Check for updates

RESEARCH ARTICLE

REVISED Willingness-to-pay for a hypothetical Ebola vaccine in Indonesia: A cross-sectional study in Aceh [version 3; peer review: 4 approved]

Mudatsir Mudatsir[1-3], Samsul Anwar[4], Jonny Karunia Fajar[3], Amanda Yufika[3,5], Muhammad N. Ferdian[3], Salwiyadi Salwiyadi[3], Aga S. Imanda[3], Roully Azhars[3], Darul Ilham[3], Arya U. Timur[3], Juwita Sahputri[6], Ricky Yordani[7], Setia Pramana[7], Yogambigai Rajamoorthy[8], Abram L. Wagner[9], Kurnia F. Jamil[10], Harapan Harapan[1-3]

[1]Tropical Diseases Centre, School of Medicine, Universitas Syiah Kuala, Banda Aceh, Indonesia
[2]Department of Microbiology, School of Medicine, Universitas Syiah Kuala, Bnada Aceh, Indonesia
[3]Medical Research Unit, School of Medicine, Universitas Syiah Kuala, Banda Aceh, Indonesia
[4]Department of Statistics, Faculty of Mathematics and Natural Sciences, Universitas Syiah Kuala, Banda Aceh, Indonesia
[5]Department of Family Medicine, School of Medicine, Universitas Syiah Kuala, Banda Aceh, Indonesia
[6]Department of Microbiology, Faculty of Medicine, Malikussaleh University, Lhokseumawe, Indonesia
[7]Institute of Statistics, Jakarta, Indonesia
[8]Department of Economics, Faculty of Accountancy and Management, Universiti Tunku Abdul Rahman, Selangor, Malaysia
[9]Department of Epidemiology, Department of Epidemiology, University of Michigan, Ann Arbor, USA
[10]Department of Internal Medicine, School of Medicine, Universitas Syiah Kuala, Banda Aceh, Indonesia

v3 **First published:** 15 Aug 2019, **8**:1441
https://doi.org/10.12688/f1000research.20144.1
Second version: 13 Jul 2020, **8**:1441
https://doi.org/10.12688/f1000research.20144.2
Latest published: 14 Jun 2023, **8**:1441
https://doi.org/10.12688/f1000research.20144.3

Abstract

Background: Some Ebola vaccines have been developed and tested in phase III clinical trials. However, assessment of whether public have willingness to purchase or not, especially in unaffected areas, is lacking. The aim of this study was to determine willingness to pay (WTP) for a hypothetical Ebola vaccine in Indonesia.
Methods: A cross-sectional study was conducted from 1 August to 30 December 2015 in five cities in Aceh province of Indonesia. Patients' family members who visited outpatient departments were approached and interviewed about their sociodemographic characteristics, knowledge of Ebola, attitude towards vaccination practice and their WTP for a hypothetical Ebola vaccine. A multivariable linear regression model assessed the relationship between these explanatory variables and WTP.
Results: During the study, 500 participants were approached and interviewed. There were 424 (84.8%) respondents who completed the

Open Peer Review

Approval Status ✓ ✓ ✓ ✓

	1	2	3	4
version 3 (revision) 14 Jun 2023		✓ view		
version 2 (revision) 13 Jul 2020			✓	✓ view
version 1 15 Aug 2019	✓ view	✗ view	✓ view	? view

1. **Roger Chun-Man Ho**, National University of Singapore, Singapore, Singapore

2. **Jing-Xin Li**, Jiangsu Provincial Center for

interview and 74% (311/424) expressed their acceptance for an Ebola vaccine. There were 288 participants who were willing to pay for an Ebola vaccine (92.6% out of 311). The mean of WTP was US$2.08 (95% CI: 1.75-2.42). The final multivariable model indicated that young age, high educational attainment, working as a private employee, entrepreneur or civil servant (compared to farmers), being unmarried, and residing in a suburb (compared to a city) were associated with higher WTP.

Conclusions: Although the proportion of the participants who would accept the Ebola vaccine was relatively high, the amount they were willing to pay for Ebola vaccine was very low. This finding would indicate the need of subsidies for Ebola vaccine in the country.

Keywords
Ebola vaccine, Ebola virus disease, Indonesia, vaccine acceptance, willingness-to-pay

Disease Control and Prevention, Nanjing, China

3. **Trung Quang Vo**, Pham Ngoc Thach University of Medicine, Ho Chi Minh City, Vietnam

4. **Brian Godman**, University of Strathclyde, Glasgow, UK

Any reports and responses or comments on the article can be found at the end of the article.

Corresponding authors: Mudatsir Mudatsir (mudatsir@unsyiah.ac.id), Harapan Harapan (harapan@unsyiah.ac.id)

Author roles: Mudatsir M: Conceptualization, Formal Analysis, Investigation, Methodology, Resources, Writing – Original Draft Preparation, Writing – Review & Editing; **Anwar S**: Formal Analysis, Methodology, Resources, Software; **Fajar JK**: Data Curation, Investigation, Writing – Original Draft Preparation, Writing – Review & Editing; **Yufika A**: Data Curation, Project Administration, Writing – Original Draft Preparation, Writing – Review & Editing; **Ferdian MN**: Data Curation, Investigation, Validation; **Salwiyadi S**: Data Curation, Investigation, Validation; **Imanda AS**: Data Curation, Investigation, Validation; **Azhars R**: Data Curation, Investigation, Validation; **Ilham D**: Data Curation, Investigation, Validation; **Timur AU**: Data Curation, Investigation, Validation; **Sahputri J**: Data Curation, Investigation, Validation; **Yordani R**: Data Curation, Formal Analysis, Methodology, Software; **Pramana S**: Conceptualization, Formal Analysis, Methodology, Software; **Rajamoorthy Y**: Data Curation, Formal Analysis, Methodology; **Wagner AL**: Data Curation, Supervision, Validation, Writing – Original Draft Preparation, Writing – Review & Editing; **Jamil KF**: Supervision, Validation, Writing – Original Draft Preparation, Writing – Review & Editing; **Harapan H**: Conceptualization, Methodology, Software, Supervision, Validation, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing

Competing interests: No competing interests were disclosed.

Grant information: The author(s) declared that no grants were involved in supporting this work.

Copyright: © 2023 Mudatsir M *et al*. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

How to cite this article: Mudatsir M, Anwar S, Fajar JK *et al.* **Willingness-to-pay for a hypothetical Ebola vaccine in Indonesia: A cross-sectional study in Aceh [version 3; peer review: 4 approved]** F1000Research 2023, **8**:1441 https://doi.org/10.12688/f1000research.20144.3

First published: 15 Aug 2019, **8**:1441 https://doi.org/10.12688/f1000research.20144.1

REVISED **Amendments from Version 2**

In this new version, we added the date of the when the ethical clearance was issued and we added the information that written Informed consent was obtained from all participants and those under 18 years old, the parent signed the informed consent.

Any further responses from the reviewers can be found at the end of the article

Introduction

Ebola virus disease (EVD), formerly called as Ebola hemorrhagic fever, is a disease characterized by high mortality in human populations[1]. EVD is caused by Ebola virus (EBOV) which is an enveloped, filamentous, and non-segmented negative-strand RNA virus[2]. EBOV first emerged in tropical areas of Africa – in the countries now known as the Democratic Republic of the Congo and South Sudan – in 1976, and was recognized as a new viral hemorrhagic fever[3]. Since then, EVD outbreaks have been reported intermittently. Recently there was an outbreak of almost 28,610 cases and 11,308 deaths, mostly affecting West Africa, but also spreading to Europe, North America, and Asia[4,5]. In Asia, EVD cases were reported in the Philippines[6]. Although no cases have yet been reported in Indonesia, many travelers pass through the country. Since 2017, several outbreaks of EVD have impacted the Democratic Republic of the Congo, with over 2,000 reported cases as of June 2019[7].

