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Mother's Media Use and Children's Vaccination Status in Indonesia: A Community-Based Cross-Sectional Study

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Abstract

Exposing appropriate information to mothers is a key factor for children's immunization status. This study aims to assess the influence of mothers' media use on their children's vaccination status in Indonesia, using the 2017 Indonesia Demographic Health Survey data. A multilevel multinomial logistic regression model was employed. Mothers who used media irregularly and regularly had higher odds of having partially vaccinated children (vs unvaccinated) than mothers who never used media with adjusted odds ratio (aOR): 1.74; 95% Confidence interval (95% CI): 1.06-2.85 and aOR: 1.48; 95% CI: 1.02-2.16, respectively. Furthermore, they had higher odds of having a fully vaccinated child (vs unvaccinated) (aOR: 1.86; 95% CI: 1.12-3.08 for irregular media use and aOR: 2.41; 95% CI: 1.64-3.53 for regular media use vs. no media use). Our findings suggest that mothers' media use could positively affect their children's vaccination status by increasing mothers' knowledge about children's vaccination.

Keywords

children, immunization program, community-based, vaccination, Indonesia

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Introduction

Vaccines are an effective way to prevent deadly vaccine-preventable diseases and, hence, have the potential to save 2 to 3 million lives per year.[1] Yet, 19.4 million infants worldwide were not fully vaccinated in 2019, 13.5 millions of whom did not receive any vaccine.[1] Currently, Indonesia's immunization program for children aged 0 to 11 months is providing free and is commonly known as primary immunization. The program covers the birth dose of hepatitis B (HepB 0) vaccines and Oral polio vaccine/OPV birth dose (OPV 0) vaccines, followed by Bacillus Calmette–Guérin (BCG) vaccines, 3 doses vaccines of Diphtheria-Tetanus-Pertussis (DTP), 3 additional doses vaccines of HepB and OPV, 3 doses vaccines of *Haemophilus influenzae type B* and measles vaccination.[2,3] However, the Indonesian National Health Surveys (INHS) of 2010, 2013, and 2018 show that the primary immunization coverage rates across the country are consistently low,[4-6] with only 57.9% of children being fully vaccinated, 32.9% being partially vaccinated and 9.3% was not vaccinated in 2018.[4] Various factors influence this disparity; however, the most common reasons given by parents for unvaccinated children in Indonesia consisted of 3 themes (belief barriers eg, religious issue that vaccine ingredients contain pork (halal issue), safety concerns and issues of trust, and misinformation (such as the threat of fever following immunization).[7] Mothers' exposure to reliable immunization information from adequate and trustworthy sources is considered a key factor in the success of immunization

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programs for children.[7,8] This approach aims to improve mothers' knowledge of immunization benefits and vaccine safety. Media can be one way to deliver this information. However, there are mixed results in the literatures on the relationship between mothers' media use and children vaccination status.[9-14] Some emphasizes the benefits of mothers' media use to children's immunization status.[10,15] On the other hand, some research report that there is no association between mothers' media use and their children's vaccination status.[9,13,14] However, most of these studies analyzed vaccination status as binary outcomes: complete and incomplete vaccination.[8-10,12,13] The INHS reports that the proportion of Indonesian children who received partial vaccination was still high (32.9%) within the last decade[4.6] This finding indicates that there is a group of mothers who have access to vaccination and are willing to vaccinate their children but could not complete the vaccination schedule. We argue that this group might differ from mothers whose children are unvaccinated, regarding primary vaccination and media use. Therefore, we aim to assess the association between mothers' media use and their children's vaccination status by comparing unvaccinated with partially and fully vaccinated children through data analysis provided by the Demographic Health Survey (DHS) Program.

Methods

Study Design, Data Sources, and Study Area

This study analyzed data from the 2017 Indonesian Demographic Health Survey (2017 IDHS).[16] The 2017 IDHS is part of the international DHS program designed to collect fertility, family planning, maternal and child health data.[16] The 2017 IDHS dataset was obtained with permission from the DHS. The first author (PBM) registered through the DHS website, followed by submitting a proposal and a summary of the study protocol. Since the DHS data have no individual identifiers, the confidentiality of the participants was ensured.

