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Research note

Tourism and vaccine hesitancy

Oscar Yuheng Zhu a,1,⁎, Bettina Grün b,2, Sara Dolnicar a,3

a UQ Business School, The University of Queensland, St Lucia Campus, Brisbane, Qld 4072, Australia
b Institute for Statistics and Mathematics, WU (Vienna University of Economics and Business), Welt-handelsplatz 1, 1020 Vienna, Austria

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Introduction

COVID-19 severely disrupted global tourism, causing a 74% drop in international arrivals (UNWTO, 2021) in 2020. Industry recovery depends on mass vaccination. In the first half of 2021, 21% of US (US Census Bureau, 2021) and Australian adults (Melbourne Institute Research Insight, 2021) hesitated to get vaccinated. Vaccine hesitancy negatively affects public health, causes social costs (Qiu et al., 2020) and delays unrestricted travel. Overcoming vaccine hesitancy is essential to the recovery of the tourism industry from the pandemic.

While governments have been combatting vaccine hesitancy for many decades, people’s scepticism of quickly developed COVID-19 vaccines led to a renewed research interest into overcoming vaccine hesitancy. Reminding patients that a vaccine dose is ‘reserved’ for them, for example, increases flu vaccination rates by 4.6 percentage points (Milkman et al., 2021). Other approaches show promise, but remain untested, including sending tailored messages to specific target groups (Roy et al., 2020) and monetary incentives (Vavreck, 2021). During the pandemic, several US states used $100 gift cards (West Virginia) or lotteries (New York, Ohio; Volpp & Cannuscio, 2021). Survey research suggests that a $100/$50 cash payment could be effective in increasing vaccination willingness for 34%/31% of the population (Vavreck, 2021). Where vaccine hesitancy is high, monetary incentives fail (Melbourne Institute Research Insight, 2021).
The role of travel-related beliefs and behaviours in vaccine hesitancy remains un-investigated. The present study expands the frontiers of knowledge in tourism social science by investigating – for the first time – (1) whether travel-related beliefs and behaviours are associated with vaccination willingness, and (2) whether alerting people to travel-related freedoms linked to vaccination can increase vaccination willingness.

In two analyses, we (1) test the association of travel-related beliefs and behaviours and vaccination willingness, while accounting for vaccine-related beliefs. We achieve this by using decision tree analysis to identify which personal characteristics most effectively group people into homogenous segments with respect to their vaccine willingness. Using additional personal characteristics, we profile the resulting segments. (2) Building on prospect theory (Kahneman & Tversky, 2013), we test the effectiveness of a gain-framed and a loss-framed message implementation in increasing vaccination willingness and benchmark findings against a conventional health message in a survey experiment (Viglia & Dolnicar, 2020). Prospect theory postulates that people are loss-averse; they are more willing to take a risk to avoid a loss than to gain a benefit (Kahneman & Tversky, 2013) – even if the loss is lower than the gain – because they assess gain and loss against their status quo (Galanter & Pliner, 1974). Gains and losses can be monetary or non-monetary (Kahneman & Tversky, 2013). The gain-framed message explains that vaccination will lead to gaining permission for quarantine-free overseas travel. The loss-framed message explains that not getting vaccinated will lead to losing permission. In line with prospect theory, we expect the loss-framed message to be more effective. We use a conventional health message as a control condition. Message exposure serves as independent variable. Change in stated vaccination willingness serves as dependent variable.

Methodology

We surveyed adult Australians twice using Prolific Scholar – an online survey participant recruitment website. We chose Prolific Scholar because it generates higher quality data than comparative services and has access to a new and diverse population of panellists (Peer et al., 2017). We filtered out respondents who attempted to manipulate participation eligibility and paid respondents who completed the survey a small monetary compensation in line with Prolific Scholar’s guidelines.

The first survey wave identified the base willingness to get vaccinated. Of 780 unvaccinated respondents, 755 were eligible to participate and answered the following question: “How high is your willingness to get vaccinated against COVID-19 in the near future?” Respondents recorded answers on a 100-point slider scale with end points labelled “Extremely low 0” and “100 Extremely high”. We chose a slider scale because the construct of likelihood is reflected well on a 100 point scale, as opposed to an ordinal answer format where people may interpret verbal labels differently, potentially introducing bias (Dolnicar, 2013).