EVD is a highly fatal disease and can be economically burdensome in affected countries. The case fatality rate of EVD ranges from 25% to 100%, with an average of approximately 68%[8,9]. The highest rates of mortality are in infants and children[10]. It is estimated that between $2.8 and $32.6 billion was spent to control the EVD outbreaks of 2014–2016[11]. Accordingly, the World Health Organization (WHO) declared EVD outbreak as a Public Health Emergency of International Concern with severe global economic burden in August 2014[12]. There is no specific treatment for EVD beyond supportive care.

Development of a safe and effective Ebola vaccine is a key component to future programs to control EVD[13]. Several vaccines have been developed and tested in phase III clinical trials, such as rVSV-EBOV and the combination of Ad26-ZEBOV and MVA-BN Filo[14]. The trials demonstrated that these vaccines have good effectiveness and provide robust protection against EVD; no EVD case have been reported among vaccinated individuals[14]. Vaccine development will be beneficial for people living in West Africa and other regions affected by Ebola outbreaks. The vaccine has had some use in the current outbreaks in the Democratic Republic of the Congo[15]. However, the problem with any new vaccine, particularly vaccines that require payment, is the public response, and whether members of the general population are willing to purchase the vaccine. A previous study reported high willingness to pay (WTP) for an Ebola vaccine in West Africa[16]. However, in areas not yet affected, the results might differ because community members might lower perceptions of risk. This present study therefore aimed to investigate WTP for Ebola vaccine in Indonesia, a currently unaffected EVD country.

Methods

Study design and setting

Approximately 16 months after the Ministry of Health of the Republic of Indonesia raised an alert for EVD in Indonesia, a cross-sectional study was conducted to assess acceptance and WTP for a hypothetical Ebola vaccine among family members of patients with any illness admitted to eight health facilities (hospitals or Community Health Centres [*Puskesmas*]) in four regencies (Nagan Raya, Aceh Selatan, Langsa and Banda Aceh) of Aceh province from 1 August to 30 December 2015. The study was conducted in. Aceh is located in the westernmost part of the Indonesian archipelago with a total population approximately 4,906,800 in 2014[17].

Study participants, sampling and sample size

Study participants were patients' family members who visited infection and non-infection outpatient departments. Based on the population size of Aceh in 2014, the minimum sample size required was 385[18]. To recruit the samples, four regencies were selected randomly, and both urban and suburban areas were included. The number of participants from each study site was gathered proportionally to the size of regency's population. To avoid repetitive field visits and to minimize the study design effect, the number of participants was increased for each study site. Family members who had resided in the specified regency for more than 3 months, were ≥17 years old, and were able to communicate in Bahasa Indonesia (the national language) were considered to be eligible for inclusion.

Study instrument

To facilitate the interviews a set of a structured questionnaire, adapted from previous studies[19,20], was used. Prior to use in the actual study, a pilot study was conducted to measure reliability of questionnaires among 25 participants in Lhokseumawe regency. For this pilot study, a Cronbach's alpha score of ≥0.7 was considered good internal consistency. Edits were made to the questionnaire based on findings from the pilot study; the questionnaire is available in Indonesian and English as *Extended data*[21].

Study variables

Response variable. The response variable was WTP for a hypothetical Ebola vaccine. Prior to assessing their WTP, participants were provided with an introduction to the Ebola disease including the symptoms and modes of transmission. They were also informed of the following points: (a) infected patients need to be isolated and health care workers need to use special protection equipment while providing healthcare to the patients; (b) currently there is no available treatment for EVD; (c) the mortality rate of EVD is up to 90%; and (d) an Ebola vaccine would be safe and protective against EVD.

To assess the amount of money that participants would be willing to pay for a hypothetical Ebola vaccine, participants were asked whether they would be willing to pay for the vaccine using a list of Ebola vaccine prices: Indonesian Rupiah (IDR) 5.000, 10,000, 17.500, 37.500, 87.500, 150.000, and 300.000 (equivalent to US$ 0.37, 1.29, 2.78, 4.63, 6.48, 11.12, and 22.24). The possible responses were "very likely", "likely",

"undecided", "unlikely" or "very unlikely". The WTP was defined as the highest price the participants said they were still "very likely" or "likely" willing to pay.

Explanatory variables. *Sociodemographic data*: Sociodemographic factors such as age, gender, educational attainment, type of occupation, marital status, monthly income and urbanicity were collected from participants. The date of birth was recorded, converted into actual age and then collapsed into three groups. Educational attainment, defined as the highest level of formal education completed by respondents, was grouped into four groups. Participants were grouped into five types of occupation: (a) farmer; (b) private sector employee; (c) housewife; (d) entrepreneur (owned a small-scale business, or traders in a market); and (e) civil servant. Monthly income was grouped into: (a) less than 1 million Indonesian Rupiah (IDR) (equivalent to US$ 74.1); (b) 1 –2 million IDR (equivalent to US$ 74.1 - US$ 148.2); and (c) more than 2 million IDR (equivalent to US$ 148.2). Urbanicity included cities and suburbs.

Socioeconomic status (SES): SES was assessed based on 15 household assets owned by participants such as radio, landline phone, refrigerator, motorcycles, car, other electronics and house characteristics. Details of the full list of the household assets have been published previously[20,22]. The ownership of those assets was used to construct an asset index based on principal component analysis[23]. SES classified into three tertiles, with the 1st tertile the poorest and the 3rd tertile the wealthiest.

Attitude towards vaccination practice: To measure attitude towards vaccination practice, five questions adopted from a previous study[20] was used. The questions included the attitude towards the safety and importance of vaccines, and previous experiences regarding vaccination practices. Participants responded to each statement on a five-point Likert-like scale ranging from "1=strongly disagree" to "5=strongly agree" with a higher score indicating a more positive attitude. The summed scores for this domain ranged from 5 to 25. Participants were classified as having a "good" or "poor" attitude based on a 75% cut-off point of the maximum score achieved by participants.

Knowledge regarding Ebola: To assess knowledge regarding Ebola, a set of six questions on transmission and prevention methods of EVD, adapted from a previous study[19], was used. Each valid response was given a score of one, whereas an incorrect response was given a score of zero. The summed scores for this domain ranged from 0 to 6, and knowledge of each participant was also classified into "good" or "poor" based on a 75% cut-off point.

Data analysis

To assess the relationship between explanatory variables and WTP, a multivariable linear regression model was employed[24,25]. Various diagnostic assessments were used to check how well the data met the assumptions of linear regression. The variance inflation factor (VIF)[26], Glejser test[27] and Kolmogorov-Smirnov test[28] were employed to assess multicollinearity, heteroscedasticity and residual normality of the data, respectively. A VIF value of lower than 10 was used to define no multicollinearity between variables. A *P*-value greater than 0.05 in the Glejser test, and Kolmogorov-Smirnov test was applied to indicate no heteroscedasticity, and normal distribution of residuals, respectively[24].

Initial assessment indicated that the data violated all three assumptions and WTP values were then transformed using a natural logarithm function (Ln). After transformation, data showed better adherence to assumptions and therefore the transformed WTP values were used in linear regression model. In the initial multivariable model, all explanatory variables were included. Then, all explanatory variables that had $P > 0.25$ in this model were excluded from final linear regression model[29]. Significance in the final model was assessed at an alpha level of 0.05. All associations between an explanatory factor and WTP were interpreted in relation to a reference category.

