Short Communication

Beyond fear of side effects: Distrust and perceived need of COVID-19 vaccinations are salient drivers of vaccine intentions in young adults with prolonged non-adoption

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Abstract

Reducing vaccine hesitancy is a critical public health priority, but it remains unclear which specific beliefs most strongly drive vaccine hesitancy. The present study compared strength of associations between several hesitant beliefs and vaccine intentions among a diverse sample of 546 young adults (M_{age}=21.7, representing 45 different states in the US) with prolonged non-adoption of COVID-19 vaccination (i.e., all participants were still unvaccinated several years into the pandemic). Fear of side effects and beliefs about vaccine effectiveness were not strongly associated with vaccine intentions, but distrust of COVID-19 vaccines and believing that one does not need a COVID-19 vaccine were the strongest relative predictors of vaccine intentions (i.e., inverse associations). Thus, findings highlight the need to improve trust of public health institutions and increase perceived need for vaccination as potential target points for increasing vaccine uptake among young adults with prolonged non-adoption, even beyond the COVID-19 vaccine.

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Prior to the COVID-19 pandemic, the World Health Organization already considered vaccine hesitancy as a top-ten global health threat (WHO, 2019). Myriad studies examined vaccine hesitancy early in the pandemic, when COVID-19 vaccines were not yet widely available to healthy adults, and very few studies since have drawn inferences from fully non-vaccinated samples. Given the importance of understanding and combatting vaccine hesitancies more broadly, we argue there is much to be learned from prolonged non-adopters who remain unvaccinated for COVID-19 several years into the pandemic. Specifically, elucidation of which hesitant beliefs most strongly relate to vaccine intentions among this hard-to-reach subgroup holds implications for public health approaches aimed at increasing uptake of both COVID-19 vaccination as well as other common or forthcoming vaccines.

Young adults have had the lowest rates of vaccine uptake and the highest levels of vaccine hesitancy (Hamel et al., 2021). Moreover, because young adults are at lower risk of developing severe symptoms and complications associated with COVID-19 (Zhu et al., 2020), they may be less likely to isolate if infected and more likely to unknowingly spread the virus to more vulnerable members of their community. Beyond the immediate urgency for increasing vaccine uptake for COVID-19, young adulthood is a highly formative developmental stage in terms of developing lifelong health beliefs and attitudes (Bonnie et al., 2015); thus, an important age group to focus on pertaining to interventions on vaccine hesitancies given they represent the next generation of community leaders. Similarly, many young adults are parents to young children (or will soon be), so reducing vaccine hesitancies among this age group is important to increase/maintain childhood vaccination rates for re-emerging vaccine-preventable diseases (e.g., Measles). As such, the present study focuses on vaccine hesitancy among young adults.

Current Study

In a sample of unvaccinated US young adults with prolonged non-adoption (ages 18-24, representing 45 states), the present study examined associations between vaccine hesitant beliefs and intentions to get a COVID-19 vaccine. The primary aim was to begin identifying which specific hesitant beliefs are driving young adults' decisions to remain unvaccinated; thus, shedding light on key target areas for intervention and other public health efforts for prolonged non-adoption of vaccination.

Method

Participants and Procedures

Data were from an RCT testing the efficacy of a brief web-based intervention pertaining to COVID-19 vaccine uptake and vaccine hesitant beliefs in young adults. Presently, we examine baseline data collected prior to randomization and intervention procedures. Data collection took place from September 2022 to March 2023. Participants were initially recruited using Qualtrics panel data service, which was chosen because of evidence that it is the most demographically and politically representative panel service (Boas et al., 2020). Eligibility criteria included (a) age 18-24, (b) willingness to participate in follow-up surveys, (c) live in the US, (d) having not received a COVID-19 vaccine, and (e) passing internal checks for quality including bot detection and 'ballot stuffing'. To boost recruitment, we posted advertisements on social media and screened participants using the same criteria while also confirming eligibility via phone screen. Baseline participation was incentivized with $10 gift cards, though participants were aware of increasing remuneration at later post-intervention follow-ups (e.g., $25 at 6-months). See Graupensperger et al., (2023) for further details.

