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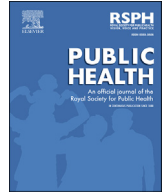
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Short Communication

Self-reported health behaviors and risk perceptions following the COVID-19 vaccination rollout in the USA: an online survey study

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ABSTRACT

Objectives: Concerns have been raised that mass vaccination campaigns might lead to reduced engagement with other recommended health behaviors. We assessed self-reported behaviors and risk perceptions following the COVID-19 vaccine rollout in the USA.

Study design: Between December 2, 2020, and March 23, 2021, we conducted three online survey studies with US adult respondents.

Methods: Respondents self-reported their COVID-19 vaccination status, their frequency of engaging in risk-increasing behaviors and wearing a mask when in public places, and their COVID-19 risk perceptions (i.e., perceived likelihood of getting COVID-19 and of being hospitalized if they got COVID-19).

Results: Our analytical sample included 832 respondents who had completed the first and final surveys and had received either 0 or 2 doses of a COVID-19 vaccine. Most respondents were non-Hispanic White (75%), male (77%), and US Veterans (64%), with the median age between 55 and 74 years. Overall, respondents reported frequently wearing masks when in public and rarely engaging in risk-increasing behaviors. Regardless of vaccination status, respondents reported more frequently engaging in risk-increasing behaviors and lower risk perceptions in March 2021 than in December 2020. Mask wearing did not change over the study period, with vaccinated respondents consistently reporting more frequent mask wearing than unvaccinated respondents.

Conclusions: Taken together, our findings indicate that the COVID-19 vaccine rollout in the USA did not result in the rapid abandonment of protective behaviors or dramatic uptake of risk-increasing behaviors. Additional studies are needed to monitor how mass vaccination might impact public behaviors and risk perceptions as coverage widens.

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Introduction

Efforts to limit the impact of the COVID-19 pandemic have relied heavily on people making substantive changes to the way they live and interact with one another. Most people have been diligent in adopting and adhering to recommended health behaviors despite the high costs and difficulty of doing so.¹ However, signs of decreasing engagement, particularly to less habitual and more burdensome health behaviors (e.g., physical distancing), have emerged during the pandemic.^{2,3}

Concerns have been raised that the rollout of COVID-19 vaccines would exacerbate decreasing public engagement to health behaviors.^{4,5} Misconceptions about the protection offered by vaccines among those fully or partially vaccinated⁶ and overconfidence in the protection of people who are vaccinated among unvaccinated people⁴ have been noted as potential drivers of increased complacency toward health behaviors, which could undermine the public health impact of the COVID-19 vaccines. However, current evidence on the impact of the COVID-19 vaccine rollout on public engagement with other health behaviors remains limited and inconclusive,^{7,8} particularly in the USA.

The aim of this study was to better understand the impact of the COVID-19 vaccine rollout on reported frequency of engaging in risk-increasing behaviors, wearing a mask when in public, and

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risk perceptions across the early vaccine rollout period in the USA (December 2020 to March 2021). To identify potential differences in the reported behaviors and perceptions of vaccinated and unvaccinated respondents, we compared respondents based on their COVID-19 vaccination status (0 doses vs 2 doses) as of March 2021.

Methods

Study population and recruitment

Respondents in this IRB-approved study were US adults recruited and compensated by Qualtrics for an online longitudinal study about the experiences of US Veterans and non-Veterans during the COVID-19 pandemic. Three surveys were conducted between December 2020 and March 2021 (December 2 to December 27, 2020 ($n = 2085$), January 21 to February 6, 2021 ($n = 1257$), and March 8 to March 23, 2021 ($n = 1075$)).

Procedure

Respondents answered a series of questions about their current behaviors, well-being, healthcare experiences, and attitudes regarding the COVID-19 pandemic. Although not relevant to the present findings, it is worth noting that at the start of the March 2021 survey, respondents were randomly assigned to a control group or to view one of two messages about COVID-19 vaccines as part of a separate experiment about communications regarding COVID-19 vaccine development and safety.⁹ As the messages had no effect on respondents' vaccine intentions, safety perceptions, or worries about side-effects, we report data across all respondents.