In the second survey wave, we quota sampled approximately half of the resulting 247 respondents to have a vaccination willingness of 50 or below and half to have 51 and above to test whether communication messages affect people with different base vaccination intention levels differently. We also asked for socio-demographic information (age, education, marital status, having children, living with elderly, state of residency) and travel-related information (international travel frequency before COVID-19, main reasons for international travel, international and domestic travel frequency in 2020, current desire to travel internationally, travel type with the highest motivational value). These variables are used in the construction of the decision tree by assessing
their association with vaccination willingness. Respondents also indicated their vaccine safety and efficacy perception; both were included in the decision tree analysis because they are likely to influence vaccination willingness.

To test the association of travel-related beliefs and behaviours with vaccination willingness, we calculated a conditional inference decision tree using binary recursive partitioning (Hothorn et al., 2006). Vaccination willingness serves as dependent variable, all other variables as potential splitting variables. The algorithm searches for splitting variables that best discriminate between people with high and low vaccination willingness. For each split, the algorithm tests for independence between the potential splitting variable and the dependent variable and chooses the variable with the smallest p-value (shown in Fig. 2 below the variable name). The optimal split maximises the two-sample test statistic obtained when splitting the dependent variable into two groups accordingly. The procedure continues until the p-value of the test for independence after Bonferroni correction exceeds 0.05; it only tries splits for nodes containing at least 20 observations and leading to nodes with at least seven observations. Recursive partitioning performs automatic variable selection and leads to easily interpretable results.

We profiled the resulting segments with similar vaccination willingness using all other available personal characteristics. We assessed the association of these variables – which have not been used to construct the decision tree – with segment membership separately using a Kruskal-Wallis rank sum test for metric variables (age, desire for international travel) and a \( \chi^2 \)-test for categorical variables (travel internationally, children). We report all variables with a p-value smaller than 5%.

In the survey experiment, we randomly assigned respondents to one of three hypothetical messages designed to be comparable in structure, appearance and word count (Fig. 1).

Table 1
Key characteristics of COVID-19 vaccination willingness/hesitancy segments. Mean (standard deviation) for metric and percentages for categorical variables.

|                      | All | Seg. 1 (Node 3) | Seg. 2 (Node 4) | Seg. 3 (Node 6) | Seg. 4 (Node 8) | Seg. 5 (Node 9) | p-value |
|----------------------|-----|----------------|----------------|----------------|----------------|----------------|---------|
| Number of respondents| 247 | 41             | 50             | 30             | 30             | 96             |         |
| Willingness to get vaccinated | 62.6 (37.6) | 10.3 (14.3)   | 32.3 (21.6)   | 63.4 (27.5)   | 78.1 (26.2)   | 95.6 (7.5)     |         |
| Trust that vaccine works | 64.3 (33.0) | 7.2 (6.5)      | 45.4 (19.4)   | 63.9 (10.5)   | 84.3 (6.8)    | 92.5 (6.6)     |         |
| Trust that vaccine safe | 62.1 (33.0) | 12.0 (13.6)    | 33.0 (14.4)   | 69.0 (10.0)   | 72.8 (7.0)    | 93.3 (5.5)     | 0.002   |
| Age (in years)       | 34.7 (10.8) | 39.8 (11.5)    | 35.5 (11.5)   | 37.5 (12.7)   | 31.4 (8.2)    | 32.2 (9.2)     | 0.022   |
| Usually travel internationally | 67.20% | 48.80%         | 60.00%        | 76.70%        | 70.00%        | 75.00%         | 0.030   |
| Desire for international travel | 54.0 (38.9) | 43.4 (42.7)    | 43.5 (38.4)   | 63.6 (35.1)   | 58.2 (40.6)   | 59.8 (36.5)    | 0.004   |
| Having children:      |     |                |                |                |                |                |         |
| No children           | 68.00% | 51.20%         | 74.00%         | 53.30%        | 73.30%        | 75.00%         |         |
| Dependent children    | 25.90% | 29.30%         | 22.00%         | 40.00%        | 26.70%        | 21.90%         |         |
| Independent children  | 6.10%  | 19.50%         | 4.00%          | 6.70%         | 0.00%         | 3.10%          |         |
After viewing the message, respondents answered the following question: “Given this information, how high is your willingness to get vaccinated against COVID-19 in the near future?” on the same slider scale. We compare pre- and post-message vaccination willingness to test the effectiveness of the messages.

