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HIV vaccine acceptability among communities at risk: The impact of vaccine characteristics

Peter A. Newman [a,*], Naihua Duan [b], Sung-Jae Lee [b], Ellen T. Rudy [c], Danielle S. Seiden [b], Lisa Kakinami [b], William E. Cunningham [d]

[a] *Centre for Applied Social Research, University of Toronto, Faculty of Social Work, 246 Bloor Street West, Toronto, Ont., Canada M5S 1A1*
[b] *UCLA Semel Institute/Center for Community Health, USA*
[c] *Los Angeles County Department of Health, Division of Sexually Transmitted Disease, USA*
[d] *UCLA Division of General Internal Medicine and Department of Health Services, USA*

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Abstract

HIV vaccines offer the best long-term hope of controlling the AIDS pandemic; yet, the advent of HIV vaccines will not ensure their acceptability. We conducted a cross-sectional survey ($n = 143$), incorporating conjoint analysis, to assess HIV vaccine acceptability among participants recruited using multi-site ($n = 9$), venue-based sampling in Los Angeles. We used a fractional factorial experimental design to construct eight hypothetical HIV vaccines, each with seven dichotomous attributes. The acceptability of each vaccine was assessed individually and then averaged across participants. Next, the impact of each attribute on vaccine acceptability was estimated for each participant using ANOVA and then analyzed across participants. Acceptability of the eight hypothetical HIV vaccines ranged from 33.2 (S.D. 34.9) to 82.2 (S.D. 31.3) on a 0–100 scale; mean = 60.0 (S.D. 21.9). Efficacy had the greatest impact on acceptability (22.7; CI: 18.5–27.1; $p < 0.0001$), followed by cross-clade protection (12.5; CI: 8.7–16.3, $p < 0.0001$), side effects (11.5; CI: 7.4–15.5; $p < 0.0001$), and duration of protection (6.1; CI: 3.2–9.0; $p < .0001$). Route of administration, number of doses and cost were not significant. Low acceptability of "partial efficacy" vaccines may present obstacles to future HIV vaccine dissemination. Educational and social marketing interventions may be necessary to ensure broad HIV vaccine uptake.

Keywords: HIV vaccines; Consumer preference; Latinos; Populations at risk; Conjoint analysis

1. Introduction

The development of safe and efficacious preventive HIV vaccines offers the best long-term hope of controlling the HIV/AIDS pandemic. Over 30 new candidate vaccines are in clinical trials in 19 countries, with numerous products in the preclinical pipeline [1,2]. While the first HIV vaccines to reach phase III clinical trials, AIDSVAX B/B [3] and B/E [4], were found to be inefficacious, these large-scale efforts demonstrate the feasibility of conducting safe and ethical human trials of HIV vaccines [5]. With growing international advocacy [6] and increased leadership and coordination of vaccine development efforts through the new Global HIV Vaccine Enterprise [7], HIV vaccine research has gained substantial momentum. Nevertheless, the advent of HIV vaccines will not ensure their acceptability.

Consumers may be faced with important trade-offs in deciding whether or not to accept a first generation HIV vaccine. However, little is known about consumer preferences for HIV vaccines or how they will affect the decision to accept a given HIV vaccine. For one, initial HIV vaccines are likely to be only partially efficacious [8,9]. High levels of vaccine uptake among communities at risk for

* Corresponding author. Tel.: +1 416 946 8611; fax: +1 416 978 7072.
E-mail address: p.newman@utoronto.ca (P.A. Newman).

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HIV infection will be required to achieve effective reduction of HIV transmission with low to moderate efficacy vaccines [10,11]. Yet a recent WHO-UNAIDS panel of experts estimated future global HIV vaccine uptake at only 38% of the projected need in the case of vaccines with high (>70%) efficacy and only 19% of projected need in the case of vaccines with low to moderate (30–50%) efficacy [12]. Thus, acceptability may be low for "partial efficacy" HIV vaccines.