Study Participants

To be included in this study, the following inclusion criteria were to be met: (i) woman of childbearing age of 15 to 49 years, (ii) having a child aged above 1 year (as only for these, the completeness of primary immunization could be judged), and (iii) having complete data on personal media use, information about the immunization status of the child and socio-demographic variables. Mothers who stated that they do not know their child's immunization status were excluded from this study.

Variables

The outcome of this study was the primary vaccination status for children aged 0 to 11 months, which reported based on mother's recall. This variable was categorized into 3 groups: fully vaccinated (the child received all primary vaccines), partially vaccinated (the child received some vaccines) and not vaccinated (the child did not receive any vaccines).

The media use variable was assessed based on the year before the 2017 IDHS and compiled from 2 variables: frequency and type of media use. A score of 1 was given if a mother was exposed to any media of the following: newspaper/magazine, radio, television, and internet less than once a week and a score of 2 if the mother was exposed almost every day. Mothers who claimed that they have never used a given medium were given a zero score. As a result, each subject had an overall media use score ranging from 0 to 8, which was grouped into 3 categories: no media use (never used in the last 12 months) (score 0), irregular media use (score 1) and regular media use (score $\geq$2) as for scores of 2 or more there were little differences (Figure 1).

Potential confounders were identified based on previous studies[8,9,12,13,17-19] and controlled for in the multivariable analysis. We considered the following variables: place of residence (urban versus [vs] rural), parents' age (15 to 19, 20 to 24, 25 to 29, 30 to 34, and 35 to 39 years old vs 40 and more years old), parents' education (primary, secondary and higher education vs. no education), marital status (living with a partner vs. married), child's age (age of 2 and 3 vs 1) and sex (girl vs boy), number of children in the household ($\leq$2 children vs $>$2), health insurance coverage (yes vs no), history of antenatal and postnatal care (yes vs no) and economic status through wealth terciles (middle and high economic status vs low economic status).

Statistical Analysis

Descriptive results are presented as median and interquartile ranges (IQR) for continuous variables and as proportions for categorical variables. The association between media use and vaccination status was analyzed using a multilevel multinomial logistic regression. Random effects were applied to account for data nested within provinces. The analysis was conducted with STATA 16.

