

# Determinants of childhood vaccine hesitancy among Malaysian youths

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## Abstract

**Context:** There is a rise in vaccine hesitancy among parents and carers, however, little is known regarding vaccine attitudes among youths. **Aims:** This work aimed to investigate the determinants of attitudes towards vaccination among youths in Malaysia. **Settings and Design:** This was a cross-sectional study performed among youths aged 18-24 years in Malaysia. **Methods:** A self-administered questionnaire was used to collect data on socio-demographics, perceived health and illness, and attitude towards vaccination. Univariate logistic regression was performed. **Results:** A total of 1022 respondents were included. The total score of the perceived health and illness was an average of  $12.4 \pm 2.9$  (total score=20), with a higher score demonstrating a more positive health perception. 184 (18.0%) were categorized as having a positive perception of health. The average vaccination attitude score of the study population was  $34.2 \pm 2.4$  (total score=51), with a higher score demonstrating a more positive attitude towards vaccination. Only 16 (1.6%) respondents were categorized as having a positive attitude towards vaccination. Despite the low number of positive attitudes towards vaccination, the majority strongly agreed/agreed that 'Vaccines are necessary to prevent certain disease' ( $n=964$ , 96.3%). Those living in villages were 7.5 times more likely to have a positive attitude towards vaccination compared to those staying in the city (CI: 0.277-3.757,  $p=0.023$ ). **Conclusion:** To that end, there is a vital need to address the generally poor attitude towards vaccination. Strategies should aim to reduce misunderstanding of vaccines, especially among youths staying in cities to prevent vaccine hesitancy in the near future.

**Keywords:** immunization, vaccination, youth

## INTRODUCTION

Childhood immunization is an effective prevention tool for reducing infectious disease burden.<sup>[1]</sup> Within the first twelve months of a child's life, various vaccinations are given as a means to protect children from severe infections.<sup>[2, 3]</sup> In Malaysia, the national immunization program is based on the Ministry of Health's immunization schedule that stipulates children should receive eight basic primary immunization by twelve months of age.<sup>[4]</sup> This includes one dose of Bacillus Calmette Guerin and hepatitis B vaccines within 24 hours of birth; two more doses of hepatitis B vaccine at one and six months of age; three doses of diphtheria, tetanus, and pertussis with *Haemophilus influenzae* type b and inactivated poliovirus at two, three and five months of age; and one dose of mumps, measles, and rubella vaccine at twelve months of age.<sup>[4]</sup> However, unless vaccinations are administered, effectiveness is still limited.

Despite its overwhelming success, childhood immunization is becoming a growing concern as huge challenges still persist in the country where outbreaks of vaccine-preventable diseases such as diphtheria and measles still occur sporadically.<sup>[5, 6]</sup> In the past decade, 10% of children in Malaysia are reported to not have completed their

immunizations.<sup>[3]</sup> Cases of parents refusing vaccines for their children has tripled from 2013 to 2015.<sup>[7]</sup> This is supported by reports of five deaths and 25 confirmed cases of diphtheria, due to the anti-vaccination movement.<sup>[8]</sup> The increasing trend in parenteral vaccine hesitancy is a concern and underlines the particular need for continued monitoring of immunization program performance to detect potential problems and identify appropriate solutions.<sup>[1, 5]</sup>

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Measuring and predicting the public's trust in the vaccination program and willingness to let one's children vaccinate, and determinants thereof, are crucial for the success of the program.<sup>[9]</sup> Socio-demographics such as gender, ethnicity, education, and health status are among reasons for vaccine acceptance.<sup>[9, 10]</sup> In many countries, immunization programs can still be very much improved, especially their coverage in urban and non-urban areas.<sup>[9]</sup> For difficult-to-reach ethnic, culturally isolated groups that oppose vaccination, or that experience a particular socio-demographic barrier, special attention is required.<sup>[9]</sup> Furthermore, socio-demographics such as health status is also a key component of vaccination acceptance.<sup>[10, 11]</sup> The perception of one's health status is a very important indicator in which older adults relate to their social world.<sup>[10]</sup> The need for childhood vaccines may be undermined, especially among healthy individuals that do not realize the severity of diseases the vaccinations prevent.<sup>[10]</sup> As such, determining socio-demographic reasons may aid in improving programs and acceptance towards the need for vaccinations.