The short Qualtrics screener was completed by 3,810 potential participants, of which 501 (13%) were eligible and completed the baseline survey. From social media recruitment, an additional 1,232 responses to the screening survey were received, of which 58 (5%) were eligible and completed the baseline survey. Pertaining to exclusion, 23.8% did not consent to participate in the full study, 70.2% were vaccinated for COVID-19, 3.6% were located outside the US, and 2.3% were outside the age range. Recruitment advertisements did not mention vaccination status as eligibility criteria, as to reduce fraudulent responding, which explains the low screen-in rate. After removing duplicates and fraudulent responses, 546 young adults were included in the baseline sample with representation from 45 different states. The mean age was 21.7 years old (*SD*=2.0), 69.8% reported female birth sex, 67.8% identified as a woman (1.8% identified as non-binary/other), 70.8% identified as exclusively heterosexual, and 19.9% were enrolled in a four-year university. The distribution of race was 58.8% White, 31.3% Black/African American, 4.0% Asian, and 5.9% another race. In addition, 12.6% were Hispanic/Latinx. Regarding political views, the sample was fairly evenly distributed: 27.8% Republican, 21.3% Democrat, 29.7% Independent, and 21.3% other or no preference.

Measures

Vaccination intentions were asked using two items, one which asked about participants' intentions to *ever* get a COVID-19 vaccine and one that asked about intentions to get a COVID-19 vaccine in the next three months. These two items were highly correlated (r = .86); thus, we opted to focus only on intentions to ever get a COVID-19 vaccine. Responses were collected on a 100-point sliding scale with labels at 0 (*Not at all likely*), 50 (*Might or might not*), and 100 (*Extremely likely*). These responses were re-coded through dividing by 10 to aid interpretation of regression coefficients.

Vaccine hesitant beliefs specific to COVID-19 vaccination were assessed using items from the US Census Bureau's Household Pulse Survey. These five items included "I am concerned about possible side effects of a COVID-19 vaccine", "I don't think a COVID-19 vaccine will protect me", I don't believe I need a COVID-19 vaccine", "I plan to wait and see if COVID-19 vaccines are safe and may get one later", and "I don't trust COVID-19 vaccines". Whereas the Household pulse survey asks these items as a binary response (yes/no), we asked participants to respond on a 5-point scale from 0=*Strongly disagree* to 5=*Strongly agree*; thus, higher scores reflect greater hesitant beliefs.

Analyses

We fit a series of multivariate regressions that estimated associations between vaccine hesitant beliefs and intentions to get a COVID-19 vaccine. Models were fit iteratively; first, separate models were fit for each hesitant belief to isolate the effect estimate without the shared variance from the other belief items. Then, a final model was fit with all the hesitant beliefs included as covariates, which estimates the effect of each belief while adjusting/controlling for the other beliefs. Despite some similarities between items, there was no evidence of multicollinearity as variance inflation factors (VIF) were all <2, indicating very low levels of multicollinearity (Tabachnick & Fidell, 2019). Finally, we directly contrasted the strength of associations between each hesitant belief and vaccine intentions using a *Z*-test to identify significant differences in association strength. Across all models, we made *a priori* decisions to control for participants' age, sex, race, ethnicity, recruitment source, political views, and previous COVID-19 infection.

Results

The sample reported very low COVID-19 vaccine intentions, on average (Table 1). Vaccine intentions did not differ by age (r= -.04, p=.328), birth sex (t=0.26, p=.794), or four-year college student status (t=.04, p=.971), but there were stark differences by political views (F(3, 539) = 20.42, p<.001). Tukey's post-hoc comparisons revealed participants with Democrat views reported significantly greater intentions to receive a COVID-19 vaccine (M=4.4 on a 0—10 scale) compared to those with Republican (M=1.9, p<.001), Independent (M=2.7, p=.030), and other political views (M=2.2, p<.001).

Vaccine hesitant beliefs were relatively high across all specific items, with means above scale midpoints on each (0—5 scale; Table 1). The various beliefs were generally correlated, but the item pertaining to waiting to see if the vaccine is safe and maybe getting vaccinated later was systematically different. Indeed, this item is double-barreled and the latter half of the item referring to 'maybe getting a vaccine later' seems more aligned with intentions to get vaccinated than reflecting a hesitant belief. As such, we did not include this item in the primary regression models.

The primary models are displayed in Table 2 with Models 1-4 showing associations with one hesitant belief covariate per model and Model 5 including all beliefs together. Model 1 shows no evidence of a significant association between concerns about vaccine side effects and intentions to get vaccinated. Models 2-4, respectively, show significant inverse associations between vaccine intentions and (a) belief that the vaccine will not protect them, (b) belief that they do not need a vaccine, and (c) distrust in the vaccines. Central to the study aims, Model 5 including all beliefs as covariates, shows that only distrust in the vaccines and belief that they do not need a vaccine were significantly associated with vaccine intentions. A subsequent Z-test revealed that of the two significant hesitancies, belief that they do not need a vaccine was a

significantly stronger predictor of vaccine intentions than was distrust of the vaccines (Z=2.61, p=.009); thus, one's belief that they do not need a vaccine emerged as the strongest relative predictor of vaccine intentions.