The university human ethics committee approved this fieldwork procedure (approval number 2021/HE001227).

**Results**

The association of travel-related beliefs and behaviours with vaccine willingness

Fig. 2 shows the decision tree. Only two constructs split respondents into five distinct segments (labelled nodes in Fig. 2) with distinctly different vaccination willingness: trust in vaccination safety and trust in vaccination efficacy. The first splitting criterion is vaccine safety, the second one is vaccine efficacy. People in the far-right segment (node 9) have very high vaccination willingness and are characterised by their belief that the vaccine is safe and effective. The exact opposite holds for the far-left segment (node 3).

Table 1 shows the profiles of the resulting nodes (segments of people), including the additional personal characteristics that significantly discriminate between segments. The two high vaccination hesitancy segments express a substantially lower desire to travel internationally. Past international travel frequency is substantially lower for the two low vaccination willingness segments. Being older and having independent children is associated with high vaccine hesitancy.

We conclude from the decision tree analysis that, while vaccine safety and efficacy are the main drivers of vaccination willingness, there is a significant association of vaccination willingness with a history of international travel and a desire to travel internationally in future.

The potential of leveraging the association of travel-related beliefs and behaviours with vaccine willingness to increase vaccination willingness

Before respondents saw one of the three communication messages, their average vaccination willingness ranged between 60 and 65 and did not differ significantly across experimental groups (F-value = 0.328, df1 = 2, df2 = 244, p-value = 0.72). Exposure to the messages did not significantly influence vaccination willingness (control group: 64 with a change of 3.9; gain group: 66 with a change of 4.4; loss group: 68 with a change of 2.9; differences in changed willingness across experimental groups: F-value = 0.132, df1 = 2, df2 = 244, p-value = 0.88). The results provide no empirical evidence for the hypothesis that promising or denying unrestricted travel affects vaccination willingness, suggesting a pre-existing association of travel-related beliefs and behaviours may have already manifested in vaccination willingness.

**Conclusion, limitations and future work**

We conclude from our two studies that there is a significant association between a person’s history of international travel and their desire to travel internationally in future and vaccination willingness. This association cannot, however, be leveraged to further increase vaccination willingness because (1) it has likely already manifested in a higher vaccination willingness within the relevant subset of the population, and (2) vaccine-related beliefs (safety and efficacy) drive vaccination willingness primarily.

These finding suggest that policymakers could develop communication strategies aimed at segments who care about international travel and have a high vaccination willingness to act as influencers in increasing the vaccination willingness among vaccine hesitant segments. High vaccination willingness segments with high interest in international travel have an intrinsic motivation for as many people as possible to get vaccinated to remove international travel barriers. Results also show that communicating travel-related freedoms is unlikely to be successful at this late stage of the pandemic, and efforts to overcome vaccine hesitancy must focus on increasing trust in the safety and efficacy of vaccines.

Limitations of the study include the use of stated vaccination willingness as dependent variable and the specific Australian vaccination context during data collection. Future research should study the association of actual travel-related behaviours and actual vaccination using behavioural data for both constructs by analysing travel movement (such as flights) and vaccination status, as soon as such data are available.

**CRediT authorship contribution statement**

Oscar Yuheng Zhu: Conceptualisation, Methodology, Data collection, Writing – original draft, reviewing and editing.
Bettina Grün: Data analysis, Data visualisation, Methodology, Writing – original draft, data analysis, reviewing and editing.
Sara Dolnicar: Conceptualisation, Methodology, Writing – original draft, reviewing and editing.

**Declaration of competing interest**

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.
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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.annals.2021.103320.

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