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Quantifying population preferences around vaccination against severe but rare diseases: A conjoint analysis among French university students, 2016

Joy Seanehia [a], Carole Treibich [b], Christine Holmberg [c], Jacqueline Müller-Nordhorn [c], Valerie Casin [d], Jocelyn Raude [a,e,f], Judith E. Mueller [a,g,*]

[a] EHESP French School of Public Health, Sorbonne Paris Cité, Paris, France
[b] Aix-Marseille Université, CNRS, EHESS, Centrale Marseille, AMSE, France
[c] Institute for Public Health, Charité-Universitätsmedizin Berlin, Germany
[d] Service inter-universitaire de médecine préventive et de promotion de la santé, Rennes, France
[e] UMR 190 EPV "Emergence des Pathologies Virales" (Aix-Marseille University, IRD 190, INSERM 1207, EHESP), Marseille, France
[f] UMR "Processus Infectieux en Milieu Insulaire Tropical" (INSERM 1187, CNRS 9192, IRD 249, Université de La Réunion), Réunion, France
[g] Institut Pasteur, Paris, France

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ABSTRACT

Background: Several concepts are available to explain vaccine decision making by individual and inter-individual factors, including risk perception, social conformism and altruism. However, only a few studies have quantified the weight of these determinants in vaccine acceptance. Using a conjoint analysis tool, we aimed at eliciting preferences in a student population regarding vaccination against a rare, severe and rapidly evolving hypothetical disease, similar to meningococcal serogroup C meningitis or measles.
Methods: During March-May 2016, we conducted an emailing survey among university students aged 18–24 years (N = 775) in Rennes, France. Participants were asked to decide for or against immediate vaccination in 24 hypothetical scenarios, containing various levels of four attributes: epidemic situation, adverse events, information on vaccination coverage, and potential for indirect protection. Data were analysed using random effect estimator logit models.
Results: Participants accepted on average 52% of scenarios and all attributes significantly impacted vaccination acceptance. The highest positive effects were seen with an epidemic situation (OR 3.81, 95%-CI 3.46–4.19), 90% coverage in the community (3.64, 3.15–4.20) and potential for disease elimination from the community (2.87, 2.53–3.26). Information on "insufficient coverage" was dissuasive (vs. none of friends vaccinated: 0.65, 0.56–0.75). Controversy had a significantly greater negative effect than a confirmed risk of severe adverse events (OR 0.05 vs. 0.22). In models including participant characteristics, preference weights were unchanged, while trust in health authorities and vaccination perceptions strongly influenced acceptance themselves. The greatest significant variation of preference weights between subgroups was observed with controversy among students using alternative medicine daily (OR 0.28) and among students relying on scientific vaccine information (OR 0.02).
Conclusions: Among young adults, potential for indirect protection and factual information on coverage in the community and potential side effects positively impact theoretical vaccine acceptance. Conjoint analyses should be conducted to understand vaccine hesitancy in specific vaccination programs.

1. Introduction

Vaccine hesitancy is defined as the 'delay in acceptance or refusal of vaccination despite availability of vaccination services' [1]. Due to the heterogeneity of the hesitant populations, experts have advocated for social marketing techniques to find community-driven vaccination solutions [2].

* Corresponding author at: EHESP, 20 avenue George Sand, 93210 La Plaine St Denis, France.
E-mail addresses: joy.seanehia@gmail.com (J. Seanehia), carole.treibich@univ-amu.fr (C. Treibich), christine.holmberg@charite.de (C. Holmberg), jacqueline.mueller-nordhorn@charite.de (J. Müller-Nordhorn), valerie.casin@univ-rennes1.fr (V. Casin), jocelyn.raude@ehesp.fr (J. Raude), judith.mueller@ehesp.fr (J.E. Mueller).

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Successful vaccination programs lead to low disease incidences and therefore, risks associated with vaccines may be perceived as equal or higher than disease-associated risks [3]. In consequence, factors which motivate for vaccination need to be understood, beyond individual protection from disease. Psychological and sociological studies have proposed various determinants of vaccine acceptance, such as fear of epidemic events [4], social norms [5], conformism with the social environment [6] and altruism [7]. However, the importance of these concepts at the population level and in different population subgroups are unknown, as is their relative importance in vaccine decisions.

Conjoint analysis is based on the methodology of discrete choice experiments and has increasingly been used in health care research [8]. It allows eliciting preferences and assigning weights of importance to the various intervention characteristics. However, its application in vaccine research (including that of other discrete choice experiments) has been limited to new vaccines and product characteristics such as price or route of administration [9–12]. Thus far, only one group has evaluated the acceptance of influenza vaccination programs, however, without taking into account the above-mentioned societal and psychological determinants of vaccine uptake [13,14].

