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RESEARCH ARTICLE

REVISED Regional disparities and their contribution to the coverage of the tetanus toxoid vaccine among women aged 15–49 years in Indonesia [version 2; peer review: 2 approved, 1 approved with reservations]

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Abstract

Background: The prevention of *Clostridium tetani* bacterial infection through the administration of the tetanus toxoid (TT) vaccine in women is important. The purpose of this study was to determine the regional disparities and factors associated with TT vaccine coverage in women aged 15–49 years in Indonesia.

Methods: The Indonesian Demographic Health Survey (IDHS) 2017 data was used in this study. A total of 36,028 women, aged 15–49 years were recruited using the two-stage stratified cluster sampling technique. The questionnaire used was based on the DHS Questionnaire Phase 7. Chi-squared and binary logistic regression were used in this study as part of the analysis.

Results: We found that the TT vaccine coverage was 75.32% and that the majority were spread across several provinces. The provinces of Bali and Nusa Tenggara, the richer respondents, living in a rural area, visiting the health facility, having health insurance, and those currently working were factors making it more likely that the women would receive the TT vaccine. The respondents aged 15–24 years with a primary education level and the respondents who were divorced were less likely to receive the TT vaccine.

Conclusion: The coverage of the TT vaccine among women can be increased by considering the regional disparities in Indonesia and the socio-economic demographic details of the respondents. Strengthening the policies from the central government in the local governments can improve the screening process and vaccine delivery outcomes. In addition, the importance of giving the TT vaccine to women needs to be relayed through health education in collaboration

between health workers and the public.

Keywords

vaccine; tetanus toxoid; tetanus vaccine; demographic health survey,
women

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> **REVISED** **Amendments from Version 1**
>
> We have improved and take a revision based on reviewers' suggestions. We added up-to-date data and references related to TT Vaccine. Secondly, we make clear the methods and gave more information about the variables. As a result, we revise the table and combine some tables to be more concise as the reviewer suggested. Lastly, in the discussion session, we much improved the sentences to be more relevant and added up-to-date references.
>
> **Any further responses from the reviewers can be found at the end of the article**

Introduction

Neonatal tetanus (NT) is a disease that can be prevented. It has become a global health problem with both high case and high fatality rates among neonates.[1] NT refers to tetanus that occurs at 28 days of early life.[2] NT occurs due to the toxins produced by *Clostridium tetani* alongside an unhygienic labor agent. It spreads through the umbilical cord.[3] One of the efforts to prevent the incidence of NT is the provision of an adequate tetanus toxoid (TT) vaccine for women of reproductive age.[4] In 2006, WHO developed guidelines for the TT vaccine for pregnant women to prevent NT.[5] The Government of Indonesia through the regulation of the Minister of Health no 12 of 2017 concerning the implementation of immunization stipulates a national immunization coverage target of at least 90% and in districts/cities of at least 80% for TT vaccination as continued vaccine.[6]

Two doses of the TT vaccine can provide immunity and reduce neonatal mortality by 94%.[7,8] One case–control study also reported that the administration of two doses of the TT vaccine was associated with a decrease in the incidence of NT[9,10] and *vice versa.*[11] Minimum two doses of TT vaccine were identified can reduce neonatal mortality.[12] TT vaccination contributes to the reduction of neonatal mortality due to tetanus by 85% from 2000 to 2018.[1] The Indonesian Health Profile data from the years 2013–2015 show the trend that not receiving the TT vaccine is the leading cause of neonatal mortality.[13–15] Although NT can be prevented by the TT vaccine, the number of cases is still high. Globally, it is estimated that as many as 3.6 million neonates die every year, among which 59,000 die from tetanus.[16] The infant mortality rate in Indonesia according to the Indonesian Demographic and Health Survey in 2007 was 34 deaths per 1,000 live births with the highest number of deaths occurring during the neonatal period.[17] The neonatal mortality rate in Indonesia in 2007 was 19 per 1000 live births and NT was one of the main causes of death.[18,19]

Neonatal tetanus cases still cannot be handled completely because the coverage of the TT vaccine is still lacking, both nationally and regionally. Nationally, the coverage of the TT vaccine for both pregnant and reproductive age women tends to fluctuate and has not yet reached the target. The TT vaccine coverage for pregnant and reproductive age women from 2007 to 2011 was 26% and 27.1%, 65.2% and 24.7%, 73.5% and 11.2%, 69.5% and 8, 6%, and 63.6% and 11.8%, respectively.[17] If the regional data is examined randomly, the coverage of the TT vaccine in select regions has also not reached the target.[20] The difference in coverage from the highest and lowest during the period was possible due to differences in perceptions of the operational definition, problems in recording, reporting formats, and others. So there needs to be an effort to organize a recording and reporting system for pregnant women TT vaccination.[17]

The low coverage of the TT vaccine is largely influenced by inadequate knowledge.[21,22] Women with poor knowledge of MNT and TT vaccine are 0.435 times less likely to receive the TT vaccine.[23] Insufficient knowledge of the TT vaccine among prospective brides of reproductive age are one of the factors for the low TT vaccine coverage.[24] Based on the data above, to overcome this inadequate knowledge, health education about TT is needed. Good health education pays attention to and identifies people's characteristics in the intended category so then the health education provided can be more effective.[25] This study is focused on revealing TT vaccine coverage and the determinant factors of the TT vaccine being received in relation to women of reproductive age.

