

ORIGINAL ARTICLE

Associated factors related to vaccine hesitancy and the intention to vaccinate their children among mothers

Renee Andal¹, Hugh Jasper Tan¹, Daniel Tolentino¹, Louie Fernand D. Legaspi^{1*}

¹De La Salle Medical and Health Sciences Institute, College of Pharmacy, Philippines

Corresponding author: Louie Fernand D. Legaspi **E-mail:** ldlegaspi@dlshsi.edu.ph

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ABSTRACT

In 2019, Region IV-A CALABARZON reported the second-highest number of measles cases in the Philippines with 1,086 cases and 25 deaths. Vaccine hesitancy was identified as one of the primary causes of the increase in measles cases. This study aimed to describe the current level of vaccine hesitancy of mothers living in the province of Cavite, to determine factors associated with this hesitancy and their relationships to a mother's intention to vaccinate their children. Data was collected from 418 respondents using a validated and reliable self-administered survey and processed using IBM SPSS V.24. Spearman's Rho and Pearson's R were used to measure correlations. The mothers' vaccine knowledge ($p < 0.001$) had moderately weak to moderately strong significant relationships to both vaccine hesitancy and intention to vaccinate. Hesitancy and intention had a moderately weak to a moderately strong significant relationship with each other ($p < 0.001$). Educational attainment ($p = 0.03$) and economic ($p < 0.001$) status were less likely to influence vaccine hesitancy and intention to vaccinate as compared to the mothers' knowledge on vaccinations. The study revealed that as vaccine hesitancy decreases, a mother's intention to vaccinate their children increases and that as knowledge on the MMR vaccine increases, mothers were less likely to be hesitant towards the vaccination of their children.

Key words: vaccine, vaccine knowledge, vaccine hesitancy, intention to vaccinate

INTRODUCTION

The World Health Organization has considered vaccine hesitancy as one of the 10 global threats in 2019 and 2020. The loss of public confidence in vaccines and the rise of anti-vaccine movements still poses a great challenge to them.¹⁻² Vaccine-preventable diseases are again increasing in

the Philippines, potentially reversing the positive results of decades of immunization campaigns. Last 2019, the country has reported outbreaks of dengue, diphtheria, measles, and polio. In August of the same year, the Department of Health declared a national dengue epidemic with 371, 717 cases and 1407 deaths.³ Research and development regarding vaccines have

progressed tremendously but have been surrounded by challenges and controversies. Among these is the Dengvaxia controversy in the Philippines.

Dengvaxia was developed by Sanofi, a multinational pharmaceutical company, as the world's first dengue vaccine and was used in a vaccine campaign in the Philippines which involved more than 800,000 school children. However, Dengvaxia became controversial due to an analysis by Sanofi, which suggests that the vaccine may put some people at an increased risk of a more severe form of dengue. This news came after Dengvaxia had already been administered to numerous children that led to a significant increase in the vaccine hesitancy of individuals living in the country. This has greatly affected the overall health of the population due to numerous delays in acceptance or refusal of safe vaccines despite the availability of vaccination services.⁴ Further, this is becoming a growing problem in the present society and has numerous repercussions, which may contribute to low vaccine coverages and may lead to outbreaks.⁵

Region IV-A CALABARZON alone had the second-highest number of measles outbreak cases with 1,086 cases and 25 deaths. Furthermore, the Department of Health has identified the causes of the measles outbreak involved several factors. One of which is the loss of public confidence and trust in vaccines brought about by the Dengvaxia controversy, which pertains to mothers who became hesitant to have their children vaccinated with vaccines that were long proven to be effective.⁶⁻⁷ Outbreaks of vaccine-preventable diseases such as measles and polio have been returning to the Philippines and are undeniable proof that vaccine hesitancy has negatively impacted the country's immunization program.⁸

The study aimed to describe the current level of vaccine hesitancy of

mothers living in the province of Cavite who have a child previously given with the Measles, Mumps and Rubella (MMR) vaccine. This study also aimed at determining factors associated with this hesitancy as well as their relationships to a mother's intention to vaccinate their children. This study will help the population to understand better what vaccines are, help in building the relationship between people and vaccines, and gain back the trust of the community in vaccination.

METHODOLOGY

Study Design

A cross-sectional descriptive study using self-administered questionnaires was conducted to determine (1) the current level of vaccine hesitancy of mothers living in the Province of Cavite; (2) the factors associated with this hesitancy; and (3) the mother's intention to vaccinate their children. Ethical approval was given by the Ethics Committee of the DLSMHSI - College of Pharmacy and has been reviewed by the DLSHSI Independent Ethics Committee (DLSHSI-IEC2019)-59-06-OR).