Because the outcome had been log-transformed, the mean estimated WTP in US$ and its 95% CI were calculated as $\text{Exp}\,(X\hat{\beta} + \hat{\sigma}^2/2)$ where $\hat{\beta}$ was the estimated regression coefficients (B) and $\hat{\sigma}^2$ was the mean squared error (MSE) of the multivariate model[24,30,31]. All analyses were performed using SPSS (version 15, Chicago, USA).

Ethical approval

The protocol of this study was approved by Institutional Review Board of the School of Medicine, Universitas Syiah Kuala, Banda Aceh, Indonesia (Approval 315/KE/FK/2015 dated 16 June 2015). Prior to enrolment, the aims of the study were explained to the participants and they signed written consent forms. Participation in this study was voluntary and participants received no financial compensation. Written Informed consent was obtained from all participants and those under 18 years old, the parent signed the informed consent.

Results

The raw data for this study are available as *Underlying data* on Figshare[32].

Participants' characteristics

In this study, 500 participants were approached, all agreed to participate, but 76 were excluded due to incomplete data. Among those with completed data (424 or 84.8%), approximately 74% (311/424) of participants would accept an Ebola vaccine. There were 288 participants (92.6%, 288/311, of those who would accept an Ebola vaccine, or 67.9%, 288/424, of all participants with completed data), willing to pay for Ebola vaccine. The characteristics of the participants who were willing to pay for Ebola vaccine are presented in Table 1.

More than half (51.0%) of those who willing to pay for the vaccine were aged 30–44 years old, and 52.4% were female. A majority (75.7%) of them had finished their senior high school (year 12) and none of them had no formal education. The most frequent type of occupation was farmer, followed by entrepreneur, housewife, civil servant and private employee. A vast majority (96.5%) of the respondents who willing to pay were married and approximately 44% of the them were living under

the poverty line, i.e. <1 million IDR (equivalent to US$74.1). Overall, 52.1% of them had good attitude towards vaccination and almost 70% had poor knowledge about transmission and prevention of EVD.

WTP for an Ebola vaccine

Among 288 participants who were willing to pay for Ebola vaccine, 114 (39.6%) of them expressed their WTP at US$ 1.29 and this decreased to 28.1%, 14.6% and 3.1% as the price for

Table 1. Unadjusted relationship between sociodemographic factors and willingness-to-pay for a hypothetical Ebola vaccine (N=288).

Parameter	N (%)	Unstandardized coefficients				US$ estimate			*P*-value
		B	95% CI of B		SE	Mean	95% CI		
			Lower	Upper			Lower	Upper	
Intercept		1.469	0.864	2.073	0.307	5.915	4.368	7.461	<0.001
Age group (year)									
17–29 *(Ref)*	68 (23.6)								
30–44	147 (51.0)	-0.304	-0.556	-0.052	0.128	1.005	-0.542	2.551	0.018
≥45	73 (25.3)	-0.280	-0.581	0.022	0.153	1.029	-0.517	2.576	0.069
Gender									
Male *(Ref)*	137 (47.6)								
Female	151 (52.4)	0.110	-0.126	0.346	0.120	1.520	-0.027	3.066	0.359
Education									
Less than junior high school *(Ref)*	70 (24.3)								
Senior high school	136 (47.2)	0.300	0.043	0.557	0.130	1.837	0.291	3.384	0.022
Diploma	42 (14.6)	0.042	-0.372	0.456	0.210	1.420	-0.127	2.966	0.842
Graduated	40 (13.9)	0.526	0.042	1.010	0.246	2.304	0.757	3.851	0.033
Occupation									
Farmer *(Ref)*	77 (26.7)								
Private employee	24 (8.3)	0.741	0.267	1.215	0.241	2.857	1.310	4.403	0.002
Housewife	67 (23.3)	0.045	-0.284	0.375	0.167	1.424	-0.122	2.971	0.788
Entrepreneur	72 (25.0)	0.400	0.106	0.694	0.149	2.032	0.485	3.578	0.008
Civil servant	48 (16.7)	0.606	0.146	1.065	0.233	2.495	0.948	4.042	0.010
Marital status									
Unmarried *(Ref)*	10 (3.5)								
Married	278 (96.5)	-0.896	-1.438	-0.355	0.275	0.556	-0.991	2.102	0.001
Monthly income (IDR)									
<1 million *(Ref)*	127 (44.1)								
1 to ≤ 2 million	96 (33.3)	-0.107	-0.336	0.123	0.117	1.224	-0.323	2.770	0.360
>2 million	65 (22.6)	0.054	-0.315	0.424	0.188	1.437	-0.110	2.984	0.774
Urbanicity									
Suburb *(Ref)*	247 (85.8)								
City	41 (14.2)	-0.491	-0.842	-0.141	0.178	0.833	-0.714	2.379	0.006

Parameter	N (%)	Unstandardized coefficients				US$ estimate			*P*-value
		B	95% CI of B		SE	Mean	95% CI		
			Lower	Upper			Lower	Upper	
Socio-economic status									
1st tertile (Poorest) *(Ref)*	95 (33.0)								
2nd tertile	96 (33.3)	-0.150	-0.418	0.119	0.136	1.172	-0.374	2.719	0.273
3rd tertile (Wealthiest)	97 (33.7)	-0.076	-0.404	0.252	0.167	1.262	-0.285	2.808	0.649
Attitude towards vaccination practice									
Poor *(Ref)*	138 (47.9)								
Good	150 (52.1)	-0.029	-0.251	0.193	0.113	1.322	-0.224	2.869	0.797
Knowledge of Ebola									
Poor *(Ref)*	196 (68.1)								
Good	92 (31.9)	-0.201	-0.461	0.059	0.132	1.113	-0.433	2.660	0.129
Mean squared error (MSE)			0.617						
F value			4.281 (P<0.001)						
R^2			0.223						

CI, confidence interval; IDR, Indonesia rupiah; US$, American dollar; SE, standard error; *Ref*, reference group.

Ebola vaccine increased to US$2.78, US$4.63, and US$6.48, respectively (Figure 1). Only 7 out of 288 respondents agreed to pay the highest price (US$22.24). The mean of WTP was US$2.08 (95% CI: 1.75-2.42).

Factors associated with WTP for an Ebola vaccine

The initial multivariable model showed that age, educational attainment, type of occupation, marital status, type of residence and having good knowledge of Ebola were associated with WTP with a P-value under 0.25. (Table 1). The final multivariable model indicated that age, educational attainment, type of occupation, marital status and urbanicity were significantly associated with WTP (Table 2). Knowledge of Ebola had no association with WTP. Compared to the youngest age group (17–29-year-olds), participants who were between 30–44 years old and those older than 45 years had lower WTP, at approximately US$ 1. Respondents who finished senior high school (year 12) and graduated from university had higher WTP – approximately US$1.7 and US$2.3, respectively, compared to those who had an education less than junior high school (year 9). Compared to farmers, participants who were working as employees in private companies, entrepreneurs and civil servants were willing to pay US$2.6, US$1.8 and US$2.3 more, respectively. In addition, this study found that participants who were married and those who were living in the city had lower WTP compared to unmarried participants and those who were living in the suburbs (Table 2).

Discussion

WTP is a commonly used method in economic evaluation of healthcare interventions. In cost-benefit analysis, the WTP is able to value both the indirect and intangible aspects of the disease. It is important to be aware of methodology and interpretation of results because of affecting to decision of policy maker and also affecting in national expanded program in immunization on adding new good vaccines[33]. Several studies have been conducted to assess the WTP for various vaccines and its associated determinants[34–36]. One of the reasons since is able to inform future health policies including the adoption of a dengue vaccine

This study was conducted to assess the WTP for a hypothetical Ebola vaccine and its associated determinants among community members in Aceh province, Indonesia. We found that age, educational attainment, type of occupation, marital status and urbanicity were all associated with WTP. Better understanding of which groups have greater WTP for the vaccine and what this amount would be are important to consider if the vaccine were to be introduced into Indonesia in the future.