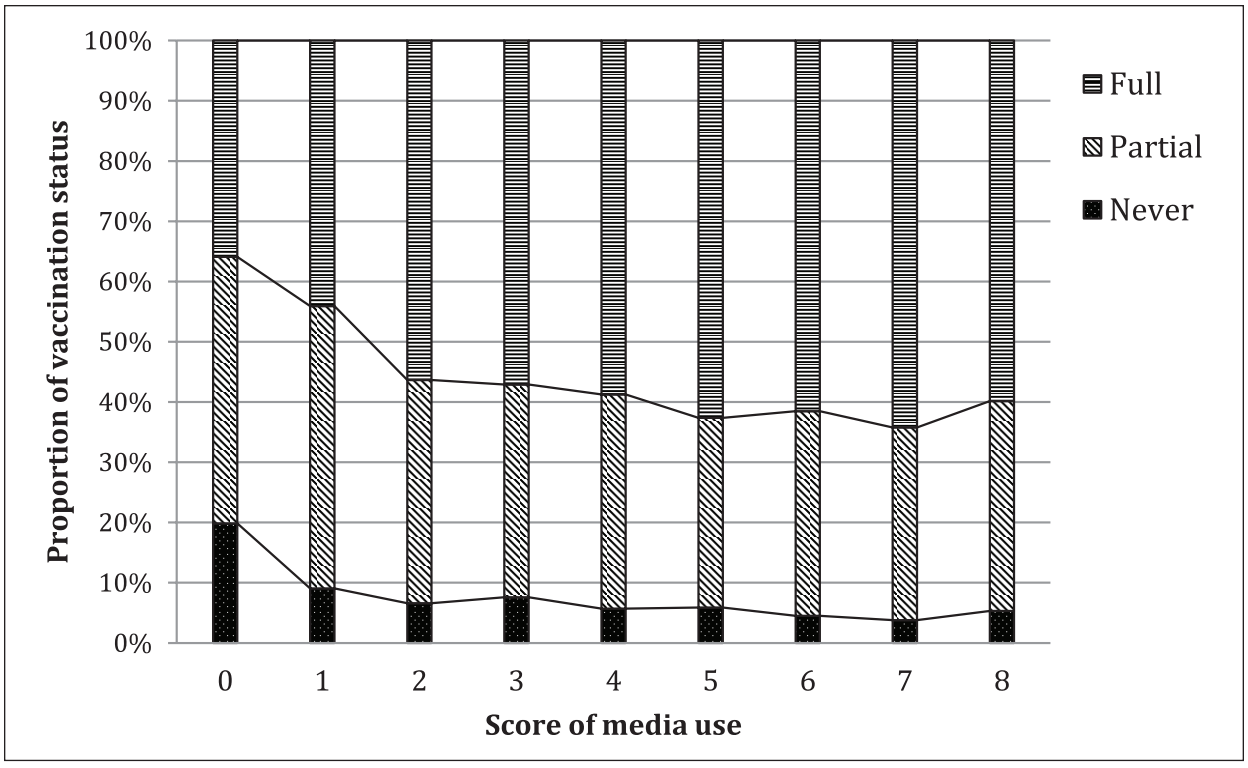

Figure 1. Proportion of children with given vaccination status for each value of the media use score.

Results

Socio-Demographic Characteristics

In total, 7867 women, who met the inclusion criteria, were included in this study. Seven participants who did not know their children's immunization status were excluded (Figure 2). Mothers' and fathers' median age was 30 (IQR 26-35) and 34 (IQR 29-39) years, respectively. A large proportion of mothers had low economic status (46.9%) and half of mothers were residing in a rural area (50.4%) (Table 1).

Mother's Media Use and Children's Immunization Status

Approximately 91% (n = 7151) of mothers used media regularly, 5.0% (n = 397) used media irregularly, while 4.0% (n = 312) did not use media in the last year before survey participation (Table 1). In the sample, 57.0% (n = 4506) of children were fully vaccinated, while 36.0% (n = 2829) were partially vaccinated and 7.0% (n = 525) were not vaccinated (Table 1).

Mothers' media use was associated with their children's vaccination status. Children whose mothers used media irregularly and regularly compared to those who never used media showed 1.74 (95% CI: 1.06-285) and 1.48 (95% CI: 1.02-2.16) times higher odds of being partially vaccinated vs. not vaccinated. Similarly, children of mothers who used media irregularly (aOR: 1.86; 95% CI: 1.12-3.08) and regularly (aOR: 2.41; 95% CI: 1.64-3.53) compared to those who did not use media had higher odds of being fully vaccinated vs. not vaccinated (Table 2).

Variables Associated With Children's Immunization Status

In addition to media use, several variables were associated with children's immunization status: parents' age and education, economic status, child's age and sex, number of children, and health insurance coverage (Table 2).

Compared to children with older fathers (aged ≥ 40 years), children whose fathers were aged 25 to 29 years had higher odds of being partially vaccinated compared to not vaccinated (aOR: 1.57; 95% CI: 1.04-2.38). Mothers with secondary education showed 2 (aOR: 2.00; 95% CI: 1.07-3.74) times higher odds of having partially vaccinated children compared to unvaccinated children than to those without education.

