© 2022 Journal of Pharmacy & Pharmacognosy Research, 10 (4), 748-767, 2022
ISSN 0719-4250
https://jppres.com

DOI: https://doi.org/10.56499/jppres22.1404_10.4.748

Review

Acceptability of and willingness to pay for human immunodeficiency virus vaccination: A systematic literature review

[Aceptabilidad y disposición a pagar por la vacunación contra el virus de la inmunodeficiencia humana: Una revisión sistemática de la literatura]

Tram N.T. Huyen[1], Somying Pumtong[1], Sermsiri Sangroongruangsri[1], Luerat Anuratpanich[1,2*]

[1]Faculty of Pharmacy, Mahidol University, Bangkok, Thailand.
[2]Department of Pharmacy, Division of Social and Administrative Pharmacy, Faculty of Pharmacy, Mahidol University, Bangkok 10400, Thailand.
*E-mail: luerat.anu@mahidol.ac.th

Abstract

Context: Vaccines for the human immunodeficiency virus (HIV) have considerably improved public health in the last century. Important considerations, however, are that effective vaccination substantially depends on the acceptability of future vaccines and that monetary measurements of vaccine preference, as reflected by the willingness to pay (WTP), may help policymakers establish health capital priorities.

Aims: To systematically pool data on vaccine acceptability and WTP.

Methods: A systematic search was performed over five databases to identify eligible articles published from 2005 to 2020, and key terms were used in accordance with the guidelines of the Preferred Reporting Items for Systematic Review and Meta-Analyses. Two researchers independently assessed the articles, extracted relevant data, and drew numerical and descriptive summaries for result presentation via Excel.

Results: Out of 31 eligible studies, 28 and 3 reported on the acceptability of and WTP for HIV vaccination, respectively. Acceptability levels ranged from 2.94% to 93.10%, with the average being 60.16%, and WTP values fell between US$108 and US$671. The most prevalent themes were the characteristics of HIV vaccines (safety/side effects, efficacy, duration of protection, vaccine-induced seropositivity).

Conclusions: Overall, the review uncovered a lack of standardized, universal, and acceptable scales for determining acceptability and WTP. The evaluation provided a comprehensive and systematic summary of these matters along with useful information for policymakers on maximizing public health under limited resources.

Keywords: acceptability; HIV; immunization; systematic review; vaccination; willingness-to-pay.

Resumen

Contexto: Las vacunas contra el virus de la inmunodeficiencia humana (VIH) han mejorado considerablemente la salud pública en el último siglo. Las consideraciones importantes, sin embargo, son que la vacunación efectiva depende sustancialmente de la aceptabilidad de las vacunas futuras y que las mediciones monetarias de la preferencia por la vacuna, reflejadas en la disposición a pagar (WTP), pueden ayudar a los formuladores de políticas a establecer prioridades de capital de salud.

Objetivos: Agrupar sistemáticamente los datos sobre la aceptabilidad de las vacunas y la disposición a pagar.

Métodos: Se realizó una búsqueda sistemática en cinco bases de datos para identificar artículos elegibles publicados entre 2005 y 2020, y se utilizaron términos clave de acuerdo con las pautas de Preferred Reporting Items for Systematic Review and Meta-Analyses. Dos investigadores evaluaron de forma independiente los artículos, extrajeron datos relevantes y elaboraron resúmenes numéricos y descriptivos para la presentación de resultados a través de Excel.

Resultados: De los 31 estudios elegibles, 28 y 3 informaron sobre la aceptabilidad y la disposición a pagar por la vacunación contra el VIH, respectivamente. Los niveles de aceptabilidad oscilaron entre 2,94 % y 93,10 %, con un promedio de 60,16 %, y los valores de disposición a pagar estuvieron entre US$ 108 y US$ 671. Los temas más predominantes fueron las características de las vacunas contra el VIH (seguridad/efectos secundarios, eficacia, duración de la protección, seropositividad inducida por la vacuna).

Conclusiones: En general, la revisión descubrió la falta de escalas estandarizadas, universales y aceptables para determinar la aceptabilidad y la disposición a pagar. La evaluación brindó un resumen completo y sistemático de estos asuntos junto con información útil para los formuladores de políticas sobre cómo maximizar la salud pública con recursos limitados.

Palabras Clave: aceptabilidad; inmunización; revisión sistemática; vacunación; VIH; voluntad de pago.

ARTICLE INFO
Received: April 12, 2022.
Accepted: June 19, 2022.
Available Online: July 6, 2022.

INTRODUCTION

Globally, millions of people are suffering from the health and social burdens associated with the human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) and related opportunistic infections. As estimated by the World Health Organization, 37.9 million people around the world were infected with HIV at the end of 2018 (Tremouillaux-Guiller et al., 2020). This problem is compounded by the fact that approximately 700,000 people contract HIV each year, and thousands of others die from chronic AIDS afterward (Tsekoa et al., 2020). Some measures are available for the prevention of HIV transmission, but the disease continues to take many lives, thus counting as a critical public health issue owing to the significant morbidity that it has caused on a global scale (Bakari et al., 2013). Advances in health technology, especially vaccines, have tremendously improved public health in the last century, but recent introductions of inoculations do not guarantee their effectiveness, especially when issuance is accompanied by unclear definitions of quantities and mechanisms of protection. These issues have been clarified through acceptability tests carried out in clinical and preclinical stages of development, which have thus informed the launch of numerous clinical trials. Nevertheless, these processes have also given rise to additional challenges. One such challenge is the possibility that the general public will have to contend with an important trade-off in deciding whether or not to accept HIV vaccines (Newman and Logie, 2010). Understanding people's perceptions regarding this matter are, therefore, imperative (Newman and Logie, 2010).

To ensure a broad distribution for end-users, future HIV vaccines should be suitable for individuals presenting with a high risk of infection. Aside from yielding favorable clinical outcomes, vaccines should be developed along ethically acceptable principles to ensure consideration of the health care needs of recipients (Dimi et al., 2019). To date, studies have rarely examined the acceptability of future HIV vaccines, which are less tolerated in developing countries than in developed nations (Cameron et al., 2013). These studies are important because vaccine acceptability is an indicator of future users' assessment of a vaccine's suitability and their willingness to be inoculated. In quantitative research, this acceptability is usually calculated as the probability of vaccine acceptance (Liau et al., 1998; Mays and Zimet, 2004), determined through a numerical scale (Crosby et al., 2004; Newman et al., 2009), or ascertained using a dichotomous "yes"/"no" question regarding the willingness to be vaccinated (Hom et al., 1997; Lally et al., 2006).

Another parameter for assessing vaccines is the willingness to pay (WTP), which is a monetary indicator of how a product or service is valued by consumers (Kim et al., 2014). It is also defined as the inclination of an individual to pay a sum of money to acquire goods or obtain benefits from a program (Boardman et al., 2017; Drummond et al., 2015). WTP and its determinants are used as criteria for marketing a novel HIV/AIDS vaccine because it influences priority setting with respect to health intervention (Suraratdecha and Hecht, 2005). Information on the needs of people also plays a part in promoting vaccine trials and raising awareness. Correspondingly, the global potential of policy research and the implementation of a future vaccination program should be improved to enable rapid access to an HIV vaccine when necessary (Suraratdecha and Hecht, 2005).

Numerous studies have been devoted to the acceptability of and WTP for HIV vaccination (Cameron et al., 2013; Dimi et al., 2019; Kpanake et al., 2018; Whittington et al., 2008), but a comprehensive systematic review of these works is rarely conducted (Kim et al., 2014; Newman and Logie, 2010). Among the few initiatives in this regard is the assessment carried out by Newman and Logie (2010), who reported that the acceptability score of vaccination against HIV infection on a 100-point scale ranges from 37.2 to 94.0, with the average value being 65.6. The authors also discussed safety concerns, fear of adverse effects, vaccine efficacy, and perceived benefits as factors that affect vaccine acceptability. The drawback to the research is that it was published 10 years ago. Similarly, Kim et al. (2014) systematically reviewed WTP for HIV/AIDS vaccines but also included various other inoculations in their examination, including those for influenza, malaria, typhoid fever, and cholera. The findings showed a WTP below 100 international dollars (I$) per capita for typhoid and cholera vaccines and above I$1,000 for HIV vaccines. To the best of our knowledge, no exhaustive and updated review of the aforementioned variables has been conducted despite the rise in HIV vaccination trials.