Discussion

Fear of Side Effects. Counter to common discourse and mainstream media, concerns about side effects were *not* significantly associated with COVID-19 vaccine intentions in this prolonged non-adopting sample. Qualitative research on fear of COVID-19 vaccine side effects posits that such beliefs reflect prevention focused decision making where individuals seek to avoid undesired health outcomes (George et al., 2023) and, relative to other hesitant beliefs, prolonged non-adopters with fear of side effects may have elevated intentions or openness to becoming vaccinated at some point. Fear of side effects may no longer be a salient driver for prolonged non-adoption given no compelling evidence of serious side effects has emerged.

Perceived Effectiveness. When isolated in a regression model without other hesitant beliefs, concerns that COVID-19 vaccines will not protect was significantly associated with lower vaccine intentions. However, when controlling for additional hesitant beliefs in a subsequent model, beliefs that vaccines will not protect was not significantly associated with vaccine intentions, suggesting that perceived effectiveness may not be a driving factor for prolonged non-adopters, on average. So, while the mean of this item (i.e., 3.83 out of 5) suggests many young adults in our sample did question the effectiveness of COVID-19 vaccines, focusing on such beliefs may not be compelling enough to increase vaccination rates among prolonged non-adopters.

Distrust. Distrust of COVID-19 vaccines was strongly associated with lower vaccine intentions among young adults with prolonged non-adoption, even when adjusting for other

hesitant beliefs. This may indicate a need for improving trust in governmental health agencies more broadly. The rapid development/distribution of COVID-19 vaccines is a scientific marvel, but raised concerns for some people (Latkin et al., 2021). Indeed, preexisting downward trends in trust of health care and government (Khullar, 2019) may have created a 'perfect storm' for high levels of distrust. Given our findings show distrust as a salient driving factor of vaccine intentions, efforts must be made to gain the trust of non-adopters, which may require starting small with incremental steps towards increasing trust in public institutions completely aside from the COVID-19 vaccine.

Perceived Need. Finally, our findings indicate the belief that one does not need a vaccine was a significantly stronger predictor of intentions than all other beliefs. There may be some validity to the belief that young adults are less vulnerable to COVID-related deaths (Elo et al., 2022), but meta-analytic evidence suggests young adults are comparable to other age groups in vulnerability to experiencing post COVID-19 (i.e., 'long covid'; Notarte et al., 2022). Because post COVID-19 is often a long-term debilitating condition, even for young adults (Mogensen et al., 2023), vaccine campaigns and health professionals may highlight the long-term adverse health effects of contracting the virus. Moreover, a lack of belief in the personal necessity of a COVID-19 vaccine may suggest an ego-driven mindset, whereas adopting a more collectivistic mindset has been shown to enhance the value placed on vaccination for the sake of others, particularly those who are more vulnerable (Courtney et al., 2022).

Implications. Taken together, prolonged non-adoption of COVID-19 vaccination among young adults is primarily driven by distrust and perceived personal need. It follows that efforts to increase vaccination uptake in this hard-to-reach population with complex and multifaceted barriers may benefit from efforts to improve trust in healthcare and public health, more generally,

as well approaches to better highlight both the personal and collective value in vaccination. These implications transcend the COVID-19 pandemic, as vaccine hesitancy has been and will continue to be a central public health priority.

Limitations

Alongside the strengths of the relatively large and nationwide sample of young adults with prolonged non-adoption, several limitations warrant mention. Regarding measurement of hesitant beliefs, we used the hesitant beliefs items from the CDC Household Pulse survey to identify which had the most salient associations with vaccine intentions, but this was not an exhaustive list of hesitant beliefs. Participants were recruited using a panel service and through online advertisements, but we faced challenges enrolling a large sample of non-vaccinated young adults, which is perhaps a subgroup that is less-likely to participate in University-based research in general. The cross-sectional nature of the data preclude strong causal interpretation, but otherwise, the present research question did not require longitudinal data.

Conclusions

Examining which vaccine hesitant beliefs most closely relate to COVID-19 vaccine intentions revealed beliefs that one does not need a vaccine and distrust in the vaccines were the strongest relative predictors among young adults with prolonged non-adoption. Fears of side effects no longer appear to be a driving factor for young adults, and beliefs regarding the effectiveness of COVID-19 vaccines was also not a robust predictor of vaccine intentions when controlling for other hesitant beliefs. Thus, findings highlight the need to modify beliefs about distrust and perceived need for vaccination as potential target points for increasing vaccine uptake among prolonged non-adopters.