Study Population and Sampling

The inclusion criteria for this research study were Mothers living in the Province of Cavite with at least one child that has been vaccinated with the Measles-Mumps-Rubella vaccine and another child aged between 0-5 years old that has not been vaccinated with the MMR vaccine. The study excluded mothers who have no children that have been vaccinated with the MMR vaccine and mothers whose children have all been vaccinated with the MMR vaccine.

The study focused on variables relating to MMR vaccine hesitancy and maternal intention to vaccinate, thus

requiring a specific target population with experiences and knowledge regarding the phenomena. However, due to the large total population as well as various other constraints, convenience sampling was implemented by the researchers despite the possible sampling bias. Sampling was based on the gathered statistics from each of the cities of Cavite, with the population of mothers estimated to be at 220,000. Using Slovin's formula with a total population of 220,000 mothers, a confidence level of 95%, and a margin of error of 5%, the total computed sample size for the study was 384 respondents.

Data Collection

Data gathering was conducted over a 3 months period from the 4th week of November 2019 to the 1st week of January 2020. Before the data gathering, letters of permission to conduct the study were sent to the Mayor's offices, in the respective areas. Upon approval from the offices the respondents were selected through convenience sampling in each of the seven cities. The selected mothers were informed of the study's commitment to providing confidentiality of data and anonymity of the respondents. If the mother was available and was willing to participate in the study, they were asked to sign the screening and consent form. The respondents who fulfilled the inclusion criteria were asked to answer questions about their demographic characteristics, knowledge regarding MMR vaccinations, vaccine hesitancy, and the mother's intention to vaccinate their children.

Research Instrument

The instrument used to collect data was divided into four parts. The first part was composed of a 7-item questionnaire related to the participants' demographic profile. The questions had either choices or blank spaces for short answers related to

their educational attainment, employment status, monthly household income, number of children, and children characteristics. The next part was composed of 15-items containing formulated questions by the researchers and modified questions from an adapted validated questionnaire written by Massimi, *et al.*,⁹ to fit the purpose and objective of the study. This part of the questionnaire was used to assess the respondent's vaccine knowledge in terms of general knowledge, safety, and efficacy. The third part was composed of a 10-item questionnaire from a validated questionnaire developed by Larson, *et al.*,¹⁰ which was used to assess the vaccine hesitancy of the respondents. Both instruments from Massimi, *et al.*⁹ and Larson, *et al.*¹⁰ were validated and separately used by other researchers. The last segment was composed of an 8-item questionnaire answerable through a Likert-scale that was developed by the researchers to determine the respondent's intention to vaccinate. The research instrument was submitted to an expert to check content validity. To test the reliability of the instrument developed, it was subjected to pre-testing among 40 mothers who met the same criteria as the respondents. Cronbach's alpha coefficient test was applied to measure the internal reliability of the instrument, resulting in an acceptable ($\alpha = 0.72$) internal consistency.

Data Analysis

The results of the questionnaires were tabulated based on their category. Manual coding of the raw data was done first followed by the encoding using Microsoft Excel and processed through Statistical Package for Social Science (SPSS, version 24). Descriptive statistics such as frequency, percentage, mean, and standard deviations were used to describe the data for each variable. Spearman's Rho and Pearson's R were used to measure

correlations where a p-value of <0.05 was considered statistically significant.

The maternal MMR vaccine hesitancy and intention to vaccinate used a 5-point Likert-scale tool. For descriptive

purposes, the response was classified into low (1.00 to 2.33), moderate (2.34 to 3.67), and high (3.68 to 5.00) according to an interval of means with a 1.33 difference.

RESULTS

Table 1 Demographic characteristics of Mothers (n=418).

Demographic Characteristic	Number	%
Educational Attainment		
No formal education	3	0.7
Elementary Level	36	8.6
Secondary/High school Level	204	48.8
Vocational/Technical	27	6.5
College Level	107	25.6
Bachelor's Degree	41	9.8
Employment Status		
Employed	131	31.3
Self-Employed	175	41.9
Unemployed	112	26.8
Monthly Household Income		
< ₱7030 (Low-income)	55	13.2
₱7031 - ₱14,060 (Middle-income)	139	33.3
> ₱14,060 (High-income)	224	53.6

Table 1 shows that almost half of the respondents (48.8%) were able to reach high school level, 107 (25.6%) were able to attend college, and 41 of them were able to graduate with a bachelor's degree (9.8%).