Measures

Vaccination status (measured March 2021): 'Have you received the COVID-19 vaccine?' with responses 'No,' 'Yes, 1 dose,' and 'Yes, 2 doses.' As we could not differentiate between those vaccinated with a 1-dose vaccine (Johnson & Johnson) and those who received the first of a 2-dose vaccine (e.g., Pfizer or Moderna), respondents who answered 'Yes, 1 dose' were not included in these analyses. However, analyses including these respondents are available in the Appendix.

Risk-increasing behavior (measured December 2020 and March 2021): How frequently, if at all, respondents were doing five risk-increasing behaviors ('Going to gatherings of 10 or more people'; 'Going on optional shopping trips'; 'Going on optional travel'; 'Having optional social visits'; 'Eating inside restaurants, bars, and food courts'). These items demonstrated good reliability (Cronbach's alpha [α] = 0.84 for December 2020; $\alpha = .87$ for March 2021) and were averaged for analyses.

Mask wearing (measured December 2020 and March 2021): How frequently, if at all, respondents were 'Wearing a mask over your nose and mouth when you are in a public place (e.g., a store).' The risk-increasing behavior and mask-wearing questions were answered using a six-point scale (1 = 'Never,' 2 = 'Very rarely,' 3 = 'Rarely,' 4 = 'Occasionally,' 5 = 'Frequently,' and 6 = 'Very frequently').

Risk perceptions (measured December 2020 and March 2021): Two questions ('In your opinion, how likely is it that you will get COVID-19 during the next month?,' and 'If you were to get COVID-19, how likely do you think it is that you would need to be hospitalized?') answered using a five-point scale (1 = 'Not at all likely' to 5 = 'Very likely').

Statistical analyses

Analyses were conducted using RStudio Version 1.4.1106. We conducted linear mixed-effects models with lme4 for each outcome measure with survey time (December 2020; March 2021) as the within-subjects factor and vaccination status as the between-subjects factor. For follow-up comparisons, we used rstatix to conduct Welch's independent *t*-tests and paired-samples *t*-tests. These analyses were not preregistered. Although we preregistered the research question, we realized the proposed analyses were not the most appropriate for answering the research question. Thus, we present the preregistered analyses in the Appendix.

Results

A total of 1075 respondents completed the December 2020 and March 2021 surveys (completion rate = 52%). Our analytic sample included 832 respondents who reported having received either 0 doses (361, 34%) or 2 doses (471, 43%) of a COVID-19 vaccine in the March 2021 survey. Most respondents were non-Hispanic White (621, 75%), male (641, 77%), and US Veterans (529, 64%), with a median age between 55 and 74 years (Appendix Table 1a).

On average, respondents reported very rarely engaging in risk-increasing behaviors both before and after the COVID-19 vaccine rollout (Fig. 1 and Appendix: Table 2). In December 2020, unvaccinated (0 doses) respondents reported more frequently engaging in risk-increasing behaviors as compared to vaccinated (2 doses) respondents (mean difference estimate, 0.39 [95% CI, 0.25 to 0.53]). Regardless of vaccination status, respondents reported more frequently engaging in risk-increasing behaviors over time, with the steeper increase observed among vaccinated respondents (0-dose group difference, -0.20 [95% CI, -0.29 to -0.12]; 2-dose group difference, -0.43 [95% CI, -0.49 to -0.36]). By March 2021, vaccinated and unvaccinated respondents did not differ (difference, 0.17 [95% CI, 0.00 to 0.33]), with both groups reporting very rarely engaging in risk-increasing behaviors following the vaccine rollout.

Most respondents reported frequently-to-very frequently wearing a mask when in public both before (December 2020: 99% of vaccinated respondents vs 87% unvaccinated respondents) and after the COVID-19 vaccine rollout (March 2021: 98% of vaccinated respondents vs 85% unvaccinated respondents). There were no observed changes regarding the reported frequency of mask wearing over the study period within groups; however, unvaccinated respondents consistently reported less frequently wearing masks as compared to vaccinated respondents (December 2020 difference; -0.44 [95% CI, -0.57 to -0.31]; March 2021 difference; -0.44 [95% CI, -0.58 to -0.31]).