Age was related to WTP, with younger participants having higher WTP compared to older participants. This corresponds to another study in Indonesia that also showed older participants had lower WTP for a vaccine compared to their younger counterparts[20]. In Indonesia, this association could arise for several reasons. First, in general, the older generation tends to have lower education levels. In the context of health-related knowledge and WTP, it has been shown that higher education was associated with better health-related knowledge[37,38] and WTP for vaccines against infectious diseases[39,40] although some studies found educational attainment had no association or had no consistent association with WTP[20,24,41,42]. Second, older

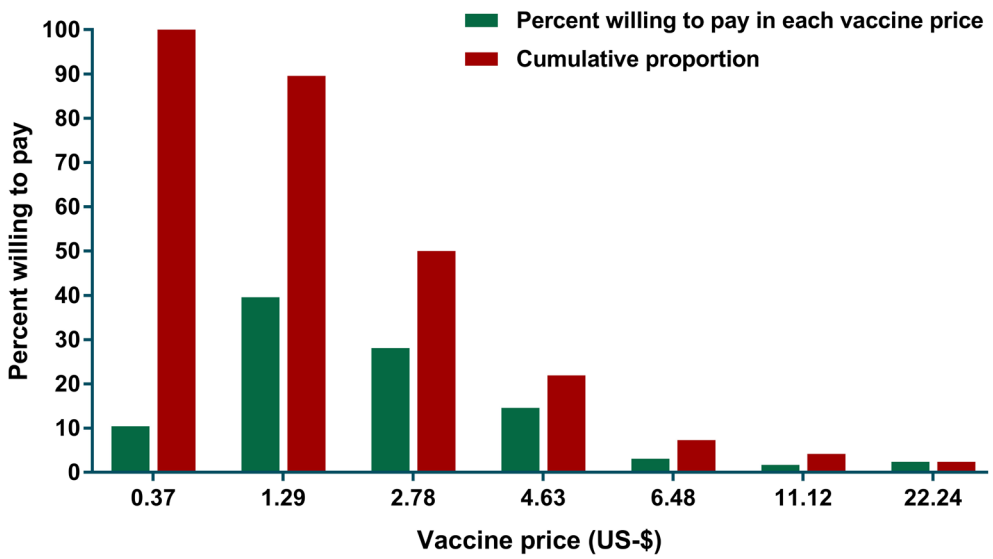

Figure 1. Relationship between the presented vaccine price and proportion of participants who were willing to pay for an Ebola vaccine in Aceh, Indonesia. Only those who were willing to pay for Ebola vaccine were included in this analysis.

Table 2. Final model of factors associated with and willingness-to-pay for a hypothetical Ebola vaccine (N=288).

Parameter	N (%)	Unstandardized coefficients				US$ estimate			*P*-value
		B	95% CI of B		SE	Mean	95% CI		
			Lower	Upper			Lower	Upper	
Intercept		1.478	0.908	2.048	0.290	5.944	4.408	7.479	<0.001
Age group (years) *(Ref: 17–29)*									
30–44	147 (51.0)	-0.311	-0.546	-0.077	0.119	0.993	-0.543	2.528	0.009
≥45	73 (25.3)	-0.299	-0.580	-0.019	0.142	1.005	-0.531	2.540	0.036
Education *(Ref: Less than junior high school)*									
Senior high school	136 (47.2)	0.245	0.031	0.458	0.109	1.731	0.195	3.266	0.025
Graduated	40 (13.9)	0.544	0.191	0.897	0.179	2.335	0.799	3.870	0.003
Occupation *(Ref: Farmer)*									
Private employee	24 (8.3)	0.661	0.285	1.037	0.191	2.625	1.090	4.161	0.001
Entrepreneur	72 (25.0)	0.319	0.085	0.552	0.119	1.864	0.329	3.400	0.008
Civil servant	48 (16.7)	0.563	0.225	0.901	0.172	2.379	0.844	3.914	0.001
Marital status *(Ref: Unmarried)*									
Married	278 (96.5)	-0.868	-1.398	-0.337	0.269	0.569	-0.966	2.105	0.001
Urbanicity *(Ref: Suburb)*									
City	41 (14.2)	-0.552	-0.882	-0.221	0.168	0.781	-0.755	2.316	0.001
Knowledge of Ebola *(Ref: Poor)*									
Good	92 (31.9)	-0.206	-0.421	0.008	0.109	1.103	-0.433	2.638	0.059
Mean squared error		0.608							
F value		7.417 (P<0.001)							
R^2		0.211							

CI, confidence interval; IDR, Indonesia rupiah; US$, American dollar; SE, standard error; *Ref*, reference group.

community members may have had less exposure to information regarding Ebola, resulting in lower knowledge and awareness of the disease. In addition, many older people work as farmers, have less income and therefore are less willing to pay for vaccination. This could also explain why participants who were working in other sectors had higher WTP compared to farmers.

We also found that participants with higher educational attainment had higher WTP. Higher education level has a positive association with higher WTP in interventions related to infectious diseases[39,40]. And it could be that education relates to WTP because of knowledge related to Ebola. However, we found no relationship between knowledge and WTP. It is interesting to discuss why knowledge on Ebola was not significantly associated with WTP in this present study, but higher education was. It could due to the observation that only knowledge on an infectious disease provided health professional was found to be associated with WTP for vaccine[43]. This is understandable since Ebola, as the new re-emerging infectious disease, was not taught in Indonesia's curriculum. However, education does increase people's awareness of infectious diseases and vaccination in general[44,45]. Therefore, even though people do not have much knowledge of Ebola, they still have better awareness of the importance to keep themselves protected from infectious diseases, resulting in higher WTP for vaccination as found in this study. Therefore, it is important for the government to target groups with lower education levels during vaccination campaigns to raise their awareness of a specific disease.

Our study found there was no association between income or SES and WTP. However, previous studies have consistently found that income or economic status is one of the most robust predictors for WTP[20,25,39,40,42,46], i.e., individuals with a higher income can afford a more expensive vaccine. However, one previous study found that income could had negative association with WTP in Nigeria[47]. The diversity of these findings may serve as an indication that socioeconomic variables behave differently across countries. We note that the vaccine prices that were provided in this present study were substantially lower than the WTP of the respondents. Nevertheless, few respondents (less than 3%) were willing to pay for the vaccine at the highest price (US$22.24) indicating that the provided vaccine prices were not significantly lower than participants' WTP. According to the theory of goods classification in microeconomics, a negative relationship between income and WTP label the products as inferior goods[48]. This happen when the consumers have low knowledge and awareness of that particular product and leads the low WTP even though very important.

There are some limitations of this study that need to be discussed. There were no Ebola cases reported in Indonesia and therefore the respondents were provided with brief information related to Ebola infection prior to assess their WTP. Social desirability bias is inevitable in which participants might tend to give favorable answer in some questions given included in WTP section. This study did not explore the WTP difference between two or more scenarios of vaccine with different efficacies. As could be seen in previous studies[49,50], higher efficacy of vaccines resulted in higher value of WTP. This study also did not explore the effect of health insurance on WTP as previous study found that having health insurance were associated with WTP for vaccine[51]. Finally, a hypothetical bias might exist in which respondents misstate their actual WTP as this study was conducted when no Ebola vaccine had been approved and licensed.

