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Adolescent, parent and societal preferences and willingness to pay for meningococcal B vaccine: A Discrete Choice Experiment

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ABSTRACT

Objective: Meningococcal B (MenB) vaccines have been licensed in many countries with private purchase the only option until recently, when a funded programme was introduced in the UK. The aim of this study was to explore adolescent/parental values for a variety of salient vaccine attributes (cost, effectiveness, side effect profile) to assess preferences and willingness-to-pay (WTP) for a MenB vaccine.
Methodology: A national cross-sectional population study was conducted in Australia using Discrete Choice Experiment methodology to assess adolescent/parent/adult preferences for attributes related to MenB vaccine.
Results: 2003 adults and 502 adolescents completed the survey in 2013. The majority of participants were willing to be vaccinated with MenB vaccine with vaccination opt-out chosen by 11.9% of adolescents and parents, and 18.2% of non-parent adults. A mixed logit regression model examining adolescent/adult preferences indicated consistent findings; the higher the effectiveness, the longer the duration of protection, the less chance of adverse events and the lower the cost, the more likely respondents were to agree to vaccination. For an ideal MenB vaccine, including the most favoured level of each attribute summed together (90% effectiveness, 10 year duration, 1 injection, no adverse events) adolescents would pay AU$251.60 and parents AU$295.10. Adolescents and parents would pay AU$90.70 or AU$127.20 for 90% vaccine effectiveness vs AU$18.50 or AU$16.70 for 70% effectiveness and would want to be financially compensated for 50% effectiveness; pay AU$63.30 or AU$76.40 for 10 years protection; and pay AU$48.50 or AU$49.20 for no vaccine related adverse events. A slight fever post vaccination was a preferred choice with parents and adolescents willing to pay AU$9.60 or AU$12.30 for this attribute.
Conclusions: Vaccine effectiveness, adverse events and duration of immunity are important drivers for parental and adolescent decisions about WTP for MenB vaccine and should be included in discussions on the benefits, risks and cost.

1. Introduction

Although the incidence of meningococcal disease in the population is low, the age specific incidence rate of 19/100,000 population in infants <1 year in Australia and 31/100,000 population in the UK is more concerning [1], with one of the highest case fatality rates (5–10%) of any bacterial infection [2]. Of patients that survive 30–40% develop debilitating sequelae, which may include limb amputation, hearing loss, skin scaring, chronic headaches and lethargy [3,4]. New meningococcal B (MenB) vaccines have been developed to protect against the commonest serogroup in many countries and recently licensed in the European Union, Canada, USA and Australia [5–7]. MenB vaccines are now available in several countries for private purchase, and recently introduced in a publicly funded programme in the UK [8,9]. A vaccine procurement price of £3 (A$5.80) per dose (£14 (A$28.00) per dose given "favourable assumptions"), has been estimated as likely to deliver a cost-effective national infant programme in the UK [10]. In Australia a recommendation has been made not to publicly fund a MenB vaccine programme [11]. Uptake of an available MenB vaccine on the private market is likely to be influenced by perceived potential benefits including protection against meningococcal disease and risks such as potential vaccine side effects.

Due to the success of meningococcal C (MenC) vaccine programmes previously implemented in many countries including Australia and the UK, MenC disease has declined and MenB

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disease predominates [12,13]. It is estimated that the 4CMenB vaccine could be 88% effective against vaccine strains in the UK and protect against at least 76% of MenB strains in Australia [14]. Individuals vaccinated are expected to have 95% protection against disease, based on immunogenicity studies. These estimates are likely to be conservative as the outer membrane protein (OMP) based vaccines may be protective against all serogroups so although 4CMenB was designed primarily to protect against MenB disease, it may also offer protection against other serogroups [15,16].

MenB vaccine has a heightened reactogenicity profile, with an increased risk of fever in infants receiving concomitant routine vaccines [15]. As the vaccine is now recommended for infants and adolescents in several countries, parents will need to weigh up the risk benefit and financial impact of a decision whether or not to have their child immunised against MenB disease.