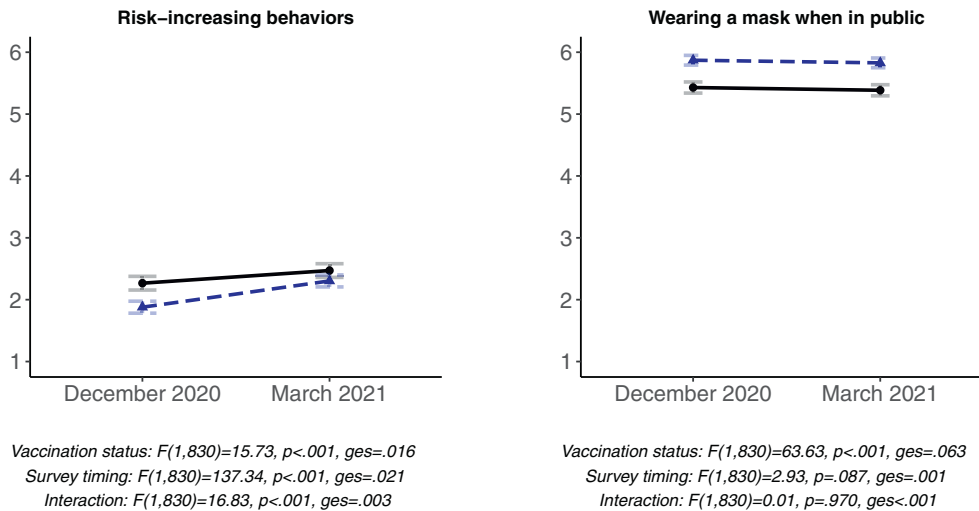
All respondents, even those who were unvaccinated, reported that it was less likely they would get COVID-19 (0-dose group difference, 0.13 [95% CI, 0.02 to 0.23]; 2-dose group difference, 0.67 [95% CI, 0.59 to 0.75]) or be hospitalized if they did get COVID-19 (0-dose group difference, 0.19 [95% CI, 0.08 to 0.29]; 2-dose group difference, 0.76 [95% CI, 0.66 to 0.87]) in March 2021 as compared to December 2020, with the greatest reductions observed among respondents who were vaccinated by March 2021.

Discussion

Taken together, our findings indicate that the COVID-19 vaccine rollout in the USA did not result in the rapid abandonment of protective behaviors or dramatic uptake of risk-increasing behaviors. Overall, respondents reported very rarely engaging in risk-increasing behaviors both before and after the vaccine rollout. Thus, despite respondents engaging slightly more frequently in risk-increasing behaviors after the vaccine rollout, with a steeper

Self-reported behavior

(1=Never; 3=Rarely; 6=Very frequently)



COVID-19 risk perceptions

(1=Not at all likely; 5=Very likely)