Attitude towards vaccination has waned in recent years as more and more parents refuse to immunize their children. Some parents prefer natural immunity or a homeopathic alternative, believing that having the illness is beneficial for the child and strengthens their immune system.<sup>[12]</sup> A reduction in the incidence of a vaccine-preventable disease often leads to the understanding that vaccinations are therefore no more required. The most common reasons for refusing vaccination given by parents are the concerns about vaccine safety and its side effects that might harm their children.<sup>[13]</sup> This could lead to a more negative attitude and less trust in vaccination programs. This heightened level of concern often results in an increase in the number of people refusing vaccines.<sup>[14]</sup> Health care providers are cited by parents, including parents of unvaccinated children, as the most frequent source of information about vaccination.<sup>[14]</sup> However, healthcare professionals report increasing challenges in building a trustful relationship with patients, through which they might otherwise allay concerns. Thus, education and communication with parents are clearly vital in improving attitude towards vaccination as well as improving vaccination compliance.<sup>[15]</sup>

At present, the growing data on vaccination programs are targeted mostly at adults, and parents in particular.<sup>[16]</sup> There is a lack of data looking into the understanding of vaccination among the younger generation. As more and more parents refuse to vaccinate their children, there needs to be more work investigating the effects of negative vaccination information among the young adults, and how this affects the future. Furthermore, the data could also serve as a basis for educational tools to be developed for the younger generation in an attempt to curb negative understanding and attitudes towards vaccination in the future. This is especially vital as studies have shown a positive correlation between education and good health practice among young adults.<sup>[4, 17]</sup> Educational interventions that provide age-appropriate

factual information and peer group discussions regarding illness processes are effective in improving knowledge of illness among the younger generation.<sup>[18]</sup> Therefore, this study aimed to identify the predictors of vaccination attitude among youths in Malaysia

## SUBJECTS AND METHODS

### Study design

A cross-sectional study was conducted involving Malaysian youths. Respondents were conveniently recruited from universities, colleges, and public places around Malaysia. An online questionnaire was also developed and sent via social media such as Facebook, Whatsapp, and Telegram. Respondents were included if they were aged between 18-24 years old.<sup>[19]</sup> Respondents who failed to complete the questionnaire were excluded from the study.

A sample size of 384 was required based on a population of approximately 5 3000 000 youths in Malaysia.<sup>[20, 21]</sup> However, a total of 1000 respondents were targeted to take into account possible exclusions and the need for sub-analysis.

### Ethical Approval

The study was approved by the appropriate institutional and/or national research ethics committee and has been performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. Ethical approval was obtained from the Research Ethics Committee (Human), under the Medical and Innovation Research Secretariat, Universiti Kebangsaan Malaysia Medical Center (JEP-2019-577). All respondents were included with informed consent and the confidentiality of the data was preserved throughout the study.

### Data collection

The self-administered questionnaire was divided into three sections. The first section composed of socio-demographic data such as gender, age, ethnicity, location, presence of chronic illness, use of prescribed medication, use of complementary alternative medicine (CAM), and perceived health and illness. The perceived health and illness of respondents were assessed based on previous work.<sup>[22]</sup> Four items were used to represent health and illness perception: "I am somewhat ill", "I am as healthy as anybody knows", "My health is excellent" and "I have been feeling bad lately". Responses were based on a five-point Likert scale: 1=definitely true, 2=mostly true, 3=not sure, 4=mostly false, 5=definitely false. Each statement was scored based on the Likert scale and the total score was summed to give a maximum of 20. Negative statements were reversed scored. A higher score indicated a much more positive perception of health. The scores were based on the Likert scale and categorized as  $\geq 16$  indicating a positive perception and  $< 16$  as negative health perception.

Vaccine hesitancy attitude was assessed in the second section.<sup>[23-25]</sup> Eleven statements regarding attitudes towards vaccines were assessed based on a five-point Likert scale: 5-strongly agree, 4-agree, 3-neutral, 2-disagree, and 1-strongly disagree. Negative statements were reverse scored. The scores based on the Likert scale for each statement were then summed up, with a higher score indicating a higher positive attitude. The maximum score was 51. Based on the Likert scale, a total score of  $\geq 36$  indicated a positive attitude, and scores  $< 36$  were categorized as a negative attitude towards vaccination.