To bridge this information gap and promote research on HIV vaccination, the current work systematically reviewed studies published from 2005 to 2020 to generate an evidence-based report on the acceptability of and WTP for future HIV vaccinations.

MATERIAL AND METHODS

Study design

This systematic literature review was conducted using thematic analysis, with the processes applied

and the findings reported in accordance with the guidelines indicated in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Page et al., 2021). The guidelines were also used as references in deciding on which studies are relevant to the target outcome, which was to identify published studies on the acceptability of and WTP for HIV vaccination. Ethical approval was not necessary because the review involved only the evaluation of publicly accessible information.

Search strategy

The review was carried out from January to May 2020 and updated in July 2020 to identify additional appropriate studies related to the topic explored in the present research. Only publications and manuscripts published from January 2005 to April 2020 were included in the search because studies carried out before 2005 did not reflect key information about HIV vaccination, mainly because vaccines for this disease have only recently been experimented on. The search was carried out over five online databases, namely, PubMed, Cochrane, MEDLINE (via OVID), ScienceDirect, and Google Scholar. Google Scholar was included in the mining to enhance the probability of discovering potentially relevant studies. The reference list of each possibly qualifying study and the references cited in other review articles were reviewed and manually scanned to identify additional studies for inclusion.

English keywords were used in the systematic retrieval of articles on HIV/AIDS vaccination, with Boolean operators (OR, AND, NOT) employed to ensure effective connections among different terms. The key terms and/or phrases used in the search were as follows: "acceptability", "HIV", "AIDS", "vaccine", "vaccination," "willingness", "willingness-to-pay", "HIV vaccine", "HIV vaccination", "acceptability of HIV vaccination", and "willingness-to-pay for HIV vaccination". The publications collected from each database were imported into EndNote® (version X8.0) to handle duplicates. The "find full text" functionality in the EndNote library was activated to automatically download the entire texts of the exported studies. The search strategy is described in full below.

For the acceptability of HIV vaccination, the key terms used in PubMed is (acceptability [All Fields] AND ("hiv"[MeSH Terms] OR "hiv"[All Fields]) AND ("vaccine"[MeSH Terms] OR "vaccination"[All Fields]) AND ("hiv"[MeSH Terms] OR "hiv"[All Fields]) AND ("acceptability"[All Fields] AND ("2005/01/01" [PubDate]: "2020/3/20"[PubDate]).

For the willingness-to-pay for HIV vaccination, the key terms used in PubMed is (willingness-to-pay [All Fields] AND ("hiv"[MeSH Terms] OR "pay"[All Fields]) AND ("hiv vaccine"[MeSH Terms] OR "willingness-to-pay"[All Fields]) AND ("vaccine"[MeSH Terms] OR "willingness"[All Fields]) AND ("vaccination"[All Fields] AND ("2005/01/01"[PubDate]: "2020/3/20"[PubDate]).

Inclusion and exclusion criteria

The following studies were included in the analysis: (1) original research, including quantitative, qualitative, or mixed-methods analyses and peer-reviewed research; (2) studies written in English; and (3) studies published between January 2005 and April 2020. Studies were excluded if they corresponded to (1) grey literature, including presented abstracts, letters to editors, commentaries, case reports or series, systematic reviews, or meta-analyses; (2) research with insufficient or no information about the acceptability of and WTP for HIV vaccination; and (3) studies for which full texts remained unavailable even after the transmission of two email messages asking for permission from principal investigators.

Study selection

To screen the titles and abstracts, each researcher was assigned a range of years within which the chosen studies were published. The first author, for example, screened the titles and abstracts of research published from 2005 to 2010. During the initial rounds of citation screening, we instituted a training session wherein all the researchers evaluated the same set of papers and continued the training iteratively until all decided on the specifics of citation screening and selection. To ensure consistency in study selection, the screening was independently reviewed and assessed by two of the research team members. The articles were assessed first on the basis of the title, followed by the abstract. When uncertain of whether a title was appropriate, EndNote was used to access the abstract, thus providing a reviewer with more details that could inform selection.

Article screening and data extraction

When both the reviewers could not confidently dismiss a title or abstract, the paper's full text was retrieved to further evaluate eligibility. The reviewers were asked to highlight each title/abstract about which they were unsure, and the corresponding paper was rescreened on the grounds of eligibility criteria decided by TNTH and LA. All the researchers (TNTH, SP, SS, and LA) downloaded and evaluated full-text articles. Upon completing the full-text screening, they met to discuss and finalize the list of articles to be chosen for inclusion in the analysis. Information on the selected studies was entered manually into a

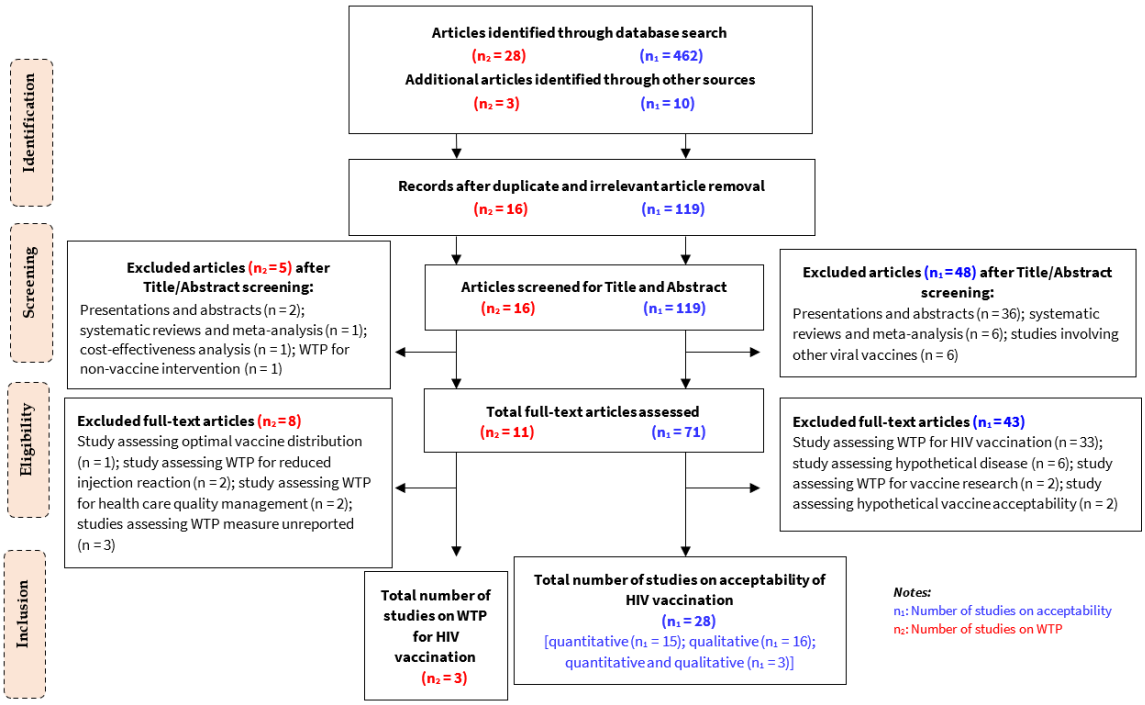

Figure 1. PRISMA flowchart.

predesigned Microsoft Excel sheet, and missing details were considered equivalent to unavailable information. The screening for study retrieval, selection, and inclusion is shown in the PRISMA flowchart illustrated in Fig. 1.

