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# Factors Related with Vaccination Acceptance Behaviour among Parents Using PLS-SEM Analysis

Syamilah Musa<sup>1\*</sup>, Nooraini Othman<sup>2</sup>, Puziah Yusuf<sup>3</sup>, Aini Ahmad<sup>4</sup>, Mohd Norazmi Nordin<sup>5</sup>

<sup>1</sup>(Perdana Centre, Faculty of Technology & Informatics Razak, Universiti Teknologi Malaysia)

<sup>2</sup>(Perdana Centre, Faculty of Technology & Informatics Razak, Universiti Teknologi Malaysia)

<sup>3</sup>(School of Nursing KPJ Healthcare University, Nilai, Malaysia)

<sup>4</sup>(School of Nursing KPJ Healthcare University, Nilai, Malaysia)

<sup>5</sup>(Faculty of Education, Universiti Kebangsaan Malaysia)

#### Corresponding Author: <sup>1\*</sup>Syamilah Musa

<sup>1\*</sup>Perdana Centre, Faculty of Technology & Informatics Razak, Universiti Teknologi Malaysia, Malaysia

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### **ABSTRACT:**

vaccination acceptance, knowledge, attitudes, parents, beliefs, PLS-SEM

**KEYWORDS** 

The childhood vaccination program, which is offered to all children under the age of 17 for free, is a crucial preventative measure against infectious diseases in Malaysia. Knowledge, attitude, beliefs, and trust towards healthcare providers (HCPs) have been shown to impact parental acceptance of vaccines. This study aimed to examine the influence of factors on vaccination acceptance behaviour among parents. This cross-sectional study involved the distribution of a self-administered questionnaire among 251 parents in a healthcare education institution were analysed by producing a Partial Least Square-Structural Equation Modelling (PLS-SEM) model using Smart Partial Least Square (Smart-PLS) software. Theory of Planned Behaviour (TPB) was used as a determinant model with knowledge, attitudes, beliefs, and healthcare provider trust (HCPT), and vaccination intention as a mediating variable for the vaccination acceptance behaviour among parents. The finding indicate a vaccination intention has partially mediator effect (VAF=64.3%) in between knowledge and beliefs on vaccination acceptance. Results showed the data fitted well with the model. The final vaccination acceptance model has been developed and validated. Although the findings showed only knowledge and beliefs have a significant relationship with vaccination acceptance. Hence, the ongoing research must be intensified. Therefore, this study can be used to guide decision-making on the execution of the vaccination not only in Malaysia but also in other countries with a history of serious vaccination hesitancy.

#### 1. Introduction

For the goal of ensuring high vaccination rates and a low prevalence of vaccine-preventable illnesses (VPDs), parental support for children vaccinations is crucial. One of the most successful strategies in lowering morbidity and mortality linked to VPDs and their consequences has been recognized as childhood vaccination programs. Many parents continue to doubt the benefits and necessity of vaccination for their children, despite the efforts of national and international organizations to raise awareness of the matter. A recent study found that these fears have grown in the last few years (Huber et al., 2020). There are now two sides to the previous effectiveness of childhood vaccination in preventing the spread of some VPDs. Because many VPDs have low incidence rates, many individuals lack personal experience with VPDs and are ignorant of the risks and difficulties that come with them. It may so intensify parental scepticism over the efficacy of vaccinations. Not only can delaying or refusing vaccination put the community's herd immunity at risk, but it also puts the health of those who shouldn't get vaccinated like young children and patients with compromised immune systems at risk for developing vaccine-predisposed diseases (Lovrić Makarić et al., 2018).

According to the Ministry of Health's vaccination schedule, children in Malaysia who are 12 months of age or younger are recommended to receive eight

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primary immunisations: BCG, Hepatitis Doses 1, 2, and 3, Diphtheria-Tetanus-Pertussis-Haemophilus Influenza Doses 1, 2, and 3, and Measles-Mumps-Rubella (MMR) (Ministry of Health, 2015; Ministry of Health, 2016). The federal government established the National Immunisation Programme (NIP) to vaccinate children under the age of 15 for free against diseases such as human papillomavirus, poliomyelitis, hepatitis B, diphtheria, tetanus, pertussis, measles, mumps, and rubella, as well as haemophilus influenza type b. Every child in public primary health facilities has free access to the vaccinations.