Only 3 of the respondents had no formal education while 175 (41.9%) of them were self-employed. In addition, a great majority (53.6%) of the mothers belonged to high-income families.

Table 2 Summary of Answers of Maternal MMR Vaccine Knowledge

Statements	Number of correct answers	%
<i>General Knowledge</i>		
MMR vaccine protects against measles, mumps, and rubella only.	342	81.8
Vaccine-preventable diseases can cause death.	259	62.0
Even healthy children need vaccinations.	392	93.8
MMR vaccine helps in preventing chickenpox.	78	18.7
Measles, mumps, and rubella can be cured by antibiotics.	121	29.0
<i>Safety Knowledge</i>		
The serious side effects of vaccines are very rare.	279	66.8
The MMR vaccine is safe.	351	84.0
The MMR vaccine may be given together with other vaccines.	131	31.3
The site of vaccine administration can develop an allergic reaction.	260	62.2
The MMR vaccine contains harmful substances.	244	58.4
<i>Efficacy Knowledge</i>		
Two doses of MMR vaccine increase protection against measles, mumps, and rubella.	281	67.2
Vaccination decreases the rates of mortality and disabilities.	383	91.6
The efficacy of vaccinations against infectious diseases has been scientifically proven.	372	89.0
MMR vaccine gives complete immunity against measles, mumps, and rubella.	18	4.3
Children who have been vaccinated with MMR and are still infected are more likely to have a milder illness, and are also less likely to spread the disease to other people?	363	86.8

A summarized report of the respondent's answers to the questions regarding MMR vaccine knowledge in the three categories (General Knowledge, Safety Knowledge, Efficacy Knowledge) is shown in Table 2. Out of 5 questions for

each category, the majority of the mothers had a mean score of 2.85 (SD=0.96) for General Knowledge, 3.06 (SD=1.20) for Safety Knowledge, 3.39 (SD=0.90) for Efficacy Knowledge, and an Overall Knowledge Score of 9.25 (SD=2.22).

Table 3 Summary of Level of Maternal MMR Vaccine Knowledge

Levels	Number (N=418)	%
Low (0-5)	22	5.3
Moderate (6-10)	274	65.6
High (11-15)	122	29.2

Table 3 shows that very few (5.3%) of the mothers had low knowledge regarding the MMR vaccine, where out of 15 questions only 22 of them scored between 0 to 5 points. A great majority

(65.6%) scored between 6 to 10 and had a moderate level regarding the MMR vaccine, while 122 (29.2%) mothers scored between 11 to 15 points and had a high knowledge of the MMR vaccine.

Table 4 Level of Maternal MMR Vaccine Hesitancy

Statements	$\bar{x}$ (N=418)	SD	Interpretation
Children get too many vaccines.	2.92	1.50	Moderate
Newer vaccines carry more risks than older vaccines.	2.46	1.26	Moderate
The serious side effects of the MMR vaccine is concerning.	2.30	1.23	Low
It is better for children to develop immunity by getting sick rather than getting vaccinated.	2.14	1.22	Low
Childhood vaccinations are not important for the health of others in my community.	1.87	1.02	Low
Vaccines are not needed anymore for uncommon diseases like cholera, human papillomavirus, meningococcal disease, etc.	1.87	0.96	Low
Vaccines are more harmful than beneficial.	1.73	0.87	Low
The MMR vaccine is not important for my child's health.	1.72	0.96	Low
The MMR vaccine is not effective.	1.68	0.84	Low

Statements	$\bar{x}$ (N=418)	SD	Interpretation
Vaccines are not a good way to protect my child/children from disease.	1.62	0.82	Low
Total Mean for Maternal MMR Vaccine Hesitancy	2.03	0.74	

Legend: 3.68 to 5.00 for High Vaccine Hesitancy; 2.34 to 3.67 for Moderate Vaccine Hesitancy; 1.00 to 2.33 for Low Vaccine Hesitancy

Table 4 shows the level of maternal vaccine hesitancy. Most of the mothers moderately agreed that children get too many vaccines ($\bar{x}$ =2.92) and that newer vaccines carry more risks than older

vaccines ($\bar{x}$ =2.46). While the remaining 8 statements, the mothers scored low. Overall, the total mean score for maternal MMR vaccine hesitancy was low ($\bar{x}$ =2.03).