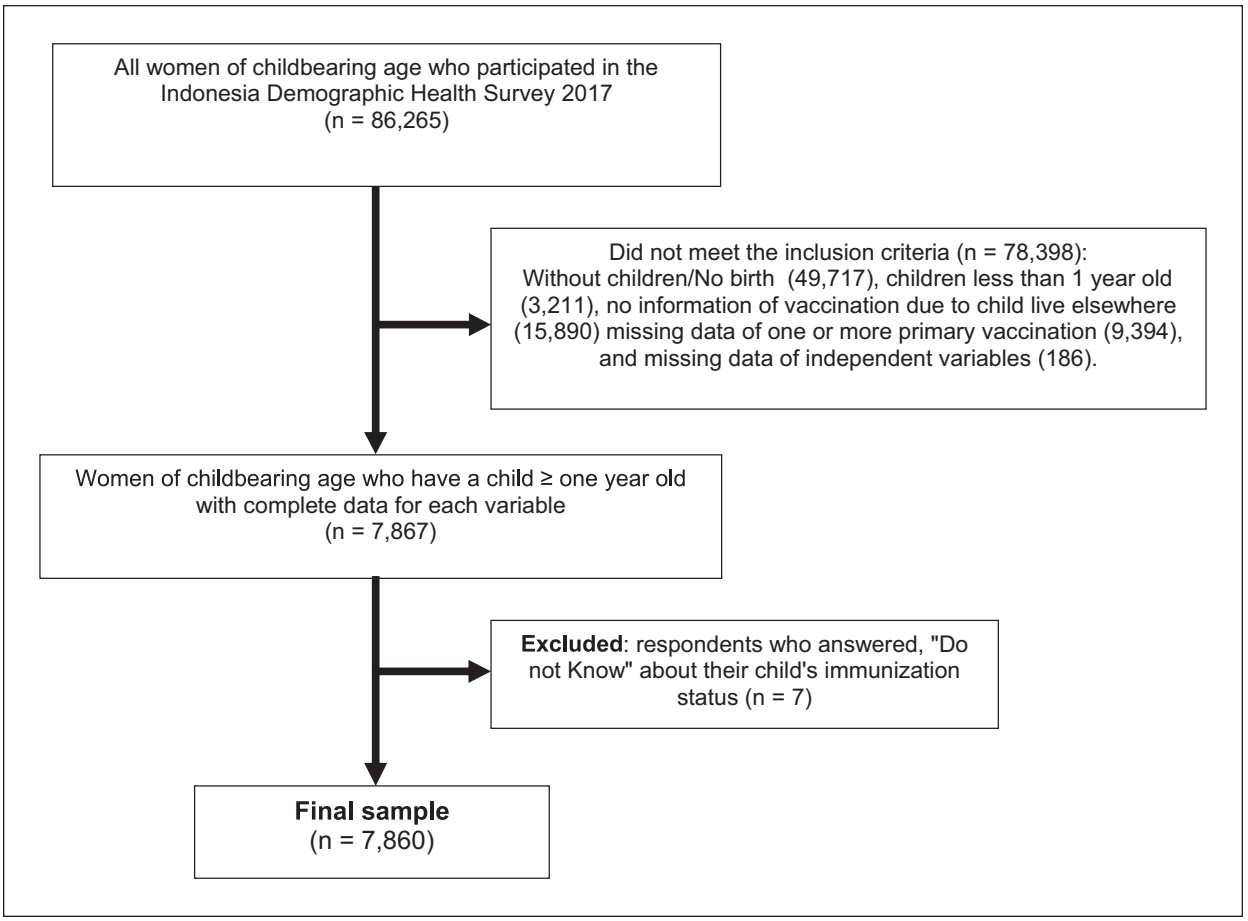

Figure 2. Flow chart of participant selection for the study.