Our objective was to quantify the preferences among French university students aged 18–24 years regarding vaccination against diseases that evolve rapidly to severe conditions and are rare, and have epidemic potential (eg, meningococcal invasive disease or measles). In France, this age group is targeted by catch-up strategies with serogroup C meningococcal conjugate vaccine (to provide indirect protection to <12-month-old children) and with a second dose of measles vaccine (birth cohorts ≥1980).[15] Despite outbreaks of both diseases during the past decade [16,17], coverage remains insufficient for herd protection (<6.6% among 20-to 25-year old adults for group C meningococci and 83.9% among 15-year old adolescents for measles [18]).

2. Methods

2.1. Study design and population sampling

We conducted a cross-sectional study among university students in Rennes, France, during March 29 through May 14, 2016. Eligible participants were aged 18–24 years and enrolled at the universities Rennes 1 (23,085 students during 2015–2016, focusing on natural and life sciences) or Rennes 2 (21,103 students, focusing on social sciences and humanities), the two major higher education institutes in Rennes. In France, 45% of the population start a university program after secondary education.[19] We contacted all Rennes 1 students via one single email sent by the university service for preventative medicine and health promotion, without reminder message. The email contained an explanation of the study topic, the expected duration of self-administration (20 min), and a link to the anonymous questionnaire on the Sphinx® online survey platform. As no email listing was available for Rennes 2, one investigator (JS) recruited students from this population during three days in the waiting room of the medical consultation offered by the university service for preventative medicine and health promotion. Students were given information similar to the email and were free to choose to complete the online questionnaire on site or at home. However, due to student strikes during one recruitment days, the number of participating Rennes 2 students was limited. A lottery of €15 vouchers was proposed to individuals at the end of the online questionnaire. One quarter of participants emailed to be a part of the lottery, which did not create any link to the information entered on the survey platform. Because participation did not imply any personal identification, we did not collect written informed consent. The survey obtained authorization from the universities and by one author's (JS) Master program, without need for institutional ethical review.

No formal method for sample size estimation exists for conjoint analysis, but we aimed at a minimal size of 200 per strata [8].

2.2. Conjoint analysis tool and data collection

We developed a conjoint analysis tool according to recommendations from the International Society for Pharmacoeconomics and Outcomes Research [8]. The identification and selection of the setting and attributes were guided by the results of recent literature reviews devoted to the social and contextual determinants of vaccine hesitancy, in particular those of Ward & Raude [20], Dubé et al. [21], the SAGE Working Group on vaccine hesitancy [1] and Yaqub et al. [22]. We also conducted a literature search on effects from indirect protection and efforts to quantify them.

Based on the health belief model adapted to vaccine decision [23], we included variable levels of attributes referring to risk perception of the vaccine-preventable disease and the vaccine itself [4]; referring to general attitude (trust in authorities, in particular in case of controversy [20] and effect of nudging [24]); referring to social norms in form of descriptive norms (bandwaggoning, social conformism) [6] and injunctive norms (contribution to disease elimination). We included additional aspects which were absent from previous conceptual models: altruistic motivation and free-riding [6,7]. We decided to neutralise aspects related to vaccine access (self-efficiency) by fixing free and immediate vaccination in the frame.

Our hypotheses included (1) that epidemic context is a proxy for risk perception; (2) that controversy reduces vaccine acceptance to a similar degree as a confirmed severe adverse event; (3) that communication on high (low) vaccination coverage increases (reduces) acceptance; (4) that communication of "insufficient coverage", used by authorities and the media, decreases acceptance; (5) that altruistic motivation, in particular to protect children, and the potential for disease elimination can increase acceptance substantially, while free-riding diminishes it; and (6) that eagerness to accept vaccination can be expressed by the maximum acceptable risk from vaccination [25].

For the epidemic context, we included an attribute on the recent observation of disease cases in the community (none vs. several) (Table 1). We included an attribute on the existence of a severe adverse event following vaccination (AEFI), presented as a chronic neurological disorder leading to paralysis and inability to speak and walk (none vs. scientifically confirmed small marginal risk increase vs. controversy between health professionals and authorities). We included an attribute representing the information that the participant has on vaccine uptake among close friends and family of the same age (none vs. most). As reference level for this coverage information, we chose "insufficient vaccination coverage", and contrasted it with equivalent information of "30% coverage among university students". Furthermore, we included a level of high coverage in the student community (90%). Finally, we presented in some scenarios the potential for indirect protection from vaccination: by getting vaccinated, the participant protects under 5-year-old children or peers; or the disease being eliminated from the community given high vaccine coverage of at least 80%.

In the conjoint analysis frame, the participant was asked to imagine being in the office of the general practitioner or at the consultation of the university service for preventative medicine and health promotion. The physician offers a vaccine that can be administered immediately and without additional costs. We chose this frame to avoid confounding influence of financial or logistic access in the vaccine decision. The disease or vaccine was not named, to avoid prejudice from existing controversy or individual

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