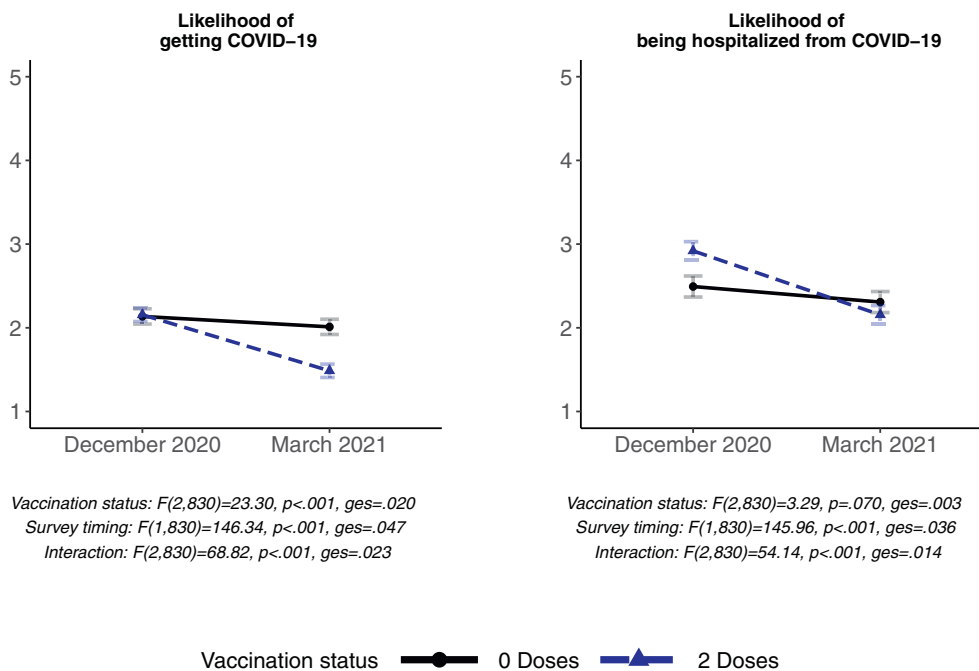


Fig. 1. Respondents' self-reported behaviors and risk perceptions from the December 2020 and March 2021 surveys according to their self-reported vaccination status as of March 2021. Results of mixed-effects models' main effects and interactions shown in each panel.

change among vaccinated respondents, both vaccinated and unvaccinated respondents continued to predominantly avoid engaging in risky behaviors and situations. Engagement with protective health behaviors also remained high following the COVID-19 vaccine rollout with the vast majority of respondents in our sample consistently reporting that they frequently-to-very frequently wore masks when in public. Notably, vaccinated respondents reported more frequent mask wearing than unvaccinated respondents, which further highlights the scope for

promoting mask use by unvaccinated individuals. Although engagement with risk-increasing behaviors and mask wearing did not change dramatically, risk perceptions did vary with vaccinated respondents in particular thinking it was less likely they would get COVID-19 or be hospitalized if they did get COVID-19 following the COVID-19 vaccine rollout.

Limitations of the present study include reliance on the accuracy of self-reported vaccination status and behavior. Self-report data provide valuable public health insights, given the high

correspondence with actual health behaviors^{10,11} and medical records (e.g., for vaccination status).¹² However, it is important to consider that there are many reasons why respondent's answers may have been inaccurate or inconsistent (e.g., social desirability). Observational data for the same period would therefore provide greater confidence in the present findings. In addition, our sample is not representative of the general population. Nonetheless, these findings provide important insights into the behaviors and perceptions of US adults, some of whom were eligible and received COVID-19 vaccines in the early stages of the rollout.

Continued assessment of public behavior remains important, given changing recommendations (e.g., revised CDC guidance for fully-vaccinated individuals announced in April and May-2021),¹³ easing of public health measures, and the emergence of variants of concern (e.g., Delta/Omicron).

The present findings do not support concerns that the COVID-19 vaccine rollout resulted in complacency toward other health behaviors by either vaccinated or unvaccinated individuals. Conversely, vaccinated respondents continued to avoid risk-increasing behaviors and very frequently wore masks when in public even in light of their reduced risk following vaccination, which these respondents acknowledged in updating their risk perceptions. Unvaccinated respondents also continued to refrain from risk-increasing behaviors, frequently wore masks in public, and reported only moderate changes in their risk perceptions. These findings suggest that, at least in this study, the COVID-19 vaccine rollout did not appear to result in widespread complacency toward other health behaviors.

Author statements

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Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Author contributions

Thorpe, Scherer, and Fagerlin, concept and design; Thorpe, Scherer, Shoemaker, and Fagerlin, acquisition, analysis, or interpretation of data; Thorpe, drafting of the manuscript and statistical analysis; Scherer and Fagerlin, supervision; all authors, critical revision of the manuscript for important intellectual content.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.puhe.2022.05.007>.

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