## Data analyses

Data analyses were performed using IBM Statistical Package for the Social Sciences (SPSS) Version 25.0 (IBM Corp. 2017, Armonk, NY). Descriptive analysis was used to summarize and explain the characteristics of the variables. Socio-demographic data were presented as frequency, percentage, mean and standard deviations. The normality of the data was checked using the Kolmogorov-Smirnov test for normality. Variables with a  $p < 0.25$  from the univariate logistic analysis were subjected to multiple logistic regression. For all analyses, a  $p$ -value of  $< 0.05$  was considered to be statistically significant.

## RESULTS

### Socio-demographic characteristics

The socio-demographic data of respondents are shown in Table 1. A total of 1022 respondents were included in the survey. The average age was  $20.5 \pm 2.1$  (18-24) years. Females accounted for the highest number of respondents ( $n=668$ , 64.9%). More than half of the respondents were Malay ( $n=614$ , 60.5%), followed by Chinese ( $n = 325$ , 31.8%), Indian ( $n=63$ , 6.2%), and others ( $n=16$ , 1.6%). A large majority had a tertiary education level ( $n=820$ , 80.2%) and lived in towns around Malaysia (567, 55.5%). Among 1022 respondents, 137 (13.4%) of them admitted to having a chronic illness and was on long-term medication. A total of 14 respondents were reported as taking CAM; of which 10 took herbs and 4 took supplements.

### Perceived health and illness

Health and illness perceptions are shown in Table 2. The total score of the perceived health and illness was an average of  $12.4 \pm 2.9$  (score range 6-20; total score=20). A higher score showed a more positive health perception. Only 184 (18.0%) were categorized as having a positive perception towards health. Further analysis demonstrated that there was a significant difference between perceived health and illness with socio-demographics; ethnicity, location, and education. Other ethnics ( $13.8 \pm 2.9$ ) had a higher health perception score compared to Malays ( $12.2 \pm 2.9$ ) ( $F=4.2$ ,  $df(3)$ ,  $p=0.005$ ). Respondents in towns ( $12.7 \pm 3.2$ ) had a higher health perception score than those living in cities ( $11.9 \pm 2.7$ ) ( $F=10.7$ ,  $df(2)$ ,  $p<0.001$ ). Respondents with secondary education ( $12.9 \pm 3.1$ ) had a higher health perception score

than those with tertiary education ( $12.3 \pm 2.9$ ) ( $t=2.8$ ,  $df(1020)$ ,  $p=0.006$ ). No other significant findings were demonstrated.

### Attitude towards vaccination

The average vaccination attitude score of the study population was  $34.2 \pm 2.4$  (score range 23-41; total score=41) (Table 3). Only 16 (1.6%) respondents were categorized as having a positive attitude towards vaccination. The majority strongly agreed/agreed that 'Vaccines are necessary to prevent certain disease' ( $n=964$ , 96.3%), 'Improving immunization coverage to all is important' ( $n=955$ , 93.3%) and 'Educating parents about vaccines is an important way to increase vaccine coverage rates' ( $n=970$ , 94.9%). The lowest score was reported for 'Vaccination education is only important for medical students' ( $1.7 \pm 0.6$ ) and 'Media coverage regarding vaccines and chronic disease has increased my concerns about the safety of vaccines' ( $1.9 \pm 0.6$ ).

A univariate and multivariate logistic regression analysis was performed to identify socio-demographic characteristics that predicted a positive attitude towards vaccination (Table 4). Predictors from the univariate analysis with a  $p$ -value  $< 0.25$  were then included in the multivariate analysis. It was demonstrated that those living in villages were 7.5 times more likely to have a positive attitude towards vaccination compared to those staying in the city ( $p=0.023$ ). The multivariate logistic regression model was not statistically significant ( $\chi^2=8.28$ ,  $df(1016)$   $p=0.101$ ), when holding all other variables constant. Those that were staying in rural areas were 7.8 times more likely to have a positive attitude towards vaccination compared to those in urban and suburban areas ( $p<0.025$ ). The model was able to explain 5.4% of the variance in an attitude of the youth towards vaccination.

## DISCUSSION

In the past decade, the number of anti-vaccines has risen not only in Malaysia but also around the world.<sup>[3, 5]</sup> Anti-vaccine movements are leading the country into a dangerous trajectory as it increases the number of vaccine-preventable diseases. The effects of this on youths have rarely been investigated as most work on vaccinations target parents and care-givers. Most often, vaccinations among younger adults are focused on human.<sup>[26, 27]</sup> To the best of our knowledge this is the first study that looks into the attitudes of youths on childhood immunization among Malaysians. The need to understand childhood immunization attitudes among youths is vital as it gives an insight into the possibility of vaccination resistance that may occur in the near future.