Conclusions

In this study, the mean of WTP for a hypothetical Ebola vaccine was US$2.08 (95% CI: 1.75-2.42) and the proportion of respondents who were willing to pay for the vaccine decreased with increase of vaccine price. Younger and unmarried participants, those with higher educational attainment and those who were living in the suburbs had higher WTP. In addition, compared to farmers, private employee, entrepreneurs and civil servants also had higher WTP. Better understanding which groups are more willing to pay for the vaccine and what this amount are important to consider if the vaccine were to be introduced into Indonesia in the future.

Data availability

Underlying data

Figshare: Willingness-to-pay for a hypothetical Ebola vaccine in Indonesia: A cross-sectional study in Aceh. https://doi.org/10.6084/m9.figshare.9256037[32].

This project contains answers given to each question by each participant.

Extended data

Figshare: Willingness-to-pay for a hypothetical Ebola vaccine in Indonesia: A cross-sectional study in Aceh (Questionnaire). https://doi.org/10.6084/m9.figshare.9293378.v1[21].

This project contains the questionnaire in Indonesian (original) and English.

Data are available under the terms of the Creative Commons Attribution 4.0 International license (CC-BY 4.0).

References

1. Omoleke SA, Mohammed I, Saidu Y: **Ebola Viral Disease in West Africa: A Threat to Global Health, Economy and Political Stability.** *J Public Health Afr.* 2016; **7**(1): 534.
PubMed Abstract | Publisher Full Text | Free Full Text

2. Weyer J, Grobbelaar A, Blumberg L: **Ebola virus disease: history, epidemiology and outbreaks.** *Curr Infect Dis Rep.* 2015; **17**(5): 480.
PubMed Abstract | Publisher Full Text

3. Baseler L, Chertow DS, Johnson KM, *et al.*: **The Pathogenesis of Ebola Virus**

Disease. *Annu Rev Pathol.* 2017; **12**: 387–418.
PubMed Abstract | Publisher Full Text

4. CDC: **2014-2016 Ebola Outbreak in West Africa**. (Accessed: 9 June 2019).
Reference Source

5. Dokubo EK, Wendland A, Mate SE, *et al.*: **Persistence of Ebola virus after the end of widespread transmission in Liberia: an outbreak report.** *Lancet Infect Dis.* 2018; **18**(9): 1015–1024.
PubMed Abstract | Publisher Full Text

6. Rajiah K, San KP, Jiun TW, *et al.*: **Prevalence and Current Approaches of Ebola Virus Disease in ASEAN Countries.** *J Clin Diagn Res.* 2015; **9**(9): LE01–6.
PubMed Abstract | Publisher Full Text | Free Full Text

7. WHO: **Ebola situation reports: Democratic Republic of the Congo**. (Accessed: 9 June 2019).
Reference Source

8. Lefebvre A, Fiet C, Belpois-Duchamp C, *et al.*: **Case fatality rates of Ebola virus diseases: a meta-analysis of World Health Organization data.** *Med Mal Infect.* 2014; **44**(9): 412–416.
PubMed Abstract | Publisher Full Text

9. Van Kerkhove MD, Bento AI, Mills HL, *et al.*: **A review of epidemiological parameters from Ebola outbreaks to inform early public health decision-making.** *Sci Data.* 2015; **2**: 150019.
Publisher Full Text

10. WHO Ebola Response Team, Agua-Agum J, Ariyarajah A, *et al.*: **Ebola virus disease among children in West Africa.** *N Engl J Med.* 2015; **372**(13): 1274–1277.
PubMed Abstract | Publisher Full Text | Free Full Text

11. Huber C, Finelli L, Stevens W: **The Economic and Social Burden of the 2014 Ebola Outbreak in West Africa.** *J Infect Dis.* 2018; **218**(suppl_5): S698–S704.
PubMed Abstract | Publisher Full Text

12. Cowling BJ, Yu H: **Ebola: worldwide dissemination risk and response priorities.** *Lancet.* 2015; **385**(9962): 7–9.
PubMed Abstract | Publisher Full Text

13. Brettin A, Rossi-Goldthorpe R, Weishaar K, *et al.*: **Ebola could be eradicated through voluntary vaccination.** *R Soc Open Sci.* 2018; **5**(1): 171591.
PubMed Abstract | Publisher Full Text | Free Full Text

14. Wang Y, Li J, Hu Y, *et al.*: **Ebola vaccines in clinical trial: The promising candidates.** *Hum Vaccin Immunother.* 2017; **13**(1): 153–168.
PubMed Abstract | Publisher Full Text | Free Full Text

15. WHO: **Ebola virus disease**. (Accessed: 9 June 2019).
Reference Source

16. Painter JE, von Fricken ME, Viana de O Mesquita S, *et al.*: **Willingness to pay for an Ebola vaccine during the 2014-2016 ebola outbreak in West Africa: Results from a U.S. National sample.** *Hum Vaccin Immunother.* 2018; **14**(7): 1665–1671.
PubMed Abstract | Publisher Full Text | Free Full Text

17. BPS: **Aceh dalam angka 2015**. In: Edited by Aceh BPSP. *Banda Aceh: Badan Pusat Statistik Provinsi Aceh*; 2015.
Reference Source

18. Harapan H, Anwar S, Ferdian M, *et al.*: **Public acceptance of a hypothetical Ebola virus vaccine in Aceh, Indonesia: A hospital-based survey.** *Asian Pac J Trop Dis.* 2017; **7**(4): 193–198.
Publisher Full Text

19. Ughasoro MD, Esangbedo DO, Tagbo BN, *et al.*: **Acceptability and Willingness-to-Pay for a Hypothetical Ebola Virus Vaccine in Nigeria.** *PLoS Negl Trop Dis.* 2015; **9**(6): e0003838.
PubMed Abstract | Publisher Full Text | Free Full Text

20. Hadisoemarto PF, Castro MC: **Public acceptance and willingness-to-pay for a future dengue vaccine: a community-based survey in Bandung, Indonesia.** *PLoS Negl Trop Dis.* 2013; **7**(9): e2427.
PubMed Abstract | Publisher Full Text | Free Full Text

21. Harapan H: **Willingness-to-pay for a hypothetical Ebola vaccine in Indonesia: A cross-sectional study in Aceh (Questionnaire).** *figshare.* Journal contribution. 2019.
http://www.doi.org/10.6084/m9.figshare.9293378.v1

22. Harapan H, Anwar S, Setiawan A, *et al.*: **Dengue vaccine acceptance and associated factors in Indonesia: A community-based cross-sectional survey in Aceh.** *Vaccine.* 2016; **34**(32): 3670–3675.
PubMed Abstract | Publisher Full Text

23. Filmer D, Pritchett L: **The effect of household wealth on educational attainment: Evidence from 35 countries.** *Popul Dev Rev.* 1999; **25**(1): 85–120.
Publisher Full Text

24. Harapan H, Anwar S, Bustamam A, *et al.*: **Willingness to pay for a dengue vaccine and its associated determinants in Indonesia: A community-based, cross-sectional survey in Aceh.** *Acta Trop.* 2017; **166**: 249–256.
PubMed Abstract | Publisher Full Text

25. Harapan H, Mudatsir M, Yufika A, *et al.*: **Community acceptance and willingness-to-pay for a hypothetical Zika vaccine: A cross-sectional study in Indonesia.** *Vaccine.* 2019; **37**(11): 1398–1406.
PubMed Abstract | Publisher Full Text

26. O'Brien RM: **A caution regarding rules of thumb for variance inflation factors.** *Qual Quant.* 2007; **41**(5): 673–690.
Publisher Full Text

27. Glejser H: **A New Test for Heteroskedasticity.** *J Amer Statist Assoc.* 1969; **64**(325): 316–323.
Publisher Full Text

28. Yap BW, Sim CH: **Comparisons of various types of normality tests.** *J Stat Comput Simul.* 2011; **81**(12): 2141–2155.
Publisher Full Text

29. Harapan H, Rajamoorthy Y, Anwar S, *et al.*: **Knowledge, attitude, and practice regarding dengue virus infection among inhabitants of Aceh, Indonesia: a cross-sectional study.** *BMC Infect Dis.* 2018; **18**(1): 96.
PubMed Abstract | Publisher Full Text | Free Full Text

30. Feng C, Wang H, Lu N, *et al.*: **Log-transformation and its implications for data analysis.** *Shanghai Arch Psychiatry.* 2014; **26**(2): 105–109.
PubMed Abstract | Publisher Full Text | Free Full Text

31. Yang J: **Interpreting coefficients in regression with log-transformed variables.** *Cornell Statistical Consulting Unit.* 2012.

