PCR18

Are Discrete-Choice Experiment Results Robust to Omitted Attributes? Evidence From a Vaccine Study

Mesfin Genie,[1,2] Verity Watson,[2,3] Michaël Schwarzinger,[4,5] Stéphane Luchini[6]

[1] Newcastle Business School, College of Human and Social Futures, University of Newcastle, Newcastle, New South Wales, Australia; [2] Health Economics Research Unit, Institute of Applied Health Sciences, University of Aberdeen, Aberdeen, United Kingdom; [3] RTI Health Solutions, Manchester, United Kingdom; [4] Department of Methodology and Innovation in Prevention, Bordeaux University Hospital, Bordeaux, France; [5] Bordeaux Population Health Research Center - U1219, University of Bordeaux, Bordeaux, France; [6] Aix-Marseille School of Economics (AMSE), Aix-Marseille University, Marseille, France; Centre National de la Recherche Scientifique (CNRS); École des Haute Études en Sciences Sociales (EHESS)

BACKGROUND

- In healthcare product development, innovations take time. Knowledge about a product's benefits and risks evolves and becomes more precise during product development and post-approval.[1]
- Patient preference studies, such as discrete-choice experiments (DCEs), are often developed pre-approval when scientific evidence is emerging.
- The US Food and Drug Administration (FDA), the European Medicines Agency (EMA), and the Innovative Medicines Initiative's PREFER consortium recommend that DCEs should:
  - Reflect realistic decision contexts
  - Include attributes that are relevant and meaningful to patients, decision-makers, health technology assessment agencies, and industry stakeholders
- It is important to understand whether preferences are robust to changing knowledge, but there is limited empirical evidence on the impact of adding or omitting DCE attributes.[2-6]

OBJECTIVE

To test the effect of the addition or removal of a study attribute on:

- the relative attribute importance for the remaining attributes in a DCE
- choice consistency of DCE responses

METHODS

- We conducted the study in December 2020 in the context of preferences for vaccines against coronavirus disease 2019 (COVID-19).
- Information was still evolving about the duration of immunity and safety of COVID-19 vaccines as they became available.
- We randomise respondents to 2 versions of the DCE: BASE and EXTRA (see Table 1). The EXTRA version includes 1 additional attribute: BOOSTER and 2 additional levels for the risk of serious side effects (SSE) from the vaccine: 1/100,000 and unknown.
- The choice tasks are presented in Figure 1.
- The study sample was randomly selected from an online survey research panel maintained by BVA Group (Paris, France).

Table 1. Attributes and Levels of COVID-19 Vaccine Included in the DCE

Attributes	Experiment 1: BASE Levels	Experiment 2: EXTRA Levels
Risk of being infected with SARS-CoV-2 (EFFICACY)	100%, 90%, 80%, 50%	100%, 90%, 80%, 50%
Risk of rare but SSE	1/100,000 vaccinated people, 1/10,000 vaccinated people	1/1,000,000 vaccinated people, **1/100,000 vaccinated people**, 1/10,000 vaccinated people, **Unknown**
Location of vaccine manufacturer (ORIGIN)	EU, US, China	EU, US, China
Place of vaccine administration (ADMINISTRATION)	GP practice, local pharmacy, mass vaccination centre	GP practice, local pharmacy, mass vaccination centre
Duration of vaccine immunity (BOOSTER)	–	**0.5 (every 6 months), 1 (every year), 5 (no vaccine booster needed)**

EU = European Union; GP = general practitioner; SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2; US = United States.