Similarly, fathers with primary (aOR: 2.08; 95% CI: 1.16-3.73), secondary (aOR: 3.21; 95% CI: 1.77-5.79) and higher (aOR: 2.96; 95% CI: 1.51-5.80) education had higher odds of having partially vaccinated compared to not vaccinated children than to fathers without education. Apart from that, the odds of being partially vaccinated compared to not vaccinated was higher among children born to mothers with health insurance than those born to mothers without any health insurance (aOR: 1.31; 95% CI: 1.07-1.60). Mothers who had 2 or fewer children had almost double the odds of having partially vaccinated compared to unvaccinated children than those who had more than 2 children (aOR: 1.46; 95% CI: 1.14-1.87). Compared to boys, girls had lower odds of being partially vaccinated (aOR: 0.78; 95% CI: 0.64-0.94) compared to unvaccinated children. In addition, children aged 2 years had about 30.0% lower odds of being partially vaccinated compared to not vaccinated than those aged 1 year old (aOR: 0.73; 95% CI: 0.59-0.89). Mothers in age groups 15 to 19 years and 20 to 24 years had 55.0% (aOR: 0.45; 95% CI: 0.21-0.98) and 40.0% (aOR: 0.60; 95% CI: 0.36-0.99) lower odds of having fully vaccinated compared to not vaccinate children than those in the older age group (≥40 years old). Children whose mothers had secondary education showed almost 3 (aOR: 2.78; 95% CI: 1.50-5.17) times higher odds of being fully vaccinated compared to not vaccinated than those without education. Correspondingly, fathers with primary (aOR: 1.72; 95% CI: 0.99-2.99), secondary (aOR: 2.32; 95% CI: 1.32-4.08) and higher (aOR: 2.26; 95% CI: 1.18-4.32) education had higher odds of having fully vaccinated compared to not vaccinated children compared to those without education. Compared to low economic status, children with middle (aOR: 1.51; 95% CI: 1.13-2.02) and high (aOR: 1.59; 95% CI: 1.20-2.09) economic status had higher odds of being fully vaccinated compared to unvaccinated children. Children aged 2 (aOR: 1.36; 95% CI: 1.11-1.67) and 3 (aOR: 1.49; 95% CI: 1.10-2.01) were more likely to be fully vaccinated compared to not vaccinated compared to children aged 1 year. The odds of being fully vaccinated compared to not

Table 1. Demographic Characteristic of the Studied Sample.

Variable	Vaccination status (%)			Total n = 7860	
	Not vaccinated n = 525	Partially vaccinated n = 2829	Fully vaccinated n = 4506	Frequency	Percentage
Place of residency					
Rural	61.3	51.7	48.3	3961	50.4
Urban	38.7	48.3	51.7	3899	49.6
Parent's age					
Age of mother (years)					
15-19	2.9	2.8	1.6	166	2.1
20-24	16.6	17.2	15.9	1289	16.4
25-29	25.9	25.0	26.4	2032	25.9
30-34	22.3	26.8	27.9	2132	27.1
35-39	21.9	19.2	19.6	1541	19.6
≥40	10.5	9.0	8.6	700	8.9
Age of father (years)					
15-19	1.0	0.4	0.4	33	0.4
20-24	5.9	7.1	6.0	502	6.4
25-29	15.8	21.5	19.4	1563	19.9
30-34	28.4	26.4	27.0	2113	26.9
35-39	23.2	21.6	23.7	1802	22.9
≥40	25.7	23.0	23.5	1847	23.5
Parent's education					
Mother's education					
No education	5.0	1.4	0.8	103	1.3
Primary	36.6	26.3	20.5	1858	23.6
Secondary	42.5	55.5	58.0	4406	56.1
Higher	16.0	16.8	20.7	1493	19.0
Father's education					
No education	5.1	1.4	1.2	118	1.5
Primary	37.3	27.2	23.4	2021	25.7
Secondary	45.7	57.3	58.8	4509	57.4
Higher	11.8	14.1	16.6	1212	15.4
Marital status					
Married	97.9	98.2	98.2	7718	98.2
Living with a partner	2.1	1.8	1.8	142	1.8
Economic status					
Low	63.8	50.4	42.7	3687	46.9
Middle	13.3	17.7	19.2	1437	18.3
High	22.9	31.8	38.1	2736	34.8
Child's age (years)					
1	45.5	53.8	38.6	3498	44.5
2	42.3	35.2	47.1	3339	42.5
3	12.2	11.1	14.3	1023	13.0
Child's sex					
Boys	48.0	54.0	50.0	4033	51.3
Girls	52.0	46.0	50.0	3827	48.7
Number of children					
>2 children	49.9	38.4	32.9	2829	36.0
≤2 children	50.1	61.6	67.1	5031	64.0