Table 5 Level of Maternal Intention to Vaccinate

Situations	$\bar{x}$ (N=418)	SD	Interpretation
If you have another child that is unvaccinated, how likely is it that you would give that child the;			
Polio Vaccine	4.34	0.77	High
Hepatitis B vaccine (HBV)	4.33	0.77	High
Measles-Mumps-Rubella Vaccine (MMR)	4.33	0.78	High
Bacille Calmette-Guerin vaccine (BCG)	4.32	0.81	High
Tetanus-Diphtheria Vaccine (Td)	4.27	0.81	High
DTwP-Hib- Hep B Vaccine	4.24	0.84	High
Human Papillomavirus Vaccine (HPV)	4.24	0.84	High
Pneumococcal Conjugate Vaccine (PCV)	4.22	0.83	High
Total Mean for Maternal Intention to Vaccinate	4.28	0.76	High

Legend: 3.68 to 5.00 for High Intention to Vaccinate; 2.34 to 3.67 for Moderate Intention to Vaccinate; 1.00 to 2.33 for Low Intention to Vaccinate

Table 5 shows that a large portion of the mothers obtained high mean scores for all 8 situations. In addition, the average mean score for the mother's intention to vaccinate was also high ($\bar{x}$ =4.28).

Correlation Between Demographic Characteristics and Maternal MMR

Vaccine Hesitancy and Intention to Vaccinate

Utilizing Pearson's R and Spearman Rho's Correlation, the findings of the study showed that demographic characteristics of educational attainment ($p < .001$) and economic status ($p < .001$) both had significant negative relationships (see

Table 6) with maternal MMR vaccine hesitancy. Additionally, educational attainment ($p=0.003$) and economic status ($p < .001$) both had positive significant relationships (see Table 6) with maternal intention to vaccinate.

Correlation Between MMR Knowledge Scores and Maternal MMR Vaccine Hesitancy and Intention to Vaccinate

MMR vaccine knowledge scores ($p < .001$) in all domains (General Knowledge, Safety Knowledge, Efficacy Knowledge, Overall Knowledge) all had negative significant relationships (see Table 6) with

maternal MMR vaccine hesitancy. With regard to maternal intention to vaccinate, all domains of MMR vaccine knowledge scores ($p < .001$) had positive significant relationships (see Table 6)

Correlation Between Maternal MMR Vaccine Hesitancy and Intention to Vaccinate

The analysis found (see Table 6) that a negative moderately weak to moderately strong significant correlation ($p < .001$) exists between the level of MMR vaccine hesitancy and the level of intention to vaccinate.

Table 6 Correlation between associated factors and MMR vaccine hesitancy and intention to vaccinate using Spearman's Correlation

Dimension	MMR Vaccine Hesitancy		Intention to Vaccinate	
	Correlation Coefficient	Sig. (2-tailed)	Correlation Coefficient	Sig. (2-tailed)
Educational Attainment	-0.22	<.001	0.15	<.001
Economic Status	-0.22	<.001	0.23	<.001
Overall Knowledge	-0.43	<.001	0.37	<.001
General Knowledge	-0.25	<.001	0.16	<.001
Safety Knowledge	-0.35	<.001	0.33	<.001
Efficacy Knowledge	-0.38	<.001	0.31	<.001
Intention to Vaccinate	-0.57	<.001		

DISCUSSION

The Influence of Knowledge Scores on Vaccine Hesitancy

This study revealed that as the mothers' general knowledge decreases, MMR vaccine hesitancy increases, which is similar to previous studies that pointed out lack of knowledge as a contributing factor to vaccine hesitancy. Knowing and

understanding the use of vaccines most likely influences a person's attitude and beliefs towards vaccination. From the results, it can also be assumed that mothers showed familiarity with the MMR vaccine as well as the severity of diseases like measles, mumps, and rubella, which most likely lessened their concerns about the vaccine. However, conflicting answers were observed with regard to the scope of diseases covered by MMR vaccines. This

may be due to misconceptions about diseases since numerous individuals falsely associate measles and chickenpox due to characteristic rashes.

The findings revealed that a significant correlation exists between safety knowledge and vaccine hesitancy, where it can be inferred that as safety knowledge decreases, vaccine hesitancy increases. These results are supported by a study written by Giambi *et al.*¹¹, wherein they found that safety concerns were the main reported reason for refusing vaccination. Additionally, a study by Matta *et al.*¹² also found that better parental vaccine knowledge was significantly associated with a better attitude towards vaccines. In the present study, the domain of safety knowledge included a question regarding the safety of the MMR vaccine, and results showed that 83.97% of the mothers found MMR vaccine safe. In this study, it can be assumed that mothers have enough knowledge when it comes to the safety of measles, mumps, and rubella vaccine. In addition, mothers were aware of the rareness of the side effects, allergic reactions that might happen on the vaccine site, and the absence of harmful substances from the vaccines.