Primary and secondary outcomes

In line with the existing literature, the study identified primary outcomes, namely, the rate of vaccine acceptability and WTP for vaccination in future clinical trials. The secondary outcomes were factors associated with vaccine acceptability, including social determinants (e.g., mistrust and conspiracy), behavioral factors (e.g., risk compensation), structural indicators (e.g., costs), and vaccine characteristics (e.g., efficacy).

Risk of bias across studies

In the first stage of article assessment, two reviewers worked independently on title and abstract screening. Two researchers were blinded to the authors' names and journal titles as they selected studies for inclusion. Any discrepancy between the reviewers was resolved by consulting an unbiased third party. In the next step, four reviewers worked independently on full-text screening. Disagreements among the four researchers were resolved by a majority vote; in case of a deadlock, LA made the final decision.

Data analysis

Microsoft Excel 2010 was used for data management and data analysis. Descriptive statistics were performed in both qualitative and quantitative analysis. Categorical variables were presented by frequency and percentage. Heterogeneity among study results was not considered in this study since no hypothesis test or regression was generated.

RESULTS

Study selection

The search yielded 503 articles, of which 472 focused on the acceptability of HIV vaccination, and 31 concentrated on the WTP for such inoculation. Out of the 472 acceptability studies, 343 were duplicates, and 10 were irrelevant articles. Of the 119-remaining works, 48 were excluded after the title and abstract screening, and 43 were eliminated after full-text assessment. This left us with a sample of 28 acceptability studies. In the case of WTP research, 31 articles were identified via the search strategy. The removal of duplicate and irrelevant articles yielded 16 articles for initial screening. The assessment of titles and abstracts and the review of full texts eliminated 5 and 8 other articles, respectively. A total of 3 WTP studies were deemed eligible for inclusion. Overall, 31 studies were subjected to this systematic review (Fig. 1).

Acceptability characteristics in HIV vaccination studies

A total of 15 quantitative (Dimi et al., 2019; Frew et al., 2008; Kakinami et al., 2008; Kpanake et al., 2018; Lee et al., 2008; 2012; 2014; Newman et al., 2006; 2009; 2010; Painter et al., 2013; Ravert and Zimet, 2009; Weaver et al., 2013; Young et al., 2014; Zimet et al., 2005) and 16 qualitative (Atujuna et al., 2018; Barrington et al., 2007; 2008; Dimi et al., 2019; Frew et al., 2008; Koniak et al., 2007; Lee et al., 2008; Lindegger et al., 2007; Newman et al., 2012a; 2012b; Nguyen, 2007; Nodin et al., 2008; Roberts et al., 2005; Rudy et al., 2005; Salazar et al., 2005; Sayles et al., 2010) studies were included. Three studies (Dimi et al., 2019; Frew et al., 2008; Lee et al., 2008) performed both qualitative and quantitative analyses. All the studies were published in English and revolved around seven themes: vaccine characteristics, demographic factors, attitudes toward HIV vaccines, HIV risk perceptions, structural factors, social factors, and behavioral determinants.

Quantitative studies

The characteristics of the examined studies and the average values of HIV vaccine acceptability are outlined in Table 1. The most common method used for data collection in quantitative studies was questionnaire administration, followed by face-to-face interviews and surveys. The sample sizes ranged from 14 to 1,225 participants, amounting to a total of 5,557 participants for all the studies analyzed. The ages of the participants ranged from 17 to 86 years. The majority of the studies were conducted in the United States (n = 11) (Frew et al., 2008; Kakinami et al., 2008; Lee et al., 2008; 2012; 2014; Newman et al., 2006; 2009; Painter et al., 2013; Ravert and Zimet, 2009; Young et al., 2014; Zimet et al., 2005), whereas the four remaining studies were carried out in Thailand (Newman et al., 2010), Canada (Weaver et al., 2013), Togo (Kpanake et al., 2018), and France (Dimi et al., 2019). The most prevalent sample compositions were high-risk adults (n = 4) (Frew et al., 2008; Newman et al., 2006; 2009; 2010), followed by general adults (n = 3) (Kakinami et al., 2008; Kpanake et al., 2018; Painter et al., 2013) and multi-ethnic Los Angeles groups (n = 2) (Lee et al., 2012; 2014). The sampling method used most frequently was random sampling (n = 4) (Frew et al., 2008; Kpanake et al., 2018; Lee et al., 2014; Newman et al., 2009), followed by venue-based sampling (n = 3) (Lee et al., 2012; Kakinami et al., 2008; Newman et al., 2006) and non-random sampling (n = 2) (Weaver et al., 2013; Zimet et al., 2005). The studies primarily adopted conjoint analysis in determining the acceptability of HIV vaccination (n = 9) (Kakinami et al., 2008; Lee et al., 2008; 2012; 2014; Newman et al., 2006; 2009; 2010; Weaver et al., 2013; Young et al., 2014).

Qualitative studies

A total of 16 original qualitative studies (Tables 2 and 3) published between 2005 and 2020 were included in the exploration. Data were typically collected through semi-structured interviews, in-depth interviews, and questionnaire administration. These works were conducted in the US (n = 7) (Frew et al., 2008; Koniak et al., 2007; Lee et al., 2008; Nodin et al., 2008; Roberts et al., 2005; Rudy et al., 2005; Salazar et al., 2005), South Africa (n = 3) (Atujuna et al., 2018; Lindegger et al., 2007; Sayles et al., 2010), the Dominican Republic (n = 2) (Barrington et al., 2007; 2008), Thailand (n = 1) (Newman et al., 2012b), Canada (n = 1) (Newman et al., 2012a), Vietnam (n = 1) (Nguyen, 2007), and France (n = 1) (Dimi et al., 2019). The sample populations were constituted mostly by men who have sex with other men (MSM) (n = 5) (Atujuna et al., 2018; Newman et al., 2012b; Nodin et al., 2008; Roberts et al., 2005; Salazar et al., 2005), followed by female sex workers (n = 3) (Barrington et al., 2007; 2008; Newman et al., 2012b) and males with sexually transmitted infections (STIs) who sought treatment in clinics (n = 2) (Barrington et al., 2007; 2008). The sample size ranged from 14 to 99 participants, with a total of 591 participants across all the studies evaluated. The age of the participants ranged from 14 to 58 years.

Value of acceptability

The percentage of vaccine acceptability fell between 2.94% and 93.10%, with the lowest reported in a study involving a multi-ethnic Los Angeles group (Lee et al., 2014) and the highest recorded in research involving a parental population in the USA (Zimet et al., 2005). The average HIV vaccination acceptability was 60.16%. Among the 15 studies reviewed, three showed a high acceptability rate (80%-95%), eight reflected moderate acceptability (50%-80%), and four documented low acceptability (<50%) (Table 1) (Newman and Logie, 2010).

Comparison of qualitative and quantitative studies

The seven major themes identified in the qualitative and quantitative studies on vaccination acceptability are presented in Table 4. Among these, the most prevalent were the characteristics of HIV vaccines, which were cited 58 times: safety concerns/side effects (n = 16), efficacy (n = 15), duration of protection (n = 9), vaccine-induced seropositivity (n = 5), vaccine-induced seropositivity (n = 5), cross-clade protection (n = 4), administration route (n = 4). Demographic factors were the least-cited theme, mentioned only 19 times.

Table 1. Characteristics of quantitative studies and average acceptability values (n = 15).