32. Harapan H: **Willingness-to-pay for a hypothetical Ebola vaccine in Indonesia: A cross-sectional study in Aceh.** *figshare.* Dataset. 2019.
http://www.doi.org/10.6084/m9.figshare.9256037

33. Vo N, Quang Vo T, Nguyen H, *et al.*: **The economic evaluation in vaccines - A systematic review in Vietnam situation.** *Sys Rev Pharm.* 2018; **9**(1): 1–5.
Reference Source

34. Godói IP, Santos AS, Reis EA, *et al.*: **Consumer willingness to pay for dengue vaccine (CYD-TDV, Dengvaxia®) in Brazil; Implications for future pricing considerations.** *Front Pharmacol.* 2017; **8**: 41.
PubMed Abstract | Publisher Full Text | Free Full Text

35. Muniz Júnior RL, Godói IP, Reis EA, *et al.*: **Consumer willingness to pay for a hypothetical Zika vaccine in Brazil and the implications.** *Expert Rev Pharmacoecon Outcomes Res.* 2019; **19**(4): 473–482.
PubMed Abstract | Publisher Full Text

36. Sarmento TTR, Godói IP, Reis EA, *et al.*: **Consumer willingness to pay for a hypothetical chikungunya vaccine in Brazil and the implications.** *Expert Rev Pharmacoecon Outcomes Res.* 2019: 1–8.
PubMed Abstract | Publisher Full Text

37. van der Heide I, Wang J, Droomers M, *et al.*: **The Relationship Between Health, Education, and Health Literacy: Results From the Dutch Adult Literacy and Life Skills Survey.** *J Health Commun.* 2013; **18 Suppl 1**(Suppl 1): 172–184.
PubMed Abstract | Publisher Full Text | Free Full Text

38. Hahn RA, Truman BI: **Education Improves Public Health and Promotes Health Equity.** *Int J Health Serv.* 2015; **45**(4): 657–678.
PubMed Abstract | Publisher Full Text | Free Full Text

39. Rajamoorthy Y, Radam A, Taib NM, *et al.*: **Willingness to pay for hepatitis B vaccination in Selangor, Malaysia: A cross-sectional household survey.** *PLoS One.* 2019; **14**(4): e0215125.
PubMed Abstract | Publisher Full Text | Free Full Text

40. Lucas ME, Jeuland M, Deen J, *et al.*: **Private demand for cholera vaccines in Beira, Mozambique.** *Vaccine.* 2007; **25**(14): 2599–2609.
PubMed Abstract | Publisher Full Text

41. Lee JS, Mogasale V, Lim JK, *et al.*: **A Multi-country Study of the Household Willingness-to-Pay for Dengue Vaccines: Household Surveys in Vietnam, Thailand, and Colombia.** *PLoS Negl Trop Dis.* 2015; **9**(6): e0003810.
PubMed Abstract | Publisher Full Text | Free Full Text

42. Slunge D: **The Willingness to Pay for Vaccination against Tick-Borne Encephalitis and Implications for Public Health Policy: Evidence from Sweden.** *PLoS One.* 2015; **10**(12): e0143875.
PubMed Abstract | Publisher Full Text | Free Full Text

43. Tran BX, Than PTQ, Doan TTN, *et al.*: **Knowledge, attitude, and practice on and willingness to pay for human papillomavirus vaccine: a cross-sectional study in Hanoi, Vietnam.** *Patient Prefer Adherence.* 2018; **12**: 945–954.
PubMed Abstract | Publisher Full Text | Free Full Text

44. Rammohan A, Awofeso N, Fernandez RC: **Paternal education status significantly influences infants' measles vaccination uptake, independent of maternal education status.** *BMC Public Health.* 2012; **12**: 336.
PubMed Abstract | Publisher Full Text | Free Full Text

45. Lu PJ, O'Halloran A, Kennedy ED, *et al.*: **Awareness among adults of vaccine-preventable diseases and recommended vaccinations, United States, 2015.** *Vaccine.* 2017; **35**(23): 3104–3115.
PubMed Abstract | Publisher Full Text | Free Full Text

46. Fajar JK, Harapan H: **Socioeconomic and Attitudinal Variables Associated with Acceptance and Willingness to Pay Towards Dengue Vaccine: A Systematic Review.** *Arch Clin Infect Dis.* 2017; **12**(3): e13914.
Publisher Full Text

47. Udezi WA, Usifoh CO, Ihimekpen OO: **Willingness to pay for three hypothetical malaria vaccines in Nigeria.** *Clin Ther.* 2010; **32**(8): 1533–1544.
PubMed Abstract | Publisher Full Text

48. Katz ML, Rosen HS: **Microeconomics**. Homewood, IL: Irwin; 1991.
Reference Source

49. Vo TQ, Tran QV, Vo NX: **Customers' preferences and willingness to pay for a future dengue vaccination: a study of the empirical evidence in Vietnam.** *Patient Prefer Adherence.* 2018; **12**: 2507–2515.
PubMed Abstract | Publisher Full Text | Free Full Text

50. Benoit CM, MacLeod WB, Hamer DH, *et al.*: **Acceptability of hypothetical dengue vaccines among travelers.** *J Travel Med.* 2013; **20**(6): 346–51.
PubMed Abstract | Publisher Full Text

51. Nguyen LH, Tran BX, Do CD, *et al.*: **Feasibility and willingness to pay for dengue vaccine in the threat of dengue fever outbreaks in Vietnam.** *Patient Prefer Adherence.* 2018; **12**: 1917–1926.
PubMed Abstract | Publisher Full Text | Free Full Text

Open Peer Review

Current Peer Review Status: ✔ ✔ ✔ ✔

Version 3

Reviewer Report 29 June 2023

https://doi.org/10.5256/f1000research.151443.r178680

© **2023 Li J.** This is an open access peer review report distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

✔ **Jing-Xin Li**
Vaccine Clinical Evaluation Department, Jiangsu Provincial Center for Disease Control and Prevention, Nanjing, China

In general, this manuscript is well-written and interesting which can provide evidence for Indonesia's policies on Ebola vaccines. However, there are several minor points that need to clarify.

1. In introduction, the authors can introduce Ebola vaccines approved for use and their prices. Why did you use a hypothetical vaccine?

2. In "study design and setting", "The study was conducted in." The sentence is not complete.

3. How to calculate the minimum sample size?

4. "To recruit the samples, four regencies were selected randomly, and both urban and suburban areas were included." While in abstract the authors said five cities.

5. In "data analysis", please clarify "three assumptions of linear regression".

6. All explanatory variables that had P>0.25 in this model were excluded from final linear regression model 2. Why did the authors choose 0.25 instead of 0.05?

7. About Marital status: does the difference of the sample size between unmarried and married participants influence the conclusion, urbanicity as well? Please provide power value or discuss in limitation briefly.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Vaccine Clinical Evaluation

I confirm that I have read this submission and believe that I have an appropriate level of

expertise to confirm that it is of an acceptable scientific standard.