Concerns regarding the efficacy of vaccination have also long been a major concern when it comes to vaccines. Based on the results of the study, most of the mothers had more correct answers regarding the efficacy of the MMR vaccine as compared to safety and general knowledge. Moreover, the findings indicate that maternal knowledge regarding the efficacy of the MMR vaccine has a negative significant relationship with their MMR vaccine hesitancy. The results are similar to a study conducted by Rosso, *et al.*¹³ where they found that most of the respondents believe that the efficacy of vaccinations has been scientifically proven. They also found that the respondents believe that smallpox

disappeared due to mass vaccinations and that a high knowledge of vaccine safety and efficacy was the strongest determinant of a positive attitude towards vaccines. The present study also found that despite the mothers having a moderate level of knowledge regarding the efficacy of vaccines, they still had a misconception that the MMR vaccine gives complete immunity towards the diseases when in reality the vaccine is not 100% effective. This may be due to a lower incidence of measles, mumps, and rubella worldwide since the vaccine has become available. This misconception, together with the parents who knew that vaccines were scientifically proven, has a significant contribution to parents agreeing that vaccines are effective and that they are an efficient way to protect their children from diseases.

The Influence of Knowledge Scores on Intention to Vaccinate

Similar to many studies that reported a positive correlation between parental knowledge, practice, and vaccination rates of children, this study revealed that as general knowledge increases, the intention to vaccinate also increases. Additionally, according to the theory of planned behavior (TPB), one of the crucial sources of attitude is cognitive information about the target topic¹⁴. It can be assumed that better knowledge about vaccinations would predict positive attitudes. Therefore, adequate education about immunization may change intentions in a positive direction.

The safety and efficacy of vaccines has always been one of the main concerns and issues related to timely vaccinations. This study showed that an increase in knowledge regarding the safety of the MMR vaccine also increases maternal intention to vaccinate. Other studies found similar results, an example of which is a study by Rosso, *et al.*¹³, wherein they found

that a higher level of knowledge regarding the safety and efficacy of vaccines was the strongest determinant of positive attitudes. These positive attitudes were translated into higher intentions. It can be inferred that knowledge does have a significant effect on vaccination intentions. With that it affects what a mother thinks about vaccines and her feelings towards vaccinations. Knowing vaccines are safe and effective may urge parents to have their child vaccinated since they know that it works and would benefit their child. When a person knows a situation will be advantageous for them, they tend to act and respond positively.

The Influence of the Level of MMR Vaccine Hesitancy on Intention to Vaccinate

The findings indicate that as maternal MMR vaccine hesitancy decreases a mother's intention to vaccinate her unvaccinated child increases. The findings have similarities with the results of a study by Paek, et al. ¹⁵, wherein they stated that the less the caregivers perceived risks and knew about vaccination, the more likely they intended to get vaccinations for their child. The presence of a significant relationship between vaccine hesitancy and vaccine intention is further supported by a study conducted by Agarwal, et al. ¹⁶ regarding vaccine hesitancy among mothers and care providers during the Measles and Rubella vaccine campaign. They found that mothers and caregivers who had a history of previous incomplete immunization were more likely to be vaccine-hesitant than those with complete vaccinations. From this, it can be assumed that negative or positive thoughts and beliefs can significantly affect decision-making. Many respondents in our study strongly disagreed that vaccines were dangerous, ineffective, and unimportant to their children. This, would in turn, mean that they are willing and open to

vaccinations, which translates to increased intentions.

The Influence of Demographic Characteristics on Vaccine Hesitancy

This study found that as the educational level of mothers increases, their vaccine hesitancy decreases. Numerous studies conducted in the past measuring the relationship between the two had varied results. A study by Yufika, et al. ¹⁷ found no significant relationship between educational attainment and hesitancy towards the Zika vaccine. In contrast, a study conducted by Agarwal, et al. ¹⁶, found that the educational attainment of mothers was a predictor of vaccine hesitancy and that the educational status of the mothers was important in their understanding of the importance and effectiveness of vaccines. Similar results were found in a study by Matta et al. ¹², wherein they reported that parents having a higher level of education had better attitudes towards vaccines. The findings of the present study indicate that educational status is a determinant of vaccine hesitancy and that higher education may decrease concerns surrounding vaccines since those with higher education are more likely to have better access to information and also have learned more about health as a whole.