Low levels of uptake for adult vaccines that are already widely available in the developed world, such as influenza [13,14] and Hepatitis B [14,15], as well as racial/ethnic disparities in vaccine coverage in the US [14,16,17] suggest additional challenges for HIV vaccine acceptability among communities at highest risk for HIV/AIDS. Suboptimal coverage for Hepatitis B vaccination [14,15], in particular, among precisely those groups at elevated risk for HIV infection, indicate difficulties in achieving adequate coverage with future HIV vaccines [18]. Many MSM, for example, do not perceive themselves to be at risk for Hepatitis B [15,19] and lack basic information about HBV vaccines [20], which are related to lower uptake of Hepatitis B vaccines; this may suggest low acceptability for HIV vaccines that are perceived to entail any risk or that offer less than complete protection.

Limited previous investigations suggest that characteristics of future HIV vaccines may influence their acceptability. Higher levels of HIV vaccine acceptability were associated with greater vaccine efficacy [21–23] and lower vaccine costs (although less than for efficacy) among Midwestern adolescents [21,24]. Route of administration and number of doses had little influence on HIV vaccine acceptability [21]. A qualitative study among high-risk communities in Los Angeles suggests that concerns about low to moderate efficacy HIV vaccines and fears of physical side effects may decrease vaccine acceptability [25]. The possible role of other vaccine attributes on acceptability, such as cross-clade protection and duration of protection, both key elements in vaccine effectiveness on an epidemic level [10], have not been studied.

To prepare for the formidable challenges facing the dissemination of future FDA-approved HIV vaccines, we conducted a survey of ethnically diverse persons at risk for HIV infection in a major HIV/AIDS epicenter in the US. The purpose of this study is to investigate HIV vaccine acceptability, and the impact of hypothetical HIV vaccine characteristics on acceptability, among populations at risk for HIV.

2. Materials and methods

2.1. Participants

Participants ($n = 143$) were recruited using multi-site, venue-based sampling [26–28] from three gay community centers ($n = 61$), three needle exchange sites ($n = 55$) and three Latino primary care clinics ($n = 27$) in Los Angeles County. The nine venues were selected based on their serving diverse populations at elevated risk for HIV in LA County. Eligibility criteria at the venues included: at least 18 years of age, not an employee of the recruitment site and ability to read and understand English. Participants were reimbursed $20 for engaging in a one-time, 60 min interview. Trained interviewers administered the questionnaire using laptop computers programmed with Questionnaire Development System software [29]. The study protocol was reviewed and approved by the Human Subjects Protection Committees of UCLA and the University of Toronto. All participants gave informed consent.

2.2. Measures

We used conjoint analysis, a multi-attribute, stated preference method, to measure preferences among HIV vaccines with different attribute profiles. As a decompositional approach, in which individuals assess holistic, multi-attribute products, conjoint analysis more closely approximates decisions about actual product acceptability than traditional single item (i.e., compositional) measures [30,31]. Conjoint analysis has been widely applied in economics and market research [30–33] and is gaining popularity in the health domain for assessing consumer acceptability of health services [33–35] and pharmaceuticals [33,36] before the actual products are developed.

Eight hypothetical HIV vaccines that vary across seven dichotomous attributes were constructed using an eight-run Plackett-Burman design [37], a 2^{7-4} fractional factorial experimental design. This design allowed efficient estimation for the main effects of the seven dichotomous attributes with a minimum number of eight hypothetical vaccines, under the assumption that the impact of the factors are additive, that is, there are no interactions among the factors [38]. Although the additivity assumption creates restrictions, we believe it is appropriate to focus on the main effects for our study given its pioneering nature in assessing the acceptability of multi-attribute HIV vaccines. In contrast to a fractional factorial design, a full factorial design in the present study would entail the assessment of 128 different vaccines, which would clearly represent cognitive overload for participants. The fractional factorial design with its assumption of additivity thus enables the estimation of the acceptability of an array of holistic, multi-attribute products, which more closely approximates consumers "real-world" decisions than eliciting preferences for one or two attributes in isolation, in this case, of an HIV vaccine.

The fundamental steps in the implementation of conjoint analysis involve identification of the product characteristics (i.e., attributes of the HIV vaccines), assignment of plausible values or levels to the characteristics (i.e., in this case two for each attribute) and then the creation of scenarios (i.e., HIV vaccines) [35]. In the present study, vaccine attributes included efficacy for susceptibility (95% versus 50%), duration of protection (lifetime versus 10 years), cross-