The attitude towards immunization is multi-factorial and has been attributed to, among others, education level, use of CAM, and perception of vaccine safety.<sup>[4, 28, 29]</sup> In the current work, it was demonstrated that among youths, those living in the smaller villages were seven times more likely to have a positive attitude towards vaccination compared to those

staying in towns and cities. It is quite possible that those in staying in slightly remote areas were less exposed to the anti-vaccination movements and therefore trusted healthcare professionals. Despite various limitations faced by those living in smaller villages, many parents still completed vaccinations for their children.<sup>[30]</sup> Among reasons for this were support from clinics and ease of immunization processes,<sup>[31]</sup> which is possibly why youths staying in villages had a much more positive attitude towards vaccination.

In general, quite a number of youths agreed that vaccinations may have negative effects, stating that the media had increased their concerns regarding its safety. This is especially true for those who have access to the internet and social media,<sup>[32]</sup> which is possibly lacking among youths in smaller villages, further supporting our findings. For decades, social networks have supported the debate on the link between autism and vaccination.<sup>[33]</sup> Parents have expressed concerns regarding the hidden effects of vaccination on the neurological condition of autism despite their lack of understanding.<sup>[34]</sup> Other effects that are thought to be linked to vaccinations that have been highlighted by parents are concerns of seizures, peanut allergies, and cancers.<sup>[34]</sup> The severity of such adverse effects related to vaccines has caused numerous doubts on the safety of vaccinations, clearly observed in our youths. The need to address concerns regarding vaccinations and the vast information available on the internet is therefore important to ensure optimization of childhood immunization in the future.

In order to curb the negative attitude of youths towards vaccination, it is vital that appropriate education is disseminated. The majority of the youths in the study population agreed that educating parents was one way to improve vaccination coverage rates. Targeting youths is similarly important as evident from this work, to ensure that knowledge of vaccinations is improved. The clear association between knowledge and attitude has been reported, with those receiving information from healthcare professionals showing a more positive attitude towards vaccination.<sup>[35, 36]</sup> Education packages have also been successful in improving knowledge among parents in Malaysia.<sup>[37]</sup>

Findings from this data suggest that further work needs to be done to improve the current attitude of youths with regards to childhood vaccination. Despite this, there were a few limitations to the current work. Firstly, the results were based on data collected through convenient sampling as opposed to random sampling. Secondly, as with all surveys, the data is dependent on the honesty of the respondents when filling out the survey. The population involved in this study was also reported to compose only of those with secondary and tertiary level and does not represent those without formal education. As such, the findings may not necessarily represent the general population and thus, generalization should be done with caution.

## CONCLUSION

Childhood immunization programs are only successful if the acceptance rate is optimized. With the rise in anti-vaccination movements, there is a risk of an increase in the number of children that do not complete their childhood immunizations. The need for a much more inclusive education program that targets youths should be developed to ensure attitudes towards childhood vaccinations are improved. Further work identifying areas to include to improve knowledge and attitude of youths towards childhood vaccinations should be performed to optimize education programs.

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**Table 1: Socio-demographic data of the study population (n=1022)**

Variables	Value
Age, mean $\pm$ SD	20.5 $\pm$ 2.1
Gender, n (%)	
Male	359 (35.1)
Female	668 (64.9)
Ethnicity, n (%)	
Malay	614 (60.5)
Chinese	325 (31.8)
Indian	63 (6.2)
Others	16 (1.6)
Place of living, n (%)	
City	425 (41.6)
Town	567 (55.5)
Villages	30 (2.9)
Education Level, n (%)	
Primary	0 (0.0)
Secondary	202 (19.8)
Tertiary	820 (80.2)
Chronic illness (asthma, diabetes, etc)	
Yes	137 (13.4)
No	885 (86.6)
Take medicine from the doctor	
Yes	137 (13.4)
No	885 (86.6)
Take CAM (supplements, herbal medicine, etc)	
Yes	14 (1.4)
No	1008 (98.6)

**Table 2: Health and illness perception of the study population (n=1022)**

No	Statement, n(%)	1- Definitely true	2- Mostly true	3- Not sure	4- Mostly false	5- Definitely false
1	I am somewhat ill.	31(3.0)	140(13.7)	261(25.5)	400(39.1)	190(18.6)
2	*I am as healthy as anybody I know.	266(26.0)	331(32.4)	270(26.4)	100(9.8)	55(5.4)
3	*My health is excellent.	266(26.0)	331(32.4)	270(26.4)	100(9.8)	55(5.4)
4	I have been feeling bad lately.	92(9.0)	296(28.9)	377(36.9)	168(16.4)	89(8.7)