No.	Authors	Data collection method	Measurement method	Sampling method	Population	Sample size	Gender (M/F/TG)	Age (mean/ range) (years)	Ethnicity	Country	Predictors of acceptability	Average acceptability
1	(Zimet et al., 2005)	Self-interview (A-CASI)	Five-point response scale	Non-random	Parents	640	6.9%/ 93.1%	41.0	White 59.7%, AA 36.3%	USA	STD history (OR: 3.82; CI: 1.25–11.66), vulnerability (OR: 2.14; CI: 1.37–3.35), emotional severity (OR: 1.62, CI: 1.10–2.37), promotion of unsafe sex (OR: 0.45; CI: 0.30–0.68)	93.10%
2	(Newman et al., 2006)	Questionnaire	Conjoint analysis	Venue based	High-risk adults	143	68.2%/ 31.8%	36.85	Black/AA 21.7%, Hispanic/Latino 31.8%, White 38.8%, American 7.7%	USA	Efficacy (OR: 22.6; CI: 18.5–27.1), cross-clade protection (OR:12.5; CI: 8.7–16.3), lack of physical side effects (OR: 11.5; CI: 7.4–15.5), long duration of protection (OR: 6.1; CI: 3.2–9.0)	60.00%
3	(Kakinami et al., 2008)	Survey	Conjoint analysis	Venue based	Adults	126	59%/ 41%	38	AA 19%, Latino 22%, Latina 48%, AA 21%	USA	NR	61.00%
4	(Lee et al., 2008)	Semi-structured focus group interview (ATLAS.ti)	Conjoint analysis	Mixed methods	Asian/Pacific Islanders	27	33.3%/ 66.7%	46.4	Thai communities	USA	Vaccine efficacy (OR: 51.4), side effects (OR: 11.1), duration of protection (OR: 8.3)	45.60%
5	(Frew et al., 2008)	Face-to-face interview	NR	Random	High-risk adults	14	NA/ 100%	34	AA 79%, African 18%, Hispanic/Latina 7%	USA	NR	43.00%

Table 2. Characteristics of quantitative studies and average acceptability values (n = 15) (continued...)

No.	Authors	Data collection method	Measurement method	Sampling method	Population	Sample size	Gender (M/F/TG)	Age (mean/ range) (years)	Ethnicity	Country	Predictors of acceptability	Average acceptability
6	(Ravert and Zimet, 2009)	Web-based survey	NR	NR	College Students	242	42.6%/ 57.8%	18–23	White 82.4%; Black, Hispanic, Asian, American Indian 17.6%	USA	Age ß = –0.11, perceived susceptibility ß = 0.30, lifetime sexual partners (log) ß = 0.26, invulnerability to danger ß = –0.13, psychological invulnerability ß = 0.14	70.20%
7	(Newman et al., 2009)	Questionnaire	Conjoint analysis	Random	High-risk adults	1,164	55.7%/ 42.4%/ 1.8%	37.4	AA 20.5%, Caucasian 17.7%, Hispanic 12.7%, Asian/Pacific Islander, American Indian, multiple races and others 11.9%; born in the United States 66.0%	USA	Efficacy 29.9 (OR: 28.1; CI: 31.7), side effects 13.9 (OR: 12.3; CI: 15.5), cost 9.5 (OR: 8.3, CI: 10.6), duration of protection 6.9 (OR: 5.7; CI: 8.1), administration route –3.5 (OR: –4.7; CI: –2.3), cross-clade protection –0.2 (OR: –1.4, CI: –1.0)	54.50%
8	(Newman et al., 2010)	Questionnaire and survey	Conjoint analysis	Sequential mixed methods	High-risk adults	255	83.9%/ NA/ 16.1%	26.6	Thai communities	Thailand	VISP (OR: 18.57), efficacy (OR 15.87), side effects (OR: 9.57), duration (OR: 5.19), cost (OR: 3.51), social saturation (OR: 2.48)	58.30%
9	(Lee et al., 2012)	Face-to-face interview	Conjoint analysis	Venue based	Multi-ethnic Los Angeles group	183	NR	18	Multi-ethnic sample from Los Angeles	USA	Efficacy (OR: 22.6; SD 27.2), cross-clade protection (OR: 12.5; SD 23.7), side effects (OR: 11.5; SD 24.6), duration of protection (OR: 6.1; SD 17.5), cost (OR: 20.2; SD 20.3), administration route (OR: 2.4; SD 18.3)	60.00%
10	(Weaver et al., 2013)	Survey questionnaire	Conjoint analysis	Non-random	Black women of African and Caribbean descents	206	NA/ 100%	35.08	African 48.4%, Caribbean 51.5%	Canada	Efficacy 22.56 (23.69), side effects 8.56 (19.70)*, cost 7.57 (16.27)*, duration of protection 6.53 (15.57)*, cross-clade protection 0.90 (15.12), route of administration –0.25 (15.79)	58.80%

Table 3. Characteristics of quantitative studies and average acceptability values (n = 15) (continued...)

No.	Authors	Data collection method	Measurement method	Sampling method	Population	Sample size	Gender (M/F/TG)	Age (mean/ range) (years)	Ethnicity	Country	Predictors of acceptability	Average acceptability
11	(Painter et al., 2013)	Hour-long survey	NR	NR	Adult AA women	321	NA/ 100%	18–55	AA	USA	Age, perceived benefit of HIV vaccination, cost	63.00%
12	(Young et al., 2014)	Interviewer-administered questionnaire	Conjoint analysis	NR	Drug users	433	55.2%/ 44.8%	29–41	Appalachian	USA	Sex, age, risk compensation, perceived security of HIV, perceived susceptibility to HIV infection, perceived vaccine benefits	91.00%
13	(Lee et al., 2014)	Large-scale survey	Conjoint analysis	Random	Multi-ethnic Los Angeles group	1,225	56.7%/ 43.3%	≥18	Los Angeles populations	USA	Risk compensation (OR: 1.49; CI: 1.18, 1.89), altruistic vaccination (OR: 1.40; CI: 1.14, 1.71)	2.94%
14	(Kpanake et al., 2018)	Questionnaire	NR	Random	Adults	363	56.4%/ 43.6%	24.37	Togolese people	Togo	Probability (OR: 4.40), severity (OR: 2.49), effectiveness (OR: 180.54), cost (OR: 49.18), familial influence (OR: 80.63)	49.00%
15	(Dimi et al., 2019)	Questionnaire	NR	NR	French PLWHs	215	70.2%/ 29.8%	48	French PLWH population	France	NR	92.00%

AA: African-American, CI: Confidence interval, F: Female, M: Male, NA: Not available, NR: No recommendation, OR: Odds ratio, TG: Transgender, VISP: Vaccine-induced seropositivity, PLWHs: Patients living with HIV/AIDS. Average rate of acceptability = 60.16%

Table 4. Characteristics of qualitative studies and average acceptability values (n = 16).

No.	Authors	Study design	Method of data collection	Sample composition	Age, mean (SD/range) (years)	Gender	Ethnicity	Sample size	Country	Acceptability
1	(Roberts et al., 2005)	NR	Questionnaire	- Latino men attending an MSM service program run in Spanish - Latina women attending a community health care clinic that provides services in Spanish - Latino men attending a community health care clinic that provides services in Spanish - Women attending a health care clinic serving AA women - Males attending a needle-exchange site - Two groups of women attending two needle-exchange sites - Men attending an STD clinic housed in a gay/lesbian service organization - Young men and women (aged 18–24 years) attending a social service agency for lesbian, gay, bisexual, and transgender street youth	18–56 years (median age = 33)	52% Male, 48% Female	22% AA, 44% Latino, 28% White, 6% other	99	USA	HIV/AIDS
2	(Rudy et al., 2005)	NR	Questionnaire	Diverse communities in Los Angeles	18–56 years (median age = 37)	2 Males, 48 Females	37% AA, 34% Latina, 24% White, 5% other	50	USA	HIV/AIDS
3	(Salazar et al., 2005)	NR	In-depth interview	MSM	25–50 years	Male	Black and White MSM living in Atlanta	24	USA	HIV/AIDS
4	(Koniak et al., 2007)	CBPR	Semi-structured interview	Homeless young adults	18–24 years	75% male (*n* = 15), 20% female (*n* = 4), 5% transgender (*n* = 1)	35% AA (*n* = 7), 35% White (*n* = 7), 5% other (2 Belizean, 2 multi-ethnic, 1 Tahitian), 25% Hispanic (*n* = 1)	20	USA	HIV
5	(Barrington et al., 2007)	NR	In-depth interview	Female sex workers, male STI clinic attendees and outpatients	19–58 years	15 Females, 10 Males	People of the Dominican Republic	25	Dominican Republic	HIV
6	(Lindegger et al., 2007)	NR	Face-to-face interview	Volunteers	14–50 years	34% Male, 66% Female	NR	41	South Africa	HIV