In Malaysia, vaccination rates have remained high at over 90%, but occasionally outbreaks of vaccinepreventable diseases (VPDs) like measles and diphtheria still happen (Abdullah, Nor Afiah & Rosliza, 2016). Low vaccination rates may have resulted in a lack of herd immunity, which could have led to the outbreaks. Parents who are worried about their children's vaccine adverse effects are becoming more prevalent; some of them have gone so far as to refuse to have their children vaccinated (Lim et al., 2017).

Parental understanding of the vaccines' ability to protect children from potentially fatal viral diseases is necessary for a robust parental acceptance of childhood vaccination (MacDougall et al., 2016). In order to prevent their children from VPDs and maintain their health, parental engagement is crucial in enabling their children to receive vaccinations (Gowda et al., 2013). Consequently, HCPs and the media should be among the many resources that parents have access to for vaccine-related information and education (Wallace et al., 2014). In order to ensure a high rate of vaccination acceptance and to foster vaccine confidence, parents must regularly have access to counselling and information about the health benefits of vaccinations.

Parents require more detailed information from HCPs in order to make educated decisions. But ineffective communication between doctors and patients could keep parents from realizing all the benefits of vaccinations (Berry et al., 2018). The impact of the social environment was another possible contributing element, in addition to having a negative experience with vaccinations (Mergler et al., 2014). Numerous studies, including ones on parental vaccine refusal, have been conducted on the elements that influence parental vaccination acceptance. According to Fu et al. (2017), parents who supported vaccinations for their children were more likely to refer to their physician as a source of vaccine information. Furthermore, parents think that medical experts have the biggest influence on their decision to get vaccinated (Glanz et al., 2014). Positive parenting was associated with a higher likelihood of parents reporting that their children experienced minimal or no side effects from the vaccinations (Harmsen et al., 2012). According to Alshammari et al. (2018), parents who stated that they vaccinated their children in order to reduce the risk of infection were also more likely to have favourable opinions about vaccination.

To date, data on significant factors affecting parents' acceptance of and decision to receive childhood vaccination are limited. There is a paucity of research on how parents decide to vaccinate their children. Therefore, the objective of this study was to examine the influence of knowledge, attitude, belief, and HCPT on vaccination acceptance behaviour among parents.

### Theory and Research Hypothesis

The Theory of Planned Behaviour (TPB) is a widely used conceptual framework that can help explain and understand vaccination intention and acceptance behaviour among parents. It provides valuable insights into the factors that influence individuals' decisionmaking processes. Six components proposed in the research model of this study include knowledge, attitude, belief, HCPT, vaccination intention, and vaccination acceptance. Therefore, 9 hypotheses were developed according to the study's framework to determine the relationship of factors related with the vaccination intention and vaccination acceptance among parents:

H1: There is a significant relationship between knowledge and vaccination acceptance behaviour among parents.

H2: There is a significant relationship between attitudes and vaccination acceptance behaviour among parents.

H3: There is a significant relationship between beliefs and vaccination acceptance behaviour among parents.

H4: There is a significant relationship between HCPT and vaccination acceptance behaviour among parents.

H5: There is a significant relationship between knowledge and vaccination intention behaviour among parents.

H6: There is a significant relationship between attitudes and vaccination intention behaviour among parents.

H7: There is a significant relationship between beliefs and vaccination intention behaviour among parents.

H8: There is a significant relationship between HCPT and vaccination intention behaviour among parents.

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H9: There is a significant relationship between vaccination intention and vaccination acceptance behaviour among parents.

### 2. Methodology

### **Study Design and Location**

This quantitative cross-sectional applied an online questionnaire to collect data among parents working in a healthcare education institution in Nilai, Malaysia. The inclusion criteria were consented parents with one or more children (0-17 years old) at home. The survey was conducted among academicians (lecturer and tutor) and administrative staff (management and support staff). The participated organizations are located in Nilai, Penang, and Johor, Private Healthcare University College in Malaysia, known as KPJ Healthcare University College (KPJUC). A total of two hundred thirty-one (251) of employee are working as administration and academic staffs in Nilai, Penang, and Johor. In this research researcher used population sampling which all the population of parents (251) working in KPJUC was selected.