Disclosure Statements

Ethical Approval. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

Conflicts of Interest. The authors have no conflicts of interest to declare.

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Tables

Table 1. Descriptive statistics and bivariate correlation coefficients.

	Mean	SD	Range	1	2	3	4	5	6	7	8	9
1. Baseline Age	21.75	2.00	18.0—24.9									
2. Birth Sex (0=Male, 1=Female)	0.70	0.46	0—1	-.02								
3. Four Year College Student	0.20	0.40	0—1	-.18**	-.12**							
4. Previous COVID-19 Infection	0.46	0.50	0—1	-.08	.08	.05						
5. Concerns about Side Effects	3.83	1.26	1—5	.02	.06	.04	.06					
6. Don't think the Vaccine Will Protect Them	3.80	1.22	1—5	.05	.08	.05	.09*	.33**				
7. Don't think they Need a Vaccine	3.92	1.17	1—5	.11*	-.01	.03	.09*	.18**	.54**			
8. Plan to Wait and See	3.24	1.37	1—5	-.01	.01	.00	.11*	.19**	.01	-.13**		
9. Don't Trust the Vaccine	3.90	1.15	1—5	.10*	.05	.02	.10*	.35**	.56**	.59**	-.05	
10. COVID-19 Vaccine Intentions	2.73	2.88	0—10	-.04	-.01	.00	.00	-.08	-.33**	-.52**	.35**	-.42**

Note: Vaccine intentions was initially asked on a 0-100 sliding scale, but responses were recoded via dividing by 10 to aid interpretation of effect sizes, though estimates are otherwise statistically identical. *$p < .01$, **$p < .001$.

Table 2. Multivariate regression models estimating associations between vaccine hesitant attitudes and intentions to get a COVID-19 vaccine.

	MODEL 1		**MODEL 2**		**MODEL 3**		**MODEL 4**		**MODEL 5**	
	Side Effects		**Won't Protect**		**Don't Need**		**Don't Trust**		**All Beliefs**	
Covariates	*b*	SE	*b*	SE	*b*	SE	*b*	SE	*b*	SE
Intercept	3.46*	1.56	4.71**	1.48	5.96***	1.36	5.20***	1.43	6.14***	1.36
Baseline Age	-0.06	0.06	-0.02	0.06	0.03	0.05	0.01	0.06	0.04	0.05
Birth Sex (0 = Male, 1 = Female)	-0.15	0.26	0.01	0.25	-0.15	0.23	0.01	0.24	-0.07	0.23
Four Year College Student (Y/N)	-0.23	0.31	-0.12	0.30	-0.10	0.27	-0.12	0.29	-0.07	0.27
Race (Ref = White)										
Black/African American	0.23	0.28	0.46	0.27	0.22	0.25	0.61*	0.26	0.42	0.25
Asian	1.07	0.62	1.32*	0.60	1.04	0.55	1.12	0.57	1.09*	0.54
Other	-0.04	0.54	0.16	0.51	-0.22	0.47	0.05	0.49	-0.14	0.46
Hispanic Ethnicity (Y/N)	0.88*	0.37	0.89*	0.35	0.66*	0.32	0.79*	0.34	0.68*	0.32
Recruitment Source (0 = Qualtrics, 1 = Social Media)	0.23	0.44	0.20	0.42	0.18	0.38	0.17	0.40	0.14	0.38
Political Views (Ref = Republican)										
Democrat	2.35***	0.37	1.81***	0.36	1.50***	0.33	1.51***	0.35	1.25***	0.33
Independent	0.79*	0.32	0.48	0.31	0.43	0.28	0.55	0.29	0.37	0.28
Other	0.21	0.35	-0.11	0.34	-0.25	0.31	-0.22	0.33	-0.36	0.31
Previous COVID-19 Infection (Y/N)	0.11	0.24	0.27	0.23	0.35	0.21	0.38	0.22	0.43*	0.21
Vaccine Hesitant Beliefs										
Concerns about Side Effects	-0.17	0.09							0.13	0.09
Don't think the Vaccine Will Protect Them			-0.70***	0.09					-0.07	0.11
Don't think they Need a Vaccine					-1.17***	0.09			-0.91***	0.11
Don't Trust the Vaccine							-0.98***	0.10	-0.47***	0.12

***Note*:** Vaccine intentions was initially asked on a 0-100 sliding scale, but responses were recoded via dividing by 10 to aid interpretation of effect sizes, though models are otherwise statistically identical. *$p < .05$, **$p < .01$, ***$p < .001$.