Figure 1. Example Choice Task: EXTRA DCE

	Scenario A	Scenario B	No vaccination
Risk of being infected with SARS-CoV-2	The vaccine reduces your risk of having COVID-19 by 90% and reduces the risk of people around you becoming infected	The vaccine reduces your risk of having COVID-19 by 80% and reduces the risk of people around you becoming infected	Your risk of having COVID-19 depends on the number of cases in your area and the protective measures you take on a daily basis
Risk of rare but SSEs from the vaccine	1 in 100,000 vaccinated people	1 in 10,000 vaccinated people	No risk
Location of vaccine manufacturer	Headquartered in the EU	Headquartered in the US	Not applicable
Place of vaccine administration	At your local pharmacy	At a mass vaccination centre	Not applicable
Duration of immunity	Every 6 months	Every year	Not applicable
Choice	**I would be vaccinated in scenario A**	**I would be vaccinated in scenario B**	**I would not be vaccinated**

- Participants were asked to choose between receiving 1 of 2 vaccines or no vaccination.

ANALYSIS

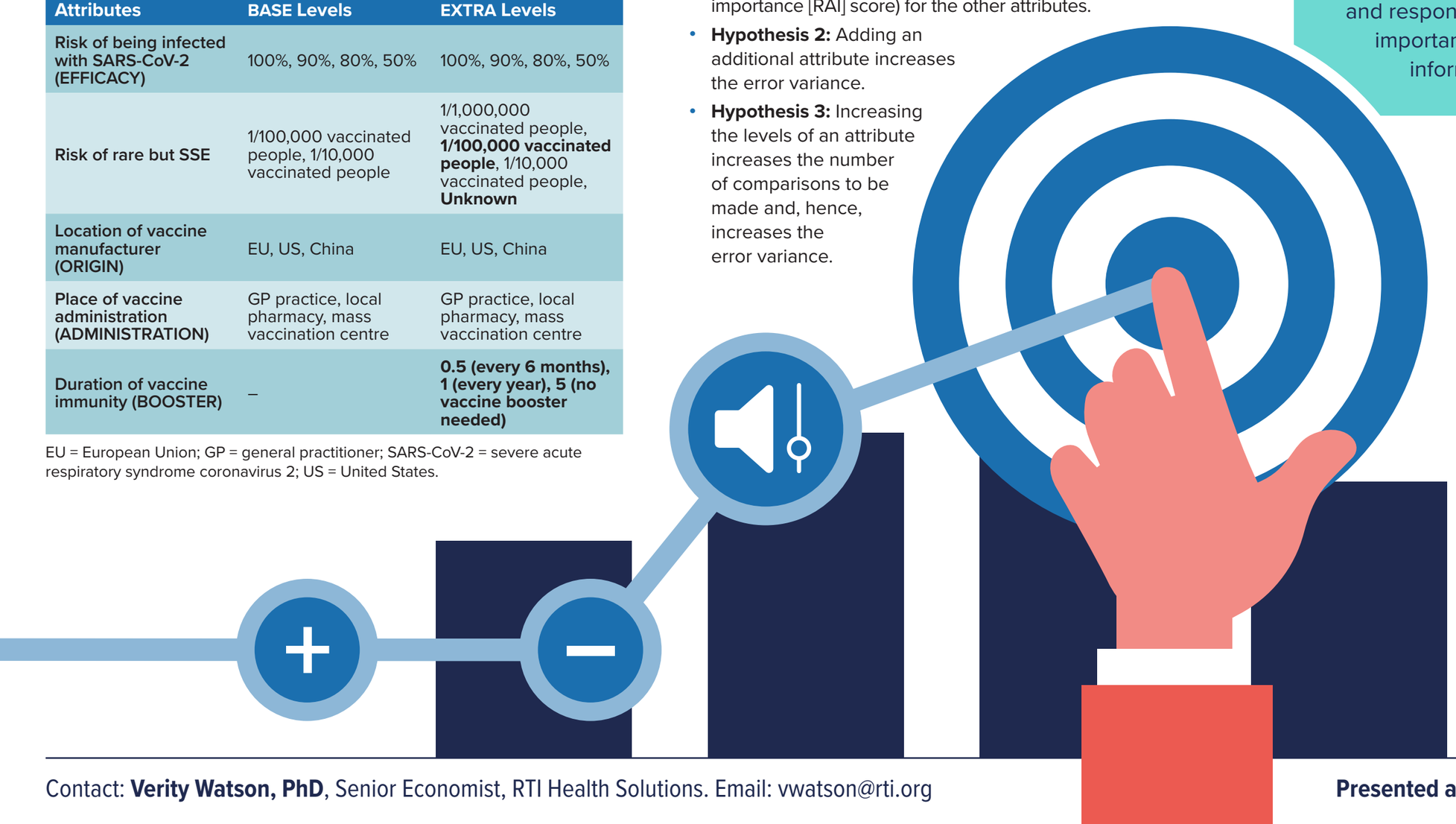
- To disentangle the level effect (LE) from the attribute number effect (ANE), we constructed 2 dummy variables: LE and ANE.
- Responses to DCE tasks are modelled within the random utility maximisation framework in which the utility (U) of the vaccine alternative (j) faced by the respondents (n) in a choice task (t) depends on a systematic component (V) and an unobservable stochastic component (ε):

