current data only allow us to speculate about why citizens are more supportive of stricter rules when they are applied to the unvaccinated only. Finding much stronger support for more restrictive rules for the unvaccinated among the vaccinated than the unvaccinated resonates with a self-interest account (i.e. imposing a higher burden on those spreading the virus to minimize disutility to oneself). Yet, this could also be motivated by fairness concerns and a concomitant desire to punish those who—in contrast to oneself—do not contribute to the common good (Hensel et al., 2021). Indeed, punishment opportunities are often seen as fundamental for ensuring long-term cooperation (Fehr and Fischbacher, 2004; Fehr and Gintis, 2007). Future research could investigate the causes of this differential support, for example by varying more aspects of the regulations in question or by priming respondents to more strongly consider self-interest, altruistic, or fairness concerns.

While our results do support the notion that, at a stage of widespread vaccine availability, tightened Corona regulations targeted at the unvaccinated enjoy support among the majority of citizens, especially those who are vaccinated themselves, this does not mean that implementing such unequal treatment would necessarily be preferable. For example, previous research suggests that mandatory COVID-19 certificates increased vaccinations (Mills and Rüttenauer, 2022), but it also indicates that increased pressure on the unvaccinated leads to decreased institutional trust among these (Jørgensen et al., 2021) and that perceived moral reproach by the vaccinated is associated with vaccine hesitancy (Rosenfeld and Tomiyama, 2022). Given the already significant polarization in public support that we found indications of here, this is a potential downside policy-makers must consider if faced with demands from a vaccinated majority. At the same time, in some countries it may be prudent to implement one or more of the rules and regulations that we investigated in lieu of more invasive vaccine mandates.

Credit author statement

JS: Conceptualization; Data curation; Formal analysis; Methodology; Visualization; Roles/Writing - original draft; Writing - review & editing. PTD: Conceptualization; Investigation; Methodology; Roles/Writing - original draft; Writing - review & editing. SDØ: Funding acquisition; Investigation; Writing - review & editing. KMS: Funding acquisition; Conceptualization; Investigation; Data curation; Methodology; Project administration; Validation; Roles/Writing - original draft; Writing - review & editing.

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Declaration of competing interest

SDØ received the 2020 Lundbeck Foundation Young Investigator Prize. Furthermore, SDØ owns units of mutual funds with stock tickers DKIGI and WEKAFKI, as well as units of exchange-traded funds with stock tickers TRET, QDVE, QDVH, EUNL and SADM.

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