### Ethics

The Ethical approval was obtained from Research Management Centre of KPJ Healthcare University College. The participants provided informed consent and were reminded that all their participation was voluntary. Data confidentiality was assured as only the researchers had access to the data and all the identities of the participants remained anonymous.

### **Materials and Methods**

The self-administered questionnaire included sections to capture the knowledge, attitudes, beliefs, HCPT, vaccination intention, and vaccination acceptance among the participants. The questionnaire included 62 items adapted from (Saleh et al., 2018; Rosso et al., 2019). It was reviewed by three experts and Cronbach's alpha values for the scales were: knowledge = 0.949, attitudes = 0.741, beliefs = 0.869, HCPT = 0.958, and vaccination acceptance = 0.981. The items on knowledge, beliefs, HCPT, vaccination intention, and vaccination acceptance were scored on a five-point Likert scale (1 = strongly disagree, 2 =disagree, 3 = somewhat agree, 4 = agree, and 5 =strongly agree). The online self-administered

questionnaire was distributed via email. It took 15 to 20 minutes to complete.

### Data Analysis

The results of the interpretation of the model evaluation were presented in the form of a table consisting of testing the measurement model in the form of the results of the validity and reliability tests and testing the structural model in the form of r-square and f-square tests. Researcher use SmartPLS software version 3.3.2 for analysing the collected data. In this research, we test and evaluate the model by testing the validity and reliability, which includes two stages: evaluating the measurement model (outer model) and evaluating the structural model (inner model). The model tested were the knowledge, attitudes, beliefs, HCPT on the vaccination acceptance, with the mediator variables vaccination intention.

### 3. Results

### **Demographic Profile of Respondent Analysis**

The demographic profile of respondents is as depicted in Table 1. The respondents' gender distribution is 24.2% male and 75.8% female. The range of age is between 20 to 29 years old is (16.9%), 30 to 39 years old is (37.5%), 40 to 49 years old is (24.2%), 50 to 59 years old is (19%), and 60 years old and above is (2.4%). The ethnic background of the respondents is presented by Malay (88.3%), Chinese (2%), Indian (7.3%), and others (2.4%). In relation to highest academic qualification, the largest group of respondents hold either a Diploma or a Degree (Tertiary level) which constitute 88.7%, followed by the secondary level 9.3%, primary level 2%. The majority of parents are married 87.9%, and single parents is 12.1%. The majority religion of respondents is Islam 89.9%, followed by Hindu 6.5%, Buddha 2%, and Christian 1.6%. The majority of the respondents' income is within RM1501 - RM5000 (68.1%), followed by 22.1% earning RM5001 - RM 10,000, while 9.7% are earning less than RM1500. The majority of respondents has number of children between one to three (60.9%), between four to five (22.6%), respondents who has no children (10.5%), respondents with more than eight children 3.2%, and respondents with six to seven children 2.8%. Meanwhile majority of the respondents is from academic department 72.6% and from administration is 27.4%.

Table 1. Summary of respondent's profile that participated in this research

Respondent's Profile	n	%
Gender		
Male	60	24.2

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	1	
Female	168	75.8
Range of Age		
20 – 29 years	42	16.9
30 – 39 years	93	37.5
40-49 years	60	24.2
50 – 59 years	47	19
60 years and above	6	2.4
Race		
Malay	219	88.3
Chinese	5	2
Indian	18	7.3
Others	6	2.4
Level of Education		•
Primary	5	2
Secondary	23	9.3
Tertiary	220	88.7
Marital Status	*	•
Married	218	87.9
Single parent	30	12.1
Religion		
Islam	223	89.9
Buddha	5	2
Hindu	16	6.5
Christian	4	1.6
Range of Salary		ł
<rm1500< td=""><td>24</td><td>9.7</td></rm1500<>	24	9.7
RM1501 – RM5000	169	68.1
RM5001 – RM 10,000	55	22.2
Number of Children		
No children	26	10.5
One to three	151	60.9
Four to five	56	22.6
Six to seven	7	2.8
More than eight	8	3.2
Department	-	ł
Academic	180	72.6
Administration	68	27.4