Table 5. Characteristics of qualitative studies and average acceptability values (n = 16) (continued…)

No.	Authors	Study design	Method of data collection	Sample composition	Age, mean (SD/range) (years)	Gender	Ethnicity	Sample size	Country	Acceptability
7	(Nguyen, 2007)	NR	Information sheet	General people	20–50 years (mean age = 32.6)	94% Male (*n* = 17), 6% Female (*n* = 1)	NR	18	Vietnam	HIV
8	(Barrington et al., 2008)	NR	In-depth interview	Female sex workers, male STI clinic attendees, outpatients	19–58 years	15 Females, 10 Males	People of the Dominican Republic	25	Dominican Republic	HIV
9	(Frew et al., 2008)	NR	Face-to-face interview	High-risk adults	20–53 years (mean = 34; median = 39)	Female	79% AA, 18% self-identified as African, 7% multicultural (Hispanic/Latina ethnicity)	14	USA	HIV
10	(Lee et al., 2008)	NR	Semi-structured interview	Asian/Pacific Islanders	Mean 46.4 years	33.3% Male (*n* = 9), 66.7% Female (*n* = 18)	Thai communities in the USA	27	USA	HIV
11	(Nodin et al., 2008)	NR	Semi-structured interview	MSM	28 (38.9%) below 30 years, 44 (61.1%) 31 years and above	Male	20.8% AA (*n* = 15), 30.6% European American (*n* = 22), 27.8% Latino (*n* = 20), 15.3% Asian/Pacific Islanders (*n* = 11), 5.6% other (e.g., Native American or mixed ethnicity) (*n* = 4)	72	USA	HIV
12	(Sayles et al., 2010)	NR	Interview	Adults in South Africa	18–22 years 64.35% (*n* = 27), 23–26 years 35.7% (*n* = 15)	40.5% Male (*n* = 17), 59.5% Female (*n* = 25)	20.0% Ndebele (*n* = 8), 27.5% Zulu (*n* = 11), 10.0% Tswana (*n* = 4), 17.5% Tshivenda (*n* = 7), 25.0% another ethnic group (*n* = 10)	42	South Africa	HIV
13	(Newman et al., 2012b)	NR	Semi-structured one-hour interview	Gay men/MSM, transgender women, MSWs, FSWs, and IDUs; CBO agency staff and advocates working with gay men/MSM, transgender women, MSWs, FSWs (n4), and IDUs	≥18	NR	Thai population	35	Thailand	HIV
14	(Newman et al., 2012a)	NR	Semi-structured interview	Gay/lesbian, bisexual, two-spirit, two-spirit and gay/bisexual, heterosexual	23–56 years (mean age = 37)	11 Males, 12 Females	Aboriginal peoples in Canada	23	Canada	HIV

Table 6. Characteristics of qualitative studies and average acceptability values (n = 16) (continued…)

No.	Authors	Study design	Method of data collection	Sample composition	Age, mean (SD/range) (years)	Gender	Ethnicity	Sample size	Country	Acceptability
15	(Atujuna et al., 2018)	NR	In-depth interview	MSM, adolescents, heterosexual adults	15–50 years	36 Males, 20 Females	South African populations	56	South Africa	HIV
16	(Dimi et al., 2019)	Prospec-tive cross-sectional study	Questionnaire	French PLWHs	23–66 years, (mean age = 46)	13 Males, 7 Females	French PLWH population	20	France	HIV

AA: African American, CBPR: Community-based participatory research, CBO: Community-based organization, IDUs: Injecting drug users, FSWs: Female sex workers, MSM: Men who have sex with men, MSWs: Male sex workers, NR: Not recommendation, PLWHs: Patients living with HIV/AIDS.

Table 7. Prevalence of acceptability characteristics in the qualitative studies (n = 16).

No.	Authors	Vaccine characteristics	Structural factors	HIV risk perceptions	Demographic factors	HIV vaccine-related attitudes	Social factors	Behavioral factors
1	(Roberts et al., 2005)	- Efficacy - Vaccine-induced infection - Side effects	- Lack of knowledge about vaccination - Numerous questions regarding HIV vaccines (about testing, distribution, etc.) - Future availability of HIV vaccines - Confusion about vaccines and how they work	NR	Age, gender, ethnicity	High risk of HIV infection	- Mistrust and conspiracy - Social attitudes	- Risk compensation - Respondents explaining that HIV vaccines are being withheld because those in political power fear possible behavioral implications of allowing HIV vaccination
2	(Rudy et al., 2005)	- Side effects - Fear of vaccine-induced HIV infection - Duration of protection	- Gender dynamics - Cost	- Non-risk group	Age, gender, ethnicity	NR	- Mistrust - HIV stigma - Vaccine education and social marketing for promoting uptake of future FDA-approved HIV vaccines among women, might benefit from special attention to issues of reproductive safety and side effects, relationship concerns, vaccine affordability, and empowerment to protect oneself against HIV infection	- Risk compensation

Table 8. Prevalence of acceptability characteristics in the qualitative studies (n = 16) (continued...)

No.	Authors	Vaccine characteristics	Structural factors	HIV risk perceptions	Demographic factors	HIV vaccine-related attitudes	Social factors	Behavioral factors
3	(Salazar et al., 2005)	- Effectiveness - Infection	- Cost - Needing vaccine information - Availability	- Perceived severity of AIDS, no-risk group	NA	- Perceived vaccine benefits - Vaccine attributes	- Misperception and confusion	- Risk compensation - Perceived behavioral control
4	(Koniak et al., 2007)	- Vaccine side effects - Duration of protection	- Worries over contracting HIV as a result of vaccination - Cost	- Perceived HIV severity, non-membership in a defined risk group	Age	- Concerns about who would pay for associated health care costs	- Distrust	- Majority of participants believing in risky sexual behavior - Perceived behavioral control
5	(Barrington et al., 2007)	- Preventive and causative properties - Safety and effectiveness - Vaccine-induced seropositivity	- Minimal information on type of HIV vaccine available and/or how it works (needing vaccine information)	- High perceived risk - Individuals considered at high risk for HIV infection	NA	- Vast majority expressing positive attitudes and experiences regarding both perceived preventive and curative properties (vaccine-related attitudes)	- Social attitudes - Gender dynamics/relationship - Social stigmatization barrier to HIV trials - HIV stigma	- Risk compensation
6	(Lindegger et al., 2007)	- Anxiety about safety	- Lack of information about vaccines - Concerns over illness owing to vaccination - Concerns that vaccination may cause HIV	NR	Gender	- Perceived vaccine benefits - vaccine attitudes	- Trust - Social attitudes	- Physical risk or illness (risk compensation)
7	(Nguyen, 2007)	- Side effects	- Financial costs - Five participants hearing at least the mention of HIV vaccines but confused as to whether the vaccines are for HIV prevention	- High-risk behaviors resulting in HIV infection	Gender	- Vaccine-related optimism	NR	- High-risk behaviors
8	(Barrington et al., 2008)	- Efficacy - Safety	- High expense	- Perceived susceptibility to HIV infection	NA	- Vaccine-related optimism - Perceived vaccine benefits	NR	- Increase in risky sexual behaviors - Serodiscordant partners - Discontinued use of condoms - Vaccine availability leading to a newfound sense of sexual freedom

Table 9. Prevalence of acceptability characteristics in the qualitative studies (n = 16) (continued...)