(continued)

Table 1. (continued)

Variable	Vaccination status (%)			Total n = 7860	
	Not vaccinated n = 525	Partially vaccinated n = 2829	Fully vaccinated n = 4506	Frequency	Percentage
Cover by health insurance					
No	44.6	38.1	34.7	2874	36.6
Yes	55.4	61.9	65.3	4986	63.4
Antenatal care history					
No	96.6	97.2	97.4	7646	97.3
Yes	3.4	2.8	2.6	214	2.7
Postnatal care history					
No	73.1	70.5	21.2	5615	71.7
Yes	26.9	29.5	28.8	2245	28.9
Media use					
Never	11.8	4.9	2.5	312	4.0
Irregularly	6.9	6.6	3.9	397	5.0
Regularly	81.3	88.5	93.6	7,151	91.0
Type of media used[a]					
Radio (Yes)	40.6	37.4	41.0	3117	39.7
Newspaper/	37.7	40.1	44.1	3319	42.2
Magazine (Yes)					
Television (Yes)	85.9	93.3	96.3	7430	94.5
Internet (Yes)	29.1	40.9	47.0	3428	43.6

[a]Mothers could use more than 1 type of media.

Table 2. Adjusted Odds Ratios of Partial and Full Vaccination Compared to No Vaccination.

Variable	Partially vaccinated vs. Not vaccinated		Full vaccinated vs. not vaccinated	
	aOR (95% CI)	*P*-value	aOR (95% CI)	*P*-value
Media use (reference: Never)				
Irregular	1.74 (1.06-2.85)	.029	1.86 (1.12-3.08)	.016
Regular	1.48 (1.02-2.16)	.041	2.41 (1.64-3.53)	<0001
Place of residency (reference: Urban)				
Rural	1.01 (0.81-1.27)	.911	1.06 (0.85-1.32)	.614
Parents' Age (reference: ≥ 40 years old)				
Age of mother (age groups)				
15-19	0.68 (0.31-1.48)	.326	0.45 (0.21-0.98)	.046
20-24	0.60 (0.36-1.02)	.058	0.60 (0.36-0.99)	0048
25-29	0.73 (0.46-1.15)	.172	0.78 (0.50 - 1.21)	.267
30-34	1.18 (0.78-1.80)	.431	1.22 (0.81-1.85)	0329
35-39	0.99 (0.68-1.46)	.974	1.05 (0.73-1.53)	0781
Age of father (age groups)				
15-19	0.47 (0.14-1.55)	.216	0.45 (1.14-1.45)	0181
20-24	1.32 (0.75-2.32)	.333	1.04 (0.60-1.81)	.887
25-29	1.57 (1.04-2.38)	.032	1.16 (0.77-1.75)	.467
30-34	0.94 (0.67-1.32)	.719	0.79 (0.56-1.10)	.467
35-39	0.92 (0.68-1.26)	.610	0.90 (0.66-1.21)	.477
Parent's education (reference: No education)				
Mother's education				
Primary	1.39 (0.76-2.55)	.285	1.67 (0.91-3.04)	.095
Secondary	2.00 (1.07-3.74)	.029	2.78 (1.50-5.17)	.001
Higher	1.29 (0.64-2.58)	.473	1.70 (0.86-3.37)	.129

(continued)

Table 2. (continued)