Version 2

Reviewer Report 15 July 2020

https://doi.org/10.5256/f1000research.27708.r67026

© **2020 Godman B.** This is an open access peer review report distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Brian Godman
Pharmacoepidemiology and Pharmacy Practice, Strathclyde Institute of Pharmacy and Biomedical Science, University of Strathclyde, Glasgow, UK

Thank you for the revisions - now happy with the revised paper.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: My areas of interest including enhancing the quality and efficiency of the use of medicines across countries including LMICs. This includes WTP for medicines including vaccines. I have published to date over 250 papers - many of which are listed in PubMed

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Reviewer Report 13 July 2020

https://doi.org/10.5256/f1000research.27708.r67025

© **2020 Quang Vo T.** This is an open access peer review report distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The author(s) is/are employees of the US Government and therefore domestic copyright protection in USA does not apply to this work. The work may be protected under the copyright laws of other jurisdictions when used in those jurisdictions.

Trung Quang Vo
Department of Economic and Administrative Pharmacy, Faculty of Pharmacy, Pham Ngoc Thach University of Medicine, Ho Chi Minh City, Vietnam

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Health economic, Public health and Pharmacy Administration

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Version 1

Reviewer Report 14 May 2020

https://doi.org/10.5256/f1000research.22124.r62295

© 2020 Godman B. This is an open access peer review report distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

?

Brian Godman
Pharmacoepidemiology and Pharmacy Practice, Strathclyde Institute of Pharmacy and Biomedical Science, University of Strathclyde, Glasgow, UK

Thank you for submitting this interesting paper. However, I am not sure regarding the rationale - although you have highlighted this at the beginning of the paper - but even more unlikely currently with travel bans, etc., as a result of COVID-19. This is because I believe Ebola is currently confined to the Congo (and hopefully now reducing) with ongoing steps in the neighbouring countries to prevent the infection spreading. I am not sure therefore of the hypothetical situation regarding Ebola in Indonesia - so good to discuss this more to put the findings into context.

This is because we have seen similar WTP approaches in Brazil for hypothetical and potential vaccines in key infectious disease areas (different to the situation in Indonesia currently with Ebola), with the need to balance the availability of the vaccine against other protective measures - so good to expand on this in the Introduction. Refs include: (i) Godoi IP et al. Consumer Willingness to Pay for Dengue Vaccine (CYD-TDV, Dengvaxia(R)) in Brazil; Implications for Future Pricing Considerations[1]; Muniz Júnior RL et al. Consumer willingness to pay for a hypothetical Zika vaccine in Brazil and the implications. Expert review of pharmacoeconomics & outcomes research[2] and Sarmento TTR et al. Consumer willingness to pay for a hypothetical chikungunya vaccine in Brazil and the implications. Expert review of pharmacoeconomics & outcomes research[3]. This builds also on studies discussing the economic impact, etc., of infectious diseases such as dengue - Godoi IP et al. Economic and epidemiological impact of dengue illness over 16 years from a public health system perspective in Brazil to inform future health policies including the adoption of a dengue vaccine. Expert review of vaccines[4].

In addition - good to compare the findings and differences in WTP between different groups for the Ebola vaccine in Indonesia and Brazil as both middle income countries. This can include difference in WTP for a vaccine and any potential rationale. This is very different to just concentrating on e.g. US nationals in West Africa - with very different income levels in Brazil - more akin to Indonesia.

References
1. Godói IP, Santos AS, Reis EA, Lemos LL, et al.: Consumer Willingness to Pay for Dengue Vaccine (CYD-TDV, Dengvaxia®) in Brazil; Implications for Future Pricing Considerations.*Front Pharmacol*. 2017; **8**: 41 PubMed Abstract | Publisher Full Text
2. Muniz Júnior RL, Godói IP, Reis EA, Garcia MM, et al.: Consumer willingness to pay for a hypothetical Zika vaccine in Brazil and the implications.*Expert Rev Pharmacoecon Outcomes Res*. 2019; **19** (4): 473-482 PubMed Abstract | Publisher Full Text
3. Sarmento TTR, Godói IP, Reis EA, Godman B, et al.: Consumer willingness to pay for a hypothetical chikungunya vaccine in Brazil and the implications.*Expert Rev Pharmacoecon Outcomes Res*. 2019. 1-8 PubMed Abstract | Publisher Full Text
4. Godói IP, Da Silva LVD, Sarker AR, Megiddo I, et al.: Economic and epidemiological impact of dengue illness over 16 years from a public health system perspective in Brazil to inform future health policies including the adoption of a dengue vaccine.*Expert Rev Vaccines*. **17** (12): 1123-1133 PubMed Abstract | Publisher Full Text

Is the work clearly and accurately presented and does it cite the current literature?
No

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Are all the source data underlying the results available to ensure full reproducibility?
No

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: My areas of interest including enhancing the quality and efficiency of the use of medicines across countries including LMICs. This includes WTP for medicines including vaccines. I have published to date over 250 papers - many of which are listed in PubMed

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Reviewer Report 30 April 2020

https://doi.org/10.5256/f1000research.22124.r62583

© 2020 Quang Vo T. This is an open access peer review report distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Trung Quang Vo
Department of Economic and Administrative Pharmacy, Faculty of Pharmacy, Pham Ngoc Thach University of Medicine, Ho Chi Minh City, Vietnam

Firstly, I give you a big praise for all the efforts you made in the paper. This is a well-designed study with appropriate methods and explicit results so this paper should be accepted. However, there are minor points that should be clarify to improve your paper.
The following are my comments on your manuscript:

1. The manuscript needs the use of a language editing service. Mistakes in grammar were made, in some cases, even the meaning got lost.

2. The Introduction should be strengthened. I did not see the importance of getting vaccine against Ebola in this part.

3. Although the aim of the study was to “investigate community WTP of Ebola”, only patients’ family members were recruited. I think the study subjects did not consistent with its objective. Perhaps, you should consider to change the term “community WTP” into more suitable one.

4. I know you used contingent valuation method to investigate the WTP even though no information provided. I think you should name the method and the technique used for a better understanding.

5. Please give more explanation: how did you set the range of vaccine price?

6. Please give more explanation: why did you collapse participant into three groups of age? Did they have any significance?

7. I do not think you should define all the variables in the section “Explanatory variables”. Readers can find the groups of each variable in the Table. Please be shortened.

8. Please give more explanation: why did you set the cut-off point of 75% to divide attitude and knowledge into “good” and “poor”?

9. Please cite the reference for this information: “all explanatory variables that had $P > 0.25$ in this model were excluded from final linear regression model.

10. You said that you had provided information to the Ebola disease prior to assess WTP. I wonder if this step would affect questions regarding the knowledge about Ebola, therefore affect the WTP. Please consider carefully if you still want to state this step on the paper.

11. One of your finding is that higher education associated with higher WTP but the knowledge did not. I think you should give more discussion on this interesting finding.

12. In discussion section, you should state more about benefits of WTP assessment on the economic evaluation. Please add this statement on your discussion: "...WTP is a commonly used method in economic evaluation pf healthcare interventions. In cost-benefit analysis, the WTP method can value both the indirect and intangible aspects of a disease or condition. In cost-effectiveness or cost-utility analysis, WTP is consider to be a reference value to assess if an intervention is cost-effective or not[1]. It is important to be aware of methodology and interpretation of results because of affecting to decision of policy maker and also affecting in national expanded program in immunization on adding new good vaccines[2]."