Community views and preferences can be measured by using methodologies designed for assessing choice such as a Discrete Choice Experiment (DCE). A DCE is an attribute based quantitative survey method which allows measurement of benefits (utility). In the public health sector, a DCE is used to determine preferences in relation to which features or characteristics of a public health programme individuals' value most highly [12]. DCEs have previously been applied in Australia and other countries to assess preferences for immunisations as well as other public health programmes but have not previously been used to measure preferences for MenB vaccine [17–24]. In comparison with other survey methods, it may be argued that a DCE more closely resembles a real-world decision [22]. The aim of this study was to explore parent, adolescent and community values for a variety of salient vaccine attributes or characteristics (e.g. cost, side effect profile, number of injections required) to assess preferences, potential barriers and willingness to pay (WTP) for a new MenB vaccine.

2. Methods

2.1. Study population

To ascertain community values and preferences for a MenB vaccination programme, a target sample of 2000 adults and 500 adolescents was estimated to complete an online national survey. Participants were recruited through an online panel company pureprofile (www.pureprofile.com). The survey enrolment was stratified by state and gender to ensure national representation and generalizability to the Australian population with the target sample size larger than in similar DCE studies reported in the literature to date [17–21]. Consent for adolescents to participate was obtained from parents.

2.2. Survey design

A series of attitudinal statements relating to respondents' views about health, vaccination in general and meningococcal vaccination was presented. Self-assessed risk attitude to health was measured on an eleven-point scale (ranging from 0 'not at all prepared to take risk' to 10 'very much prepared to take risk') from the German Socio-Economic Panel survey [25]. Individual preferences for meningococcal vaccination were then assessed through a series of DCE questions.

2.3. DCE design

Five attributes related to MenB vaccination were selected to be included within the DCE, based on a literature review of previous DCE studies on vaccination [18–20] and in consultation with experts in the field. The five attributes included were predicted effectiveness, duration of protection, type and probability of adverse events commonly experienced, total number of injections administered at each visit, and cost of the vaccine. These attributes were further specified by variants or levels pertaining to each attribute (Table 1). The relative importance of these attributes can be assessed by offering a series of choices between two or more vaccination alternatives with different combinations of attribute levels. The five attributes and their corresponding levels resulted in 576 profiles (two attributes at three levels and three attributes at four levels = 3^2*4^3), and a total of 165,600 possible pair wise choices ((576*575)/2).

Table 1
Discrete Choice Experiment attributes and levels.

Attributes	Attribute levels
Effectiveness – how well the vaccine protects against meningococcal disease	50% 70% 90%
Duration – the duration of protection	At least 3 years At least 5 years At least 10 years
Adverse event – the type and probability of adverse events commonly experienced	No reactions to vaccination Local reactions such as redness and/or swelling at the site of vaccination for 1–2 days Slight fever for 1–2 days High fever for 1–2 days
Injections – the total number of injections (including the meningococcal B vaccine) that may occur at each visit	1 injection 2 injections 3 injections 4 injections
Cost – the cost of the vaccine course to you	AU$ 100 AU$ 200 AU$ 300 AU$ 400

A sequential orthogonal factorial design was used to reduce the number of choice scenarios into a manageable number of 36 choice sets for presentation using the Ngene version 1.1.1 DCE design software package. Ngene was also employed to divide the resulting DCE design comprising 36 choice sets into 3 blocks, each containing 12 pair wise choice sets to reduce the size of the questionnaire presented to participants. Within each block, two choice scenarios (Pairs 1 and 9) exhibited dominant options (whereby one scenario was clearly superior and was therefore rationally the chosen option). These two choice scenarios were used to test if respondents made rational choices throughout the experiment. For those who failed the rationality tests, their data were excluded from the final analysis.

A pair wise binary two-stage response DCE design was used to maximise the information gained from the respondents [26]. In the first stage, each respondent made a choice between two alternative vaccination options, whilst in the second stage, respondents were asked to specify whether they would choose to be vaccinated in their preferred option from stage one. Parents were asked to consider their child as the target for vaccination when making choices, whereas adolescents and other adults (without children <18 years of age) were asked to consider themselves as the target for vaccination decisions/preferences.

A pilot study comprising 57 adolescents and 120 adults was initially completed in March 2013 to ensure clarity and feasibility.

2.4. Statistical methods

According to the random utility maximisation framework [27] the utility (U) individual i derives from choosing alternative j may be specified as $Uij = Vij(xij, \beta) + \varepsilon ij$ where xij is a vector of observed attributes of alternative j, β is a vector of individual specific