$$U_{ntj} = V_{ntj} + \varepsilon_{ntj} \quad (1)$$

- The systematic component of utility is a function of the vaccine attributes (x_{ntj}), characteristics of respondents (z_n), and variables representing whether respondent (n) completed with the EXTRA DCE (ANE and LE) or the BASE DCE, such that:

$$V_{ntj} = f(x_{ntj}, zn, ANE_n, LE_n \ \beta_n) \quad (2)$$

- The vector β_n represents the preferences of the respondent (n) for the attributes (k).
- We hypothesise:
  - **Hypothesis 1:** Including an additional attribute (vaccine booster) does not change the structure of preferences (relative attribute importance [RAI] score) for the other attributes.
  - **Hypothesis 2:** Adding an additional attribute increases the error variance.
  - **Hypothesis 3:** Increasing the levels of an attribute increases the number of comparisons to be made and, hence, increases the error variance.



RESULTS

We find no statistically significant difference between respondents to the 2 DCEs in terms of socio-demographic characteristics.

- **Hypothesis 1:** *RAI remained unchanged across the 2 DCEs (EXTRA vs. BASE DCEs).*

  This suggests that the preferences were consistent, and the addition of an additional attribute did not impact the preferences for the remaining attributes.

Table 2. RAI Based on Partial Likelihood Estimator

Attribute	BASE DCE RAI	EXTRA DCE RAI
EFFICACY	2	2
SSE	3	3
ORIGIN	1	1
ADMINISTRATION	4	4
BOOSTER	–	–

- **Hypothesis 2:** *Adding an additional attribute lowers choice consistency (increases error variance)*

  Respondents to the DCE with the additional attribute (vaccine booster) had a 3.49% lower choice consistency compared with those who received the BASE DCE. Respondents in choice tasks with the extra levels of SSE had a 23.21% lower choice consistency compared with BASE DCE.

- **Hypothesis 3:** *Adding additional levels lowers choice consistency (increases error variance)*

  Respondents in choice tasks with the extra levels of SSE had a 23.21% lower choice consistency compared with BASE DCE.

DISCUSSION AND CONCLUSIONS

- The introduction of an additional attribute did not change the underlying preference structure, as evidenced by the stable RAI scores across both DCEs.
- Adding an additional attribute reduced consistency in respondents' choices.
- Our results confirm the trade-off between adding realism (with more relevant attributes and levels) and respondent burden, indicating the importance of designing DCEs that are both informative and manageable.

References

1. Keller K, et al. J Acad Mark Sci. 2021;49(3):482-500.
2. Bryan S, et al. Health Econ. 1998;(7):595-603.
3. Essers BA, et al. Pharmacoeconomics. 2010;28(6):507-20.
4. Genie MG, et al. Soc Sci Med. 2021;276:113822.
5. Pedersen LB, et al. J Choice Model. 2011;4(3):88-109.
6. Sever I, et al. J Choice Model. 2019;32:100135.

Contact: **Verity Watson, PhD**, Senior Economist, RTI Health Solutions. Email: vwatson@rti.org

Presented at: ISPOR EU 2025; Glasgow, Scotland, UK