No.	Authors	Vaccine characteristics	Structural factors	HIV risk perceptions	Demographic factors	HIV vaccine-related attitudes	Social factors	Behavioral factors
9	(Frew et al., 2008)	Vaccine-induced infection	- Needing vaccine information - Confusion about whether a person would have to be HIV seropositive to receive a vaccine - Cost - Access and availability	- Perceived AIDS severity, non-risk group	NA	- Health care providers' attitudes - Perceived protective properties - History - Parental attitudes	- Mistrust and conspiracy - Relationship	- Risk compensation - Perceived behavioral control
10	(Lee et al., 2008)	- Efficacy - Physical side effects - Duration of protection - Route of administration	- Cost	NR	- HIV prevention research and exploration of similarities and differences with other racial/ethnic communities in Los Angeles	- Vaccine acceptability and optimism - Perceived vaccine benefits	- Social attitudes - Relationship	- Risk compensation
11	(Nodin et al., 2008)	- Side effects - Efficacy - Duration of protection	- Majority of participants having very general information about HIV vaccines - Cost	- Perceived severity of HIV, non-risk group	NA	- Low optimism regarding vaccines	NR	- Promote non-use of condoms and lead to reckless sexual behaviors
12	(Sayles et al., 2010)	- Efficacy - Side effects	- Relatively low general knowledge about vaccines	- Perceived vulnerability to HIV infection	- Age, gender	NR	- Mistrust of government and scientific community - HIV stigma - Social saturation	NR
13	(Newman et al., 2012b)	- Vaccine-induced seropositivity	- Cost		- Fear of having one's sexual orientation disclosed to one's family and the potential for familial rejection	- Rather than singularly promoting individual-level protective benefits, communitarian approaches might frame HIV vaccines as a social good.	- HIV stigma	- Male and female sex workers concerned that vaccine availability would increase risky sexual behaviors - Need to be informed and provided the best knowledge before vaccination - Behavioral control
14	(Newman et al., 2012a)	- Efficacy - Vaccine-induced seropositivity - Fears of iatrogenic infection	- Limited awareness of HIV vaccines (needing information) - Pragmatic obstacles	- Perceived severity of AIDS - Non-risk group	NA	- Perceived vaccine benefits - History of vaccination	- Mistrust of government and health care institutions - Social saturation	- Perceived behavioral control, risk compensation,

Table 10. Prevalence of acceptability characteristics in the qualitative studies (n = 16) (continued...)

No.	Authors	Vaccine characteristics	Structural factors	HIV risk perceptions	Demographic factors	HIV vaccine-related attitudes	Social factors	Behavioral factors
15	(Atujuna et al., 2018)	NR	NR	- Risk for HIV infection	- Reality-based concerns reflecting a generalized epidemic, in which HIV incidence is four times higher among females	NR	- HIV stigma - Mistrust of vaccines	- Serodiscordant couples
16	(Dimi et al., 2019)	- Minimal side effects - Minimal efficacy	- Limited knowledge about vaccines	NR	Gender	- Half of the interviewees exhibiting very favorable opinions and very strong positive feelings regarding vaccines, citing them as “a benefit for humanity” (perceived benefit of vaccination)	- Majority of patients hoped for a cure	NR

NA: Not available, NR: Not recommendation.

Table 11. Comparison of quantitative and qualitative studies in terms of the prevalence of acceptability determinants.

Theme	Quantitative (n = 15)		Qualitative (n = 16)		Total (n = 28)	
	N	**%**	***N***	**%**	***N***	**%**
Vaccine characteristics						
Safety concerns/side effects	6	40.0	10	62.5	16	57.1
Efficacy	6	40.0	9	56.3	15	53.6
Duration of protection	5	33.3	4	25.0	9	32.1
Vaccine-induced infection	-	-	5	31.3	5	17.9
Vaccine-induced seropositivity	2	13.3	3	18.8	5	17.9
Cross-clade protection	4	26.7	0	0.0	4	14.3
Administration route	3	20.0	1	6.3	4	14.3
Subtotal					**58**	
Structural factors						
Cost	5	33.3	9	56.3	14	50.0
Needing vaccine information	-	-	9	56.3	9	32.1
Pragmatic obstacles	-	-	1	6.3	1	3.6
Access/availability	-	-	3	18.8	3	10.7
Subtotal					**27**	
Behavioral factors						
Risk compensation	2	13.3	8	50.0	10	35.7
Risk behaviors (sexual, substance use)	1	6.7	4	25.0	5	17.9
Perceived behavioral control	1	6.7	6	37.5	7	25.0
Serodiscordant partners	-	-	2	12.5	2	7.1
Subtotal					**24**	
Social factors						
Mistrust and conspiracy	-	-	8	50.0	8	28.6
Social attitudes	-	-	5	31.3	5	17.9
Social saturation	1	6.7	2	12.5	3	10.7
HIV stigma	-	-	4	25.0	4	14.3
Gender dynamics/relationships	-	-	3	18.8	3	10.7
Subtotal					**23**	

Table 12. Comparison of quantitative and qualitative studies in terms of the prevalence of acceptability determinants (continued…)

Theme	Quantitative (n = 15)		Qualitative (n = 16)		Total (n = 28)	
	N	%	*N*	%	*N*	%
Attitudes toward HIV vaccines						
Perceived vaccine benefits	2	13.3	9	56.3	11	39.3
History of vaccinations	1	6.7	2	12.5	3	10.7
Optimism regarding vaccines	-	-	3	18.8	3	10.7
Parental attitudes	-	-	1	6.3	1	3.6
Vaccine-related attitudes	-	-	3	18.8	3	10.7
Attitudes of health care providers	-	-	1	6.3	1	3.6
Subtotal					**22**	
HIV risk perceptions						
Perceived susceptibility to HIV infection	2	13.3	5	31.3	7	25.0
Non-risk group membership	-	-	6	37.5	6	21.4
Perceived severity of AIDS	1	6.7	6	37.5	7	25.0
Subtotal					**20**	
Demographic factors						
Gender	1	6.7	7	43.8	8	28.6
Age	3	20.0	4	25.0	7	25.0
Ethnicity	-	-	3	18.8	3	10.7
Sexual orientation	-	-	1	6.3	1	3.6
Subtotal					**19**	

Table 13. Characteristics of WTP studies on HIV vaccines (n = 3).

No.	Authors	Method of WTP measurement	Method of data collection	Sample size	Country	Sex (M/F/TG)	Age (range/median) (years)	Target population for vaccination	Estimated mean of WTP
1	(Keyserlingk and Rhodes, 2007)	CV	Face-to-face interview	197	South Africa	NR	16–24	Students	US$108
2	(Whittington et al., 2008)	SBDC	Survey questionnaire	1,218	Thailand	50%/50%	18–20	Individuals	50% efficacy - US$610 95% efficacy - US$671
3	(Cameron et al., 2013)	Conjoint analysis	Face-to-face interview	326	Thailand	67.2%/ 20.2%/2.6%	27	MSM, MSWs, TG	50% efficacy - US$256 99% efficacy - US$383

CV: Contingent valuation, F: Female, M: Male, MSM: Men who have sex with men, MSWs: Male sex worker, SBDC: Single-bounded dichotomous, TG: Transgender, WTP: Willingness to pay.

WTP for HIV vaccination

Table 5 summarizes the characteristics of the WTP studies on HIV vaccines. Data were collected through face-to-face interviews (n = 2) (Cameron et al., 2013; Keyserlingk and Rhodes, 2007) and survey questionnaire administration (n = 1) (Whittington et al., 2008). The studies were carried out in Thailand (n = 2) (Cameron et al., 2013; Whittington et al., 2008) and South Africa (n = 1) (Keyserlingk and Rhodes, 2007), and the sample size ranged from 197 to 1,218 participants for a total of 1,742 across all the investigations. The ages of the participants ranged from 16 to 27 years, and the WTP for HIV vaccination fell between US$108 and US$671.

DISCUSSION

Clinical trials of HIV vaccines are a prolonged, delicate, and complex process that entails multiple medical procedures; it targets a disease that is subjected to considerable stigma and commonly afflicts individuals from marginalized populations (Thabethe et al., 2018). Chronic diseases are invariably accompanied by stigmatization and the restriction of opportunities at different levels, thereby resulting in a prolonged erosion of vocations and beliefs. Societies have constantly struggled to define discrimination and achievement (Kontomanolis et al., 2017). The acceptability of vaccinations is an indicator of a prospective patient's assessment of an inoculation's suitability and his/her readiness to be administered such a treatment. Meanwhile, WTP is an estimate of a vaccine's monetary worth to patients. When summed across a population, WTP contributes to the estimation of the social importance of a vaccine and can be evaluated against the vaccine's costs to understand the net benefit derived from inoculation (Cook et al., 2009). The current review found that the acceptability of HIV vaccines, as reported in the examined studies, ranged from 2.94% to 93.10%. The highest percentage of acceptability was observed in the study on a multiethnic Los Angeles group (Zimet et al., 2005), whereas the lowest was uncovered in research involving a parental population in California (Lee et al., 2014).