#### Latent Constructs and Measurement

There are six main latent constructs has been investigated in this study and this subsection will provide figure of descriptive analysis for each latent construct. Table 2 below presented the summary of descriptive analysis of the latent constructs namely knowledge, attitudes, belief, and healthcare provider trust (HCPT), vaccination intention, and vaccination acceptance behaviour. Five-point Likert scale was used in representing each latent construct. Additionally, this descriptive analysis presented the name of variables, computation of mean, computation of median, and standard deviation score.

Table 2. Summary of descri	ptive analy	ysis of latent	constructs

Latent Constructs	Mean	Median	Standard Deviation
Knowledge	4.42	4.62	0.63
Attitude Beliefs HCPT	2.27	2.25	0.63
	4.41	4.50	0.58
	4.18	4.00	0.68

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Intention	4.48	4.60	0.47
Acceptance	4.50	4.50	0.52

Based on the finding of analysis, the average value for the four factors namely knowledge, attitude, belief, and HCP trust. (Knowledge: M = 4.42, SD = 0.63; Attitude: M = 2.27, SD = 0.63; Belief: M = 4.41, SD = 0.58; HCPT: M = 4.18, SD = 0.68). Henceforth, the mean score range for the four factors and the main latent construct are range at a high level.

The latent construct for vaccination intention, the mean score is (M = 4.48, SD = 0.47). It can be concluded that the mean of vaccination intention is at high level. The next latent construct is vaccination acceptance, the mean score is (M = 4.50, SD = 0.52). Therefore, the mean score for this construct is at a high level. It can conclude the mean range of factors and latent construct are at high level of agreement. The interpretation of mean score is considered high for five mean range above 3.65, moderately between 2.34 to 6.67 and lower

from 1.00 to 2.33, (Hadiyanto, Amirul, Makmur, Hidayat & Failasofah, 2013).

#### Measurement Model Analysis and PLS Analysis

In this reflective measurement model assessment, Table 3 shows the score for Average Variance Extracted (AVE) across six latent construct namely knowledge, attitudes, belief, HCPT, intention, and acceptance. Every latent construct has exceeded the minimum threshold proposed value which is 0.50 (Hair et al., 2017). Therefore, from the result attained the indicator for each latent construct are well explained and correlate with each other. The total indicators assigned at each latent construct can be said reflect well as the observed variables. The measurement model in convergent validity assessment had concluded the results for this study lies in the threshold range that has been proposed by (Hair et al., 2017; Fornell & Larcker, 1981).

Table 3. Final Convergent	Validity	y Test	Result
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No	Latent Construct	AVE Value
1	Knowledge	0.683
2	Attitudes	0.704
3	Beliefs	0.748
4	НСРТ	0.713
5	Intention	0.665
6	Acceptance	0.798

The discriminant validity in this study was tested using the Fornell-Larcker criteria, Table 4 illustrated the result from Fornell and Larcker discriminant validity for first order measurement model. According to Ramayah et al., (2018), the AVE of the latent variable at the diagonal should be higher than the squared correlation from the off-diagonal

LC	(1)	(2)	(3)	(4)	(5)	(6)
(1)	0.893					
(2)	-0.125	0.839				
(3)	0.748	-0.208	0.865			
(4)	0.662	-0.278	0.719	0.844		
(5)	0.792	-0.152	0.707	0.534	0.816	

Table 4. Fornell & Larcker discriminant validity for measurement model

Note: LC = Latent Construct, (1) = Acceptance; (2) = Attitudes; (3) = Belief; (4) = HCPT; (5) = Intention; (6) = Knowledge.