Variable	Partially vaccinated vs. Not vaccinated		Full vaccinated vs. not vaccinated	
	aOR (95% CI)	*P*-value	aOR (95% CI)	*P*-value
Father's education				
Primary	2.08 (1.16-3.73)	.013	1.72 (0.99-2.99)	.056
Secondary	3.21 (1.77-5.79)	<.001	2.32 (1.32-4.08)	.003
Higher	2.96 (1.51-5.80)	.002	2.26 (1.18-4.32)	.013
Marital status (reference: Married)				
Living with partner	0.88 (0.42-1.82)	.725	1.42 (0.73-2.77)	.306
Economic status (reference: Low)				
Middle	1.32 (0.97-1.78)	.075	1.51 (1.13-2.02)	.005
High	1.23 (0.92-1.65)	.156	1.59 (1.20-2.09)	.001
Child's age (years) (reference: 1 years old)				
2	0.73 (0.59-0.89)	.003	1.36 (1.11-1.67)	.003
3	0.82 (0.60-1.11)	.209	1.49 (1.10-2.01)	.010
Child's sex (reference: Boys)				
Girls	0.78 (0.64-0.94)	.010	0.89 (0.74-1.07)	.210
Number of children (reference: > 2 children)				
≤2 children	1.46 (1.14-1.87)	.003	2.00 (1.57-2.55)	<.001
Cover by health insurance (reference: No)				
Yes	1.31 (1.07-1.60)	.009	1.49 (1.22-1.81)	<.001
Antenatal care history (reference: No)				
Yes	0.62 (0.36-1.06)	.082	0.64 (0.38-10.8)	.096
Postnatal care history (reference: No)				
Yes	1.10 (0.89-1.38)	.374	1.09 (0.88-1.35)	.448

aOR, Adjusted Odds Ratio.

vaccinated were 2.00 (95% CI: 1.57-2.55) times higher in children born to mothers who had 2 or fewer children compared to those born to mothers who had more than 2 children. Compared to unvaccinated children, mothers with health insurance had 1.49 (95% CI: 1.22-1.81) times higher odds of having fully vaccinated children compared to mothers without any health insurance.

Discussion

Mother's Media Use and Children's Immunization Status

Our study analyzed the association between mothers' media use and their children's vaccination status and showed that media use among mothers is positively associated with their children's vaccination status. There was some indication of a dose-response pattern, in the sense that irregular media use among mothers increased children's partial immunization, but had a lesser benefit to ensure the completeness of vaccination. Moreover, mothers' regular media use encouraged the partial compared to no vaccination, but even more the full vaccination compared to no vaccination. Our findings are in line with previous studies, which report a positive association between mothers' media use and children's immunization status.[10,20,21] This positive association might be explained by a better understanding of the beneficial role of immunization due to information exposure through the media, thereby, increasing mothers' knowledge.[10,11,19]

Most of the previous studies that investigated determinants of children's vaccination status used a binary outcome, categorized into complete and incomplete vaccination.[8-10,12,13] Children who missed 1 or more doses of vaccination were, then, grouped together with those children, who were never vaccinated, into the group of unvaccinated status.[10,13] This approach seemed to generalizing if both partial and unvaccinated status were similar, but we argued that children in these 2 groups might differ in certain aspects. Therefore, in this study, as well as missed opportunities to vaccinate and geographic barriers. In the perspective of our findings on media use, we believe that mothers with partially vaccinated children need further education and attention regarding the importance of vaccination and vaccine's schedule through the strengthening health promotion and/or literacy in this context.

A qualitative study in Indonesia found that perceptions about immunization were influenced not only by information related to vaccine safety but also by issues of trust and belief barriers, such as controversy of vaccine's ingredient, beliefs in natural immunity and beliefs in alternative medicine.[7] Even if the acceptance of information sources may not be the same across the population, it appears that the perceived reliability of the information source is also a crucial aspect. Tabacchi et al. reported that people who received information related to vaccination from scientific magazines had 8 and 3 times higher odds of having better perceived knowledge (believe about information on vaccines and vaccine preventable disease) and actual knowledge (knowledge about the vaccine, knowledge about the disease, knowledge about the vaccine schedule, knowledge about the national vaccination website, and knowledge about the correct strategy to prevent mentioned disease), respectively, compared to people who did not.[22] Furthermore, Handy et al.[23] found that the health clinic was referred to as the most reliable source of information among caregivers who experienced confusion after receiving some immunization information from news media. However, in Indonesia, health providers are not considered as the main actors in the dissemination of information. As a result, close collaboration between the ministry of health and other related parties, such as religious figures and the communities, is needed to enlighten the negative information facilitating vaccine hesitancy in Indonesia.[7,24] For example, Majelis Ulama Indonesia, who acts as a council of religious scholars in Indonesia, provided a halal certification or fatwa regarding the permissibility of the vaccination, which impacts community acceptance of vaccination.[24,25]