The present review is an update to that of Newman and Logie (2010) and the first to inquire into WTP for HIV vaccination and the acceptability of HIV vaccines. We discovered that acceptability was influenced by vaccine characteristics (cited 58 times) and that WTP ranged from US$108 to US$671. By contrast, demographic factors, including sex, age, ethnicity, and sexual orientation, were unimportant factors for acceptability. The average acceptability of HIV vaccination was 60.16%, which may be indicative of moderate to high acceptability. Newman and Logie (2010) found acceptability ranging from 37.2% to 94.0%, with the average being 50.4%. The difference between their review and ours indicates an increase of 10 points in the present evaluation.

The review also noted that factors such as costs, requiring vaccine information, perceived vaccine benefits, and risk compensation/perceptions were important determinants of HIV vaccine acceptability. Mechanisms for highlighting accurate information on the needs of people were equally instrumental to the promotion of vaccine trials and the cultivation of awareness on the uses and benefits of vaccines. The global potential for conducting policy research and implementing future vaccination programs should be improved to pave the way for rapid access to HIV vaccines. With respect to them, demographic factors were the least cited in the reviewed studies (19 times). Similar to the work of Newman and Logie (2010) and other research (Dhalla and Poole, 2011; Doshi et al., 2017), the present work identified the characteristics of HIV vaccines as the most prevalent theme.

The WTP for HIV vaccination ranged from US$108 to US$671, with the lowest and highest WTPs reported in the South African and Thailand studies, respectively. Whittington et al. (2008) and Cameron et al. (2013) stated that WTP is higher for 95%-efficacy vaccines than inoculations of only 50% efficacy. On this basis, then, the effectiveness of HIV vaccines significantly influences WTP values. In their systematic review, Kim et al. (2014) found that the WTP for HIV/AIDS vaccines falls between I$180 and I$1,690, which are higher than the values derived in the current work. Nevertheless, this difference should be interpreted with caution because the WTPs in the present review were extracted from only three studies.

The data used in the evaluated studies were collected using a wide range of tools, such as semi-structured interviews, in-depth interviews, survey questionnaires, and face-to-face interviews. These variations reflected a lack of standardized, universal, and acceptable scales for vaccine research. A necessary requirement, therefore, is to further explore the WTP for HIV vaccination and the reasons why mixed designs are used in vaccine scholarship.

The limitations of the review are worth noting. First, the evaluated studies were performed using various methodologies, thereby rendering the establishment of connections among the data difficult. Second, the majority of the studies were conducted in the USA, and only a few were carried out in other countries. The limited number of WTP studies further constrained the scope of our conclusions, and the risk

of bias was not assessed because the majority of the studies were typified by different research designs. Finally, given the small number of studies, we could not conduct rigorous analyses of the relationship between WTP and acceptability factors. Despite these limitations, this updated systematic review offers an evidence-based report on the acceptability of and WTP for future HIV vaccination.

CONCLUSION

The acceptability and WTP for HIV vaccination may provide an empirical basis for targeted socio-behavioral interventions designed to ensure the effectiveness of future HIV vaccines for high-risk populations. Our review comprehensively and systematically summarized acceptability and WTP values and issues, thereby providing useful information for policymakers to maximize public health under limited resources.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

ACKNOWLEDGMENTS

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

REFERENCES

Atujuna M, Newman PA, Wallace M, Eluhu M, Rubincam C, Brown B, Bekker LG (2018) Contexts of vulnerability and the acceptability of new biomedical HIV prevention technologies among key populations in South Africa: A qualitative study. PLOS ONE 13: e0191251.

Bakari M, Munseri P, Francis J, Aris E, Moshiro C, Siyame D, Janabi M, Ngatoluwa M, Aboud S, Lyamuya E (2013) Experiences on recruitment and retention of volunteers in the first HIV vaccine trial in Dar es Salam, Tanzania-the phase I/II HIVIS 03 trial. BMC Public Health 13: 1149.

Barrington C, Moreno L, Kerrigan D (2007) Local understanding of an HIV vaccine and its relationship with HIV-related stigma in the Dominican Republic. AIDS Care 19: 871-877.

Barrington C, Moreno L, Kerrigan D (2008) Perceived influence of an HIV vaccine on sexual-risk behaviour in the Dominican Republic. Cult Health Sex 10: 391-401.

Boardman AE, Greenberg DH, Vining AR, Weimer DL (2017) Cost-benefit analysis: concepts and practice, 4th edn. Cambridge, UK: Cambridge University Press.

Cameron MP, Newman PA, Roungprakhon S, Scarpa R (2013) The marginal willingness-to-pay for attributes of a hypothetical HIV vaccine. Vaccine 31: 3712-3717.

Cook J, Jeuland M, Maskery B, Lauria D, Sur D, Clemens J, Whittington D (2009) Using private demand studies to calculate socially optimal vaccine subsidies in developing countries. J Policy Anal Manage 28: 6-28.

Crosby RA, Holtgrave DR, Bryant L, Frew PM (2004) Correlates of negative intent to receive an AIDS vaccine: An exploratory study. Int J STD AIDS 15: 552-557.

Dhalla S, Poole G (2011) Motivators of enrolment in HIV vaccine trials: A review of HIV vaccine preparedness studies. AIDS Care 23: 1430-1447.

Dimi S, Zucman D, Chassany O, Lalanne C, Prazuck T, Mortier E, Majerholc C, Aubin-Auger I, Verger P, Duracinsky M (2019) Patients' high acceptability of a future therapeutic HIV vaccine in France: A French paradox? BMC Infect Dis 19: 401.

Doshi M, Avery L, Kaddu RP, Gichuhi M, Gakii G, Du Plessis E, Dutta S, Khan S, Kimani J, Lorway RR (2017) Contextualizing willingness to participate: Recommendations for engagement, recruitment & enrolment of Kenyan MSM in future HIV prevention trials. BMC Public Health 17: 469.

Drummond MF, Sculpher MJ, Claxton K, Stoddart GL, Torrance GW (2015) Methods for the economic evaluation of health care programmes, 4th edn. Oxford, UK: Oxford University Press.

Frew PM, Crosby RA, Salazar LF, Gallinot LP, Bryant LO, Holtgrave DR (2008) Acceptance of a potential HIV/AIDS vaccine among minority women. J Natl Med Assoc 100: 802-816.

Hom D, Johnson J, Mugyenyi P, Byaruhanga R, Kityo C, Louglin A, Svilar G, Vjecha M, Mugerwa R, Ellner J (1997) HIV-1 risk and vaccine acceptability in the Ugandan military. J Acquir Immune Defic Syndr 15: 375-380.

Kakinami L, Newman PA, Lee SJ, Duan N (2008) Differences in HIV vaccine acceptability between genders. AIDS Care 20: 542-546.

Keyserlingk CV, Rhodes B (2007) Using contingent valuation in hypothetical settings: Estimating the WTP for an HIV/AIDS vaccine. J Interdiscip Econ 18: 71-89.

Kim SY, Sagiraju H, Russell LB, Sinha A (2014) Willingness-to-pay for vaccines in low-and middle-income countries: A systematic review. Ann Vaccines Immunization 1: 1001.

Koniak D, Nyamathi A, Tallen L, González-Figueroa E, Dominick E (2007) Breaking the silence: What homeless 18-to 24-year-olds say about HIV vaccine trials. J Health Care Poor Underserved 18: 687-698.