0.595

0.631

Table 5 presented the summary findings of internal consistency in Cronbach's value and Composite

-0.289

0.632

reliability. As illustrated in table below, the results are as the following, knowledge (0.93), attitudes (0.80), belief (0.96), HCP trust (0.94), intention (0.87), and

0.547

0.826

(6)

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acceptance (0.91). Whereas, the Cronbach's alpha value range from 0.80 to 0.96 across the six latent constructs. Based on the results, six of the latent constructs namely knowledge, attitudes, belief, HCPT,

intention, and acceptance have exceeded more than minimum guidelines as suggested by Hair et al., (2010).

No	Latent Construct	Cronbach's Alpha	Composite Reliability
1	Knowledge	0.933	0.935
2	Attitudes	0.804	0.949
3	Belief	0.962	0.965
4	НСРТ	0.949	0.961
5	Intention	0.874	0.889
6	Acceptance	0.915	0.917

### **Mediation Analysis**

The results of data analysis have been presented in Table 6. Based on the results, it is indicated that the coefficient of determination where the exogenous variables (knowledge, attitudes, beliefs, and HCPT) explained on endogenous variables (Vaccination intention = 0.508) and (Vaccination acceptance = 0.734). Specifically, knowledge, attitudes, beliefs, and HCPT explain 50.8% of the variances in vaccination intention construct. Additionally, the result of the

vaccination intention construct explains 73.4% of the variance in vaccination acceptance. In addition, align with the rule of thumb as the acceptance level proposed by Cohen (1988), the coefficient determination of this results falls into a substantial level of acceptance. According to Cohen (1988), the coefficient determination of 0.02 considered weak, 0.13 moderate, and 0.26 is substantial. The R<sup>2</sup> values are above 0.26 value as suggested by Cohen (1988), which indicates a substantial model.

Table 6.	Summarv	coefficient of	of determination.	R <sup>2</sup>
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Latent Construct	Value of R <sup>2</sup>	Value of R <sup>2</sup> adjusted	Remark R <sup>2</sup>
Vaccination intention	0.508	0.500	Substantial
Vaccination acceptance	0.734	0.728	Substantial

Based on the results from Table 7, the vaccination intention (vaccination intention = 0.401) has a substantial effect size. In contrast, the result demonstrates the effect of the exogenous variable on the respective endogenous variable in the model. Precisely, the table reveals the effect of the exogenous variables (knowledge, attitudes, beliefs, and HCPT) in relation to vaccination acceptance were small and substantial in the model. Therefore, this study concluded that the effect size of f squared are lies from small to substantial effect size based on the suggestion by (Cohen, 1988).

Table 7. Summary assessment for the level of effect size  $f^2$ 

F SQUARED VALUES						
Latent	Attitudes	Beliefs	Knowledge	НСРТ	Vaccination	Vaccination
Constructs					acceptance	intention
Attitudes					0.026	0.001
Beliefs					0.048	0.276
HCPT					0.067	0.001
Knowledge					0.041	0.030
Vaccination						
acceptance						
Vaccination					0.401	
intention						

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Table 8 had presented the findings for mediation analysis through bootstrapping procedure in assessing the indirect effect. Based on the result, the indirect effect for the first path is Beliefs -> vaccination intention -> vaccination acceptance was significant (Indirect effect coefficient = 0.277, t = 5.530, p= 0.000). In addition, the second indirect effect path which is Knowledge -> vaccination intention -> vaccination acceptance also has shown a significant value at (indirect effect coefficient = 0.081, t = 2.650, p = 0.008). The third indirect effect path which is attitudes -> vaccination intention -> vaccination acceptance has shown not significant value at (indirect effect coefficient = 0.009, t = 0.430, p = 0.667). Thus, from the mediation analysis, two of the mediation paths are positive significant.