Variables Associated With Children's Immunization Status

Our findings indicate that parents' (age and education), children's (age and sex) and household (number of children, economic status, and health insurance) characteristics can predict children's vaccination status.

It is evident that several parental characteristics, such as age and education, influence the medium of media use. Our study found that younger mothers had higher odds of having vaccinated children in full vaccination compared to older mothers. This is reasonable, given that the younger population tends to have more convenience toward updated technologies and access to the internet, which can positively affect mothers' knowledge and health behavior.[8,26,27] Moreover, in our analyses, higher parental education was associated with better child vaccination status compared to parents with low education. This is in agreement with previous studies, reporting that parents' educational attainment level could prevent negative perceptions and assist parents in making an accurate decision related to their children's vaccination status. In addition, education is also closely related to economic and social status, both of which have a positive impact on vaccination status.[28-34]

Child's age was an important factor in the association between mothers' media use and children's vaccination status. Our study indicated that older children were more likely to be fully vaccinated, even if the vaccinations were recommended for a younger age. A study from Ethiopia found similar results, in which children aged 12 to 18 months had 50.0% lower odds of being vaccinated compared to older children (19-23 months).[35] This situation might be explained by various factors; one of them can be opportunity for a catch-up vaccination at an older age or delay in receiving vaccination.[36,37] In addition, this can be a consequence of misconceptions surrounding vaccination.

Previous studies indicate mixed results concerning the association between the child's female sex and complete vaccination status.[12,13,29] Our analysis revealed that female children were 22.0% less likely to be partially vaccinated vs. not vaccinated compared to male children. However, there was no association between sex and full vaccination vs. no vaccination in our study.

Furthermore, we found that health insurance coverage had an impact on children's vaccination status. Even though primary immunization is available without charges, health insurance ownership was an important factor in increasing vaccination rates in Indonesia. This might be due to the fact that free primary vaccination in Indonesia is only provided in public health facilities through health centers (Puskesmas) and community level-health posts (Posyandu) that only operate in particular days for vaccination services. As a result, a new mechanism of free vaccination services that involve private health care providers is needed in order to increase children vaccination coverage.

Strengths and Limitations

We used data from a large representative population study. The analyses of media use controlled for a variety of potential confounding variables, which increases the validity of the results. However, this study also has some limitations. First, recall bias might have affected mother's reports of information exposure and their child's vaccination status. Yet, we believe that the risk is low because the interviews were conducted by trained personnel who helped mothers remember their child's vaccination history through some probing questions. Furthermore, we

analyzed media use in 2017 while many of the children were vaccinated before; thus, media use could have changed over time and possibly also child's age. Confounding might be present through unobserved variables, such as religion. Finally, selection bias possibly introduced by the consecutive sampling applied in DHS surveys could reduce the generalizability of the study results. Nevertheless, secondary analysis of DHS data is still considered to have a major contribution to public health knowledge.

Conclusion

Our study found that mothers' media use, both irregular and regular use, was positively associated with their children's vaccination status. We also found irregular media use being more strongly associated with partial immunization and regular media use being stronger associated with full vaccination. Thus, further exploration with a more experimental design could be helpful to improve the result.

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Author Contributions

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Declaration of Conflicting Interests

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Data Availability Statement

The original contributions presented in the study are included in the article and further inquiries can be directed to the corresponding author.

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Supplemental Material

Supplemental material for this article is available online.

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