13. In limitation, you should state that this study did not explore the effects of vaccine efficacy on WTP values. Please add this statement under limitation: "This study did not explore the WTP difference between two or more scenarios of vaccine with different efficacy. As could be seen in previous study, higher efficacy of vaccines resulted in higher value of WTP[3,4,5]"

References

1. Rascati KL: Essentials of Pharmacoeconomics. *Lippincott Williams and Wilkins*. 2013.
2. Vo N, Quang Vo T, Nguyen H, Van Ha T: The Economic Evaluation in Vaccines - A Systematic Review in Vietnam Situation. *Systematic Reviews in Pharmacy*. 2018; **9** (1): 1-5 Publisher Full Text
3. Vo TQ, Tran QV, Vo NX: Customers' preferences and willingness to pay for a future dengue vaccination: a study of the empirical evidence in Vietnam.*Patient Prefer Adherence*. 2018; **12**: 2507-2515 PubMed Abstract | Publisher Full Text
4. Lee JS, Mogasale V, Lim JK, Carabali M, et al.: A Multi-country Study of the Household Willingness-to-Pay for Dengue Vaccines: Household Surveys in Vietnam, Thailand, and Colombia. *PLoS Negl Trop Dis*. 2015; **9** (6): e0003810 PubMed Abstract | Publisher Full Text
5. Benoit CM, MacLeod WB, Hamer DH, Sanchez-Vegas C, et al.: Acceptability of hypothetical dengue vaccines among travelers.*J Travel Med*. **20** (6): 346-51 PubMed Abstract | Publisher Full Text

Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Yes

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Health economic, Public health and Pharmacy Administration

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Reviewer Report 21 April 2020

https://doi.org/10.5256/f1000research.22124.r61990

© 2020 Li J. This is an open access peer review report distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Jing-Xin Li
Vaccine Clinical Evaluation Department, Jiangsu Provincial Center for Disease Control and Prevention, Nanjing, China

For novel vaccines (e.g., Ebola vaccines), WTP was often considered as a major factor of vaccine policy and innovation[1,2]. Several studies have examined WTP for an Ebola vaccine in Ebola-affected countries (e.g., West Africa[3,4,5] and America[6]. This study in Indonesia helped to supplement and enrich WTP for an Ebola vaccine in non-Ebola- affected countries.

However, there are several significant omissions in study design from this manuscript.

1. Although this study aimed to investigate community WTP for Ebola vaccine in Indonesia, the selection of respondents (patients' family members who visited outpatient departments) caused selection bias.

2. This study was conducted in Aceh province, Indonesia. Aceh comprises predominantly rural areas[7], which might result in the skewed distribution of participants' characteristics, including Education (Senior high school: 47.2%), Occupation (Farmer: 26.7%) and (Suburb: 85.8%). As a result, some conclusions that high educational attainment, working as a private employee, entrepreneur or civil servant (compared to farmers) and residing in a suburb (compared to a city) were associated with higher WTP could not exclude the influence of these skewness distributions.

3. The authors stated that, "Prior to assessing their WTP, participants were provided with an introduction to the Ebola disease including the symptoms and modes of transmission." Although there were no Ebola cases reported in Indonesia, some respondents were still likely to learn about Ebola and Ebola vaccines in a variety of ways, such as the Internet or newspapers. In addition, knowledge of vaccines had proven to be one of the crucial variables affecting WTP[7]. Therefore, this intervention would bias the outcome of WTP, which did not reflect the real WTP of respondents.

References

1. Harapan H, Fajar J, Sasmono R, Kuch U: Dengue vaccine acceptance and willingness to pay. *Human Vaccines & Immunotherapeutics*. 2017; **13** (4): 786-790 Publisher Full Text
2. Seib K, Pollard A, de Wals P, Andrews R, et al.: Policy making for vaccine use as a driver of vaccine innovation and development in the developed world. *Vaccine*. 2017; **35** (10): 1380-1389 Publisher Full Text
3. Ughasoro MD, Esangbedo DO, Tagbo BN, Mejeha IC: Acceptability and Willingness-to-Pay for a Hypothetical Ebola Virus Vaccine in Nigeria.*PLoS Negl Trop Dis*. 2015; **9** (6): e0003838 PubMed Abstract | Publisher Full Text
4. Huo X, Shi G, Li X, Lai X, et al.: Knowledge and attitudes about Ebola vaccine among the general population in Sierra Leone.*Vaccine*. 2016; **34** (15): 1767-72 PubMed Abstract | Publisher Full Text
5. Anikene C, Olowu A, Tagbo B, Ughasoro M, et al.: Health-Care Workers' Perspectives on Ebola Virus Vaccine: A Focus Group and In-Depth Interview Interventional Study. *The American Journal of Tropical Medicine and Hygiene*. 2016; **95** (3): 654-662 Publisher Full Text
6. Painter J, von Fricken M, Viana de O. Mesquita S, DiClemente R: Willingness to pay for an Ebola vaccine during the 2014–2016 ebola outbreak in West Africa: Results from a U.S. National sample. *Human Vaccines & Immunotherapeutics*. 2018; **14** (7): 1665-1671 Publisher Full Text
7. Harapan H, Anwar S, Bustamam A, Radiansyah A, et al.: Willingness to pay for a dengue vaccine and its associated determinants in Indonesia: A community-based, cross-sectional survey in Aceh. *Acta Trop*. 2017; **166**: 249-256 PubMed Abstract | Publisher Full Text

Is the work clearly and accurately presented and does it cite the current literature?
Partly

Is the study design appropriate and is the work technically sound?
Partly

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Partly

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Vaccine Clinical Evaluation

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.

Reviewer Report 28 August 2019

https://doi.org/10.5256/f1000research.22124.r52546

© **2019 Ho R.** This is an open access peer review report distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Roger Chun-Man Ho
Department of Psychological Medicine, Yong Loo Lin School of Medicine, Biomedical Global Institute of Healthcare Research & Technology (BIGHEART), National University of Singapore, Singapore, Singapore

Thank you for inviting me to reviewing the paper "Willingness-to-pay for a hypothetical Ebola vaccine in Indonesia: A cross-sectional study in Ace". This is an important and well written paper with sound methodology. I have the following recommendations to improve this paper.

1. Under discussion, the authors stated that, "However, we found no relationship between knowledge and WTP. It is interesting to discuss why knowledge on Ebola was not significantly associated with WTP in this present study, but higher education was." The authors should state that knowledge on an infectious disease provided health professional was found to be associated with WTP. Please add the following statement:

   .... but higher education was. It could due to the observation that only knowledge on an infectious disease provided health professional was found to be associated with WTP for vaccine.[1]

2. Under limitation, the authors should state that this study did not explore on the effect of insurance on WTP. Please add the following statement under limitation:

   ..... some questions given included in WTP section. This study did not explore the effect of health insurance on WTP as previous study found that having health insurance were associated with WTP for vaccine.[2]

References

1. Tran BX, Than PTQ, Doan TTN, Nguyen HLT, et al.: Knowledge, attitude, and practice on and willingness to pay for human papillomavirus vaccine: a cross-sectional study in Hanoi, Vietnam. *Patient Prefer Adherence*. 2018; **12**: 945-954 PubMed Abstract | Publisher Full Text
2. Nguyen LH, Tran BX, Do CD, Hoang CL, et al.: Feasibility and willingness to pay for dengue vaccine in the threat of dengue fever outbreaks in Vietnam.*Patient Prefer Adherence*. 2018; **12**: 1917-1926 PubMed Abstract | Publisher Full Text

Is the work clearly and accurately presented and does it cite the current literature?
Partly

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Willingness to pay on vaccine

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

The benefits of publishing with F1000Research:

- Your article is published within days, with no editorial bias
- You can publish traditional articles, null/negative results, case reports, data notes and more
- The peer review process is transparent and collaborative
- Your article is indexed in PubMed after passing peer review
- Dedicated customer support at every stage

For pre-submission enquiries, contact research@f1000.com

F1000Research