Kontomanolis EN, Michalopoulos S, Gkasdaris G, Fasoulakis Z (2017) The social stigma of HIV-AIDS: Society's role. HIV AIDS 9: 111-118.

Kpanake L, Gbandey S, Sorum PC, Mullet E (2018) Acceptability of vaccination against HIV: A mapping of Togolese people's positions. J H Psychol 23: 800-806.

Lally M, Gaitanis M, Vallabhaneni S, Reinert S, Mayer K, Zimet G, Rich J (2006) Willingness to receive an HIV vaccine among incarcerated persons. Prev Med 43: 402-405.

Lee SJ, Brooks RA, Newman PA, Seiden D, Sangthong R, Duan N (2008) HIV vaccine acceptability among immigrant Thai residents in Los Angeles: a mixed-method approach. AIDS Care 20: 1161-1168.

Lee SJ, Newman PA, Duan N, Cunningham WE (2014) Development of an HIV vaccine attitudes scale to predict HIV vaccine acceptability among vulnerable populations: L.A. VOICES. Vaccine 32: 5013-5018.

Lee S, Newman P, Comulada W, Cunningham W, Duan N (2012) Use of conjoint analysis to assess HIV vaccine acceptability: Feasibility of an innovation in the assessment of consumer health-care preferences. Int J STD AIDS 23: 235-241.

Liau A, Zimet GD, Fortenberry JD (1998) Attitudes about human immunodeficiency virus immunization: The influence of health beliefs and vaccine characteristics. Sex Transm Dis 25: 76-81.

Lindegger G, Quayle M, Ndlovu M (2007) Local knowledge and experiences of vaccination: Implications for HIV-preventive vaccine trials in South Africa. Health Educ Behav 34: 108-123.

Mays RM, Zimet GD (2004) Recommending STI vaccination to parents of adolescents: The attitudes of nurse practitioners. Sex Transm Dis 31: 428-432.

Newman P, Woodford M, Logie C (2012a) HIV vaccine acceptability and culturally appropriate dissemination among sexually diverse Aboriginal peoples in Canada. Glob Public Health 7: 87-100.

Newman PA, Duan N, Lee SJ, Rudy ET, Seiden DS, Kakinami L, Cunningham WE (2006) HIV vaccine acceptability among communities at risk: The impact of vaccine characteristics. Vaccine 24: 2094-2101.

Newman PA, Lee SJ, Duan N, Rudy E, Nakazono TK, Boscardin J, Kakinami L, Shoptaw S, Diamant A, Cunningham WE (2009) Preventive HIV vaccine acceptability and behavioral risk compensation among a random sample of high-risk adults in Los Angeles (L.A. VOICES). Health Serv Res 44: 2167-2179.

Newman PA, Logie C (2010) HIV vaccine acceptability: a systematic review and meta-analysis. Aids 24: 1749-1756.

Newman PA, Roungprakhon S, Tepjan S, Yim S (2010) Preventive HIV vaccine acceptability and behavioral risk compensation among high-risk men who have sex with men and transgenders in Thailand. Vaccine 28: 958-964.

Newman PA, Roungprakhon S, Tepjan S, Yim S, Walisser R (2012b) A social vaccine? Social and structural contexts of HIV vaccine acceptability among most-at-risk populations in Thailand. Glob Public Health 7: 1009-1024.

Nguyen F (2007) Gauging the acceptability of HIV vaccines: An exploratory study examining knowledge, attitudes, and beliefs among injecting drug users in Viet Nam. J Ethn Cult Divers Soc Work 16: 161-192.

Nodin N, Carballo-Dieguez A, Ventuneac AM, Balan IC, Remien R (2008) Knowledge and acceptability of alternative HIV prevention bio-medical products among MSM who bareback. AIDS Care 20: 106-115.

Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, Shamseer L, Tetzlaff JM, Akl EA, Brennan SE, Chou R, Glanville J, Grimshaw JM, Hróbjartsson A, Lalu MM, Li T, Loder EW, Mayo-Wilson E, McDonald S, McGuinness LA, Stewart LA, Thomas J, Tricco AC, Welch VA, Whiting P, Moher D (2021) The PRISMA 2020 statement: An updated guideline for reporting systematic reviews BMJ 372: n71.

Painter J, Cene-Kush C, Conner A, Cwiak C, Haddad L, Mulligan M, Diclemente R (2013) Anticipated HIV vaccine acceptability among sexually active African-American adult women. Vaccines 1: 88-104.

Ravert RD, Zimet GD (2009) College student invulnerability beliefs and HIV vaccine acceptability. Am J Health Behav 33: 391-399.

Roberts KJ, Newman PA, Duan N, Rudy ET (2005) HIV vaccine knowledge and beliefs among communities at elevated risk: Conspiracies, questions and confusion. J Natl Med Assoc 97: 1662.

Rudy ET, Newman PA, Duan N, Kelly EM, Roberts KJ, Seiden DS (2005) HIV vaccine acceptability among women at risk: Perceived barriers and facilitators to future HIV vaccine uptake. AIDS Educ Prev 17: 253-267.

Salazar LF, Holtgrave D, Crosby RA, Frew P, Peterson JL (2005) Issues related to gay and bisexual men's acceptance of a future AIDS vaccine. Int J STD AIDS 16: 546-548.

Sayles JN, Macphail CL, Newman PA, Cunningham WE (2010) Future HIV vaccine acceptability among young adults in South Africa. Health Educ Behav 37: 193-210.

Suraratdecha C, Hecht R (2005) Demand for a Preventive HIV Vaccine: A Review of the Literature. International AIDS Vaccine Initiative. Policy Research Working Paper # 3; pp. 39.

Thabethe S, Slack C, Lindegger G, Wilkinson A, Wassenaar D, Kerr P, Bekker LG, Mngadi K, Newman PA (2018) "Why don't you go into suburbs? Why are you targeting us?": Trust and mistrust in HIV vaccine trials in South Africa. J Empir Res Hum Res Ethics 13: 525-536.

Tremouillaux-Guiller J, Moustafa K, Hefferon K, Gaobotse G, Makhzoum A (2020) Plant-made HIV vaccines and potential candidates. Current Opinion in Biotechnology 61: 209-216.

Tsekoa TL, Singh AA, Buthelezi SG (2020) Molecular farming for therapies and vaccines in Africa. Curr Opin Biotechnol 61: 89-95.

Weaver J, Newman PA, Williams CC, Massaquoi N, Brown M (2013) "Sisters, Mothers, Daughters and Aunties": HIV vaccine acceptability among African, Caribbean and other Black women in Toronto. Can J Public Health 104: e413-e417.

Whittington D, Suraratdecha C, Poulos C, Ainsworth M, Prabhu V, Tangcharoensathien V (2008) Household demand for preventive HIV/AIDS vaccines in Thailand: Do husbands' and wives' preferences differ? Value Health 11: 965-974.

Young AM, Diclemente RJ, Halgin DS, Sterk CE, Havens JR (2014) HIV vaccine acceptability among high-risk drug users in Appalachia: A cross-sectional study. BMC Public Health 14: 537.

Zimet GD, Perkins SM, Sturm LA, Bair RM, Juliar BE, Mays RM (2005) Predictors of STI vaccine acceptability among parents and their adolescent children. J Adolesc Health 37: 179-186.

AUTHOR CONTRIBUTION:

Contribution	Huyen TNT	Pumtong S	Sanroongruangsri S	Anuratpanich L
Concepts or ideas	x			x
Design	x	x	x	x
Definition of intellectual content				
Literature search	x	x	x	x
Experimental studies	x	x	x	
Data acquisition	x			x
Data analysis	x			
Statistical analysis	x			x
Manuscript preparation	x			x
Manuscript editing	x	x	x	x
Manuscript review	x	x	x	x

Citation Format: Huyen TNT, Pumtong S, Sanroongruangsri S, Anuratpanich L (2022) Acceptability of and willingness to pay for human immunodeficiency virus vaccination: A systematic literature review. J Pharm Pharmacogn Res 10(4): 748–767. https://doi.org/10.56499/jppres22.1404_10.4.748