**Table 3: Attitudes towards vaccination (n=1022)**

No	Statements	n (%)
1	Vaccines are necessary to prevent certain diseases. mean $\pm$ SD	4.5 $\pm$ 0.6
	Strongly agree/Agree	964 (96.3)
	Neutral	30 (2.9)
	Strongly disagree/Disagree	6 (0.6)
2	*Vaccination may have a negative effect. mean $\pm$ SD	2.1 $\pm$ 0.7
	Strongly agree/Agree	459 (44.9)

	Neutral	272 (26.6)
	Strongly disagree/Disagree	291 (28.5)
3	In general, how safe do you think vaccinations are? mean±SD	3.7±0.7
	Very safe/ Safe	624 (61.0)
	Somewhat safe	354 (34.6)
	Not safe at all	44 (4.3)
4	How confident are you in the safety of compulsory childhood vaccination. mean±SD	3.7±0.7
	Very confident/ Confident	635 (62.1)
	Somewhat confident	327 (31.9)
	Not confident at all	60 (5.9)
5	Getting multiple shots in one visit can be a danger to a child's immune system. mean±SD	1.8±0.6
	False	105 (10.3)
	I don't know	638 (62.4)
	True	279 (27.3)
6	*Media coverage regarding vaccines and chronic disease has increased my concerns about the safety of vaccines. mean±SD	1.9±0.6
	Strongly agree/Agree	575 (56.3)
	Neutral	183 (17.9)
	Strongly disagree/Disagree	264 (25.8)
7	Improving immunization coverage to all is important. mean±SD	4.4±0.6
	Strongly agree/Agree	955 (93.3)
	Neutral	62 (6.1)
	Strongly disagree/Disagree	5 (0.5)
8	*Vaccination education is only important for medical students. mean±SD	1.7±0.6
	Strongly agree/Agree	501 (48.9)
	Neutral	64 (6.3)
	Strongly disagree/Disagree	457 (44.8)
9	*I would not get an annual influenza vaccine if I had to pay for it. mean±SD	2.1±0.7
	Strongly agree/Agree	337 (33.0)
	Neutral	299 (29.3)
	Strongly disagree/Disagree	386 (37.8)
10	It is important that all adults are fully immunized. mean±SD	3.8±0.9
	Strongly agree/Agree	732 (71.6)
	Neutral	163 (15.9)
	Strongly disagree/Disagree	127 (12.3)
11	Educating parents about vaccines is an important way to increase vaccine coverage rates. mean±SD	4.4±0.6
	Strongly agree/Agree	970 (94.9)
	Neutral	48 (4.7)
	Strongly disagree/Disagree	4 (0.4)

**Table 4: Factors affecting attitude towards vaccination among youths in Malaysia (n=1022)**

	Beta	OR	Lower 95% CI	Upper 95% CI	p-value
<b>Socio-demographics (Ref)</b>					
Gender (Male)	0.492	1.636	-0.647	1.631	0.397
Age	0.140	1.150	-0.091	0.371	0.235
Ethnic (Non-Malay)	0.683	1.980	-0.455	1.822	0.240

Education (Secondary)	1.321	3.754	-0.710	3.351	0.202
Location (City)					
Town	0.636	1.890	-0.530	1.803	0.285
Villages	2.017	7.518	0.277	3.757	0.023
Chronic illness (Yes)	15.571	5.788e6	-1785.2	1816.3	0.986
Medication (Yes)	15.572	5.795e6	-1778.7	1809.8	0.986
CAM use (Yes)	13.439	686206.7	-2058.9	2085.8	0.990
Health Perception (Negative)	0.425	1.530	-0.718	1.568	0.466
<b>Socio-demographics (Ref)</b>	<b>Multivariate Logistic Regression</b>				
Age	0.098	1.103	-0.192	0.388	0.507
Ethnic (Non-Malay)	0.432	1.540	-0.761	1.625	0.478
Education (Secondary)	1.015	2.759	-1.277	3.307	0.385
Location (City)					
Town	0.907	2.476	-0.277	2.090	0.385
Villages	2.057	7.824	0.261	3.853	0.025