This study showed that as a mother's household monthly income increases, her vaccine hesitancy decreases. These results support the study of Kim & Lee ¹⁸, where they found that poor households had lower age-appropriate immunization rates as compared to average or above households. A study by Bertoncello et al. ¹⁹ also found that rising economic hardships were significantly associated with vaccine hesitancy since some families may have financial struggles leading to difficulties in accessing vaccines. Similar results were found by Yawn, et al. ²⁰ where under-immunized children were more likely to

have mothers with a low household income. Income affects the health-seeking behavior of individuals and their access to healthcare. A higher-income may aid mothers in increasing more ways in which they can improve their child's health since they have a bigger budget to work with. This includes consultation with physicians and health professionals who can eradicate any misconceptions or fears they may have towards vaccinations.

The Influence of Demographic Characteristics on Intention to Vaccinate

In addition to educational attainment correlated to vaccine hesitancy, the results of this study showed that it has a positive significant relationship with maternal intention to vaccinate. A study conducted by Rosso, et al.¹³ found similar results in a group of pregnant women in Rome. Among the different demographic variables in their study, higher educational attainment was found to be a significant determinant in the intention to vaccinate. Additionally, Pan & Shu²¹ found that parents who were able to attend college had a significantly higher intention to vaccinate their child with the HPV vaccine as compared to parents who were high school graduates only. In the present study, the findings indicate that as maternal educational attainment increases, so does their intention to have their child vaccinated. This may be due to parents with higher educational attainment who have more quality information from their studies as well as more opportunities to critically appraise information. Mothers with lower educational attainment may also be exposed to more media, or "word-of-mouth" information which may increase in concerns and hesitations towards getting their child vaccinated.

Healthcare inequality is present in the present society, and research has found that those with higher incomes generally have better health²². This study showed that as

household monthly income increases, so do a mother's intention to vaccinate. Numerous studies have investigated the correlation between the two and have come up with mixed results. In a systematic review by Brown, et al.²³ lower vaccine uptakes were correlated to lower parental income in 5 out of 7 studies they reviewed. On the other hand, Cha & Kim²⁴ found no significant difference between income levels. Based on the results of the present study, household monthly income can be considered a possible determinant of vaccination intention of mothers in the Province of Cavite. Having a higher income means more resources that could be spent on improving quality of life, which includes better health and health care be it through improving nutrition, getting more check-ups, and vaccinating against more diseases. However, since the correlation is low, other factors may still come into play with maternal intentions.

CONCLUSION, LIMITATIONS, AND RECOMMENDATIONS

The findings of the study confirmed the researchers' hypothesis that a mother's demographic characteristics and knowledge on vaccines have a significant relationship with her MMR vaccine hesitancy and intention to vaccinate. Educational attainment, economic status, and vaccine knowledge in the three categories (General, Safety, and Efficacy) had significant negative relationships with vaccine hesitancy and significant positive relationships with the intention to vaccinate. Lastly, the researchers found vaccine hesitancy to have a negative significant relationship with vaccination intentions.

Due to various constraints and the large population size, convenience non-probability sampling was employed, and

only respondents from cities were targeted. For future studies, the inclusion of representatives from municipalities in Cavite and also the use of probability sampling is recommended to yield more representative data.

The study was limited to only a select few variables such as educational attainment, economic status, the 3 domains of MMR vaccine knowledge, vaccine hesitancy, and intention to vaccinate. The findings suggest that there are still other factors that can influence both MMR vaccine hesitancy and intention to vaccinate. For example, the strongest relationships observed for both vaccine hesitancy and intention were with knowledge, however, the study did not examine the source of knowledge of the mothers. Future studies may opt to determine the sources of information that can influence the mother's knowledge and how that can influence confidence and willingness to vaccinate.

The study was also specifically focused on the MMR vaccine. Future studies may be designed to test the same variables on other vaccines whose coverage rates have dropped (e.g., polio vaccine, tetanus vaccine). This would aid in differentiating factors affecting the uptake of different vaccines.

A combination of a qualitative and quantitative research design is also possible for future studies. The present study focused only on certain demographics and the knowledge of mothers on the vaccine. Also, a qualitative assessment of the reasons behind vaccine hesitancy may give better explanations and lead to a deeper understanding of the phenomenon.

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