Table 8. Summary	of mediation	analysis	findings
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Hypothesis	Indirect effect	Standard Frror	T- statistic	Confidence Interval Bias		P value	Decision
	eneet	(STDEV)	value	Corrected			
				LL	UP		
				(2.5%)	(95%)		
Beliefs -> Vaccination	0.277	0.050	5.530	0.188	0.383	0.000	Accepted
intention -> Vaccination							
acceptance							
Knowledge ->	0.081	0.031	2.650	0.030	0.152	0.008	Accepted
Vaccination intention ->							
Vaccination acceptance							
Attitudes ->	0.009	0.020	0.430	-0.024	0.057	0.667	Rejected
Vaccination intention ->							
Vaccination acceptance							

### **Hypothesis Testing**

Hypothesis testing was done by using Bootstrapping method on SmartPLS version 3.3.2. Hypothesis testing in this study through the direct effect procedure to test the direct effect. The relationship between variables can be seen through the value of t-statistics, p-value, and original sample on the output Path Coefficient. The hypothesis is accepted if the p-value is less than 0.05 or 5%. The p-value is used to see the significance of the relationship between variables.

### **Development of Final Model**

From table 9 researcher determine that attitudes and HCPT constructs path coefficient was not significant, and the hypothesis were rejected therefore, for the final Model the attitude and HCPT construct was removed from the path model. Upon completing the research model analysis through the PLS-SEM technique, the developed proposed path model was evaluated by following these two steps process, Evaluation of the measurement model and Evaluation of the structural model. The summary of the evaluation structural model result is presented in Table 9.

Hypothesis	Coefficient	β	Standard	Т-	Р	Remarks
			Error	statistics	value	
			(STDEV)	value		
H1	Knowledge_>Vaccination acceptance	0.146	0.066	2.211	0.027	Supported
H2	Attitudes_>Vaccination acceptance	0.088	0.047	1.888	0.060	Rejected
H3	Beliefs_>Vaccination acceptance	0.199	0.086	2.304	0.022	Supported
H4	HCPT_>Vaccination acceptance	0.206	0.058	3.535	0.000	Supported
H5	Knowledge_>Vaccination intention	0.166	0.069	2.386	0.017	Supported
H6	Attitudes_>Vaccination intention	0.022	0.045	0.478	0.633	Rejected
H7	Beliefs_>Vaccination intention	0.573	0.079	7.277	0.000	Supported
H8	HCPT_>Vaccination intention	0.036	0.083	0.436	0.663	Rejected
H9	Vaccination intention_>Vaccination	0.466	0.071	6.595	0.000	Supported
	acceptance					

Table 9. Summary of Structural Model Assessment Direct Effect and with Mediator (Indirect Effects)

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Figure 1 shows the proposed model of vaccination acceptance with four exogenous constructs (knowledge, attitudes, beliefs, and HCPT) mediated by vaccination intention and a relationship with endogenous construct (vaccination acceptance).

Therefore, for the final model, (Figure 2) the attitude and HCPT constructs was removed from the path model. The new model was developed as a vaccination acceptance model for parents that has been validated and fulfilled all the assessment methods.



Figure 1. Proposed Vaccination Acceptance Model



Figure 2. Final Validated Vaccination Acceptance Model with Algorithm Result

## 4. Conclusion and Recommendation

In summary, the findings indicate that knowledge (p=0.008) and beliefs (p=0.000) has significant relationship with vaccination acceptance. Attitude (p=0.667) and HCPT (p=0.663) has no significant relationship with vaccination acceptance. Vaccination intention has partially mediator effect (VAF=64.3%) in between knowledge and beliefs on vaccination acceptance. Results showed the data fitted well with the model. The final vaccination acceptance model has been developed and validated. This contribution is essential because this model facilitates and is helpful to responsible parties, especially the Malaysian government, to consider the predictor factors that determine vaccination acceptance among parents. Secondly, this model is crucial as a benchmark for Ministry of Health to intensify research because parents positively accept the vaccination program as a control resolution for VPDs. Therefore, in order to

improve parental acceptance of children vaccination, effective educational and promotional techniques should be created. To get more information about children's vaccination acceptability, future studies could compare national vaccinations programmes, like Malaysia's NIP, with those of other nations.

## Limitation

There are certain limitations to this research. The use of self-reported data might be vulnerable to selfreporting bias. The nature of the cross-sectional study meant that this study could not offer inferential causation. Despite these limitations, the sample of this study was representative of parents working in this healthcare education institution in Nilai, Malaysia.

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size was minimal, it was representative of the population as determined by specific parameters.

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