Several previous Indonesian studies have revealed the coverage and determinants of the TT vaccine. Research into the TT coverage is still reported on a regional scale.[26,27] Research on the determinants of the vaccine for women of childbearing age specifically includes knowledge, family support, attitudes, and the behavior of the health workers.[22,28,29] This study used available national data including age, education level, wealth quintile, residence, marital status, visiting the health facilities, health insurance, occupational status, the sex of the household head, pregnancy, and the different regional areas in relation to the TT vaccine. It is expected that the results of this study can be used when devising effective approaches for the education of women of reproductive age to promote the TT vaccine.

Methods

Study design

A cross-sectional study design was undertaken. We used secondary data from the Indonesian Demographic Health Survey (IDHS) 2017 and parts of the Inner-City Fund (ICF) International data.

Sample

The survey was conducted in December 2017. We used the IDIR71FL dataset (Indonesian Individual Recode phase 7). The total study population was 49,627 women aged 15–49 years. We then weighted the data based on the number of provinces in Indonesia in order to obtain the average for each region. We managed to reach 36,028 women aged 15–49 years who have not received the TT vaccine in Indonesia. Furthermore, there was missing data. Two-stage stratified cluster sampling was used in this study by selecting clusters from each stratum and a list of families from the selected clusters. Then the families' questionnaire responses were investigated (Demographic Health Survey, 2017).

Variables

The independent variables in this study included age, education level, wealth quintile, residence, marital status, visiting the health facility, health insurance, occupational status, sex of household head, pregnancy, regional disparities. Age was categorized into 15–24 years old, 25–34 years old and 35–49 years old (Health Ministry of Republic Indonesia, 2009). Based on Law No. 20 of 2003 concerning the National Education System in Indonesia, education level was categorized into high, secondary, primary, and no education.[30] The wealth quintiles were divided into five categories based on principal component analysis (PCA). The wealth quintiles were measured by the percentage distribution of the de jure population using the wealth quintiles and the Gini coefficient. For the percentage distribution, the numerators were divided by the denominators multiplied by 100. The results were then divided into five equal parts from quintile one (poorest) to quintile five (richest); each included 20% of the total population. Then, it was categorized into poorest, poorer, middle, richer, and richest respectively.[31,32] Residence was categorized into either an urban or rural area.[33] Marital status was classified as either married, partnered, widowed, divorced or separated. The respondents who had visited a health facility in the last six months, whether they had health insurance, if they were currently working, and their pregnancy status were all categorized as either yes or no.[31] We identified the sex of the household head as either male or female. For the regions in Indonesia, we classified the country based on the big islands as follows: Sumatera, Riau, Java, Bali and Nusa Tenggara, Kalimantan, Sulawesi, Maluku, and Papua.[34]

The dependent variable in this study was the TT vaccine. We identified women aged 15–49 years who either received or did not receive the TT Vaccine. Then we categorized them according to their answer of either yes or no (Demographic Health Survey, 2017). To enhance the quality and transparency of reporting the study results, the researchers applied The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE).[35]

Data analysis

We used the STATA version 16.1: "A Software resource for statistical analysis and presentation of graphics (Stata, RRID:SCR_012763)". We used Chi-squared to analyze the bivariate data and binary logistic regression to analyze the multivariate data. We used the adjusted odds ratio (AOR) with a 95% confidence interval (CI) and a significance level of $p < 0.05$.

Ethical considerations

Ethical approval for the secondary dataset was not required. The dataset policy is available on the official website. We received approval to use the dataset from ICF International with number AuthLetter_154679.

Results

In this study, we found that the coverage of the TT vaccine in Indonesia reached 75.32% out of the 36,028 respondents. More than half of the total respondents who received the vaccine aged 35–49 years were educated to secondary school level. The distribution of wealth quintiles was almost the same, ranging from poorest to richest. The majority were in the poorest quintile. In addition, the distribution of residence was almost the same across both urban and rural areas. The majority of the respondents in this study were married and they had regularly visited health facilities in the last six months. We found that the majority of respondents had health insurance, were working, and were not pregnant. The majority of the household heads were male.

Upon examining the regional distribution data in Indonesia, the TT vaccine coverage was more than 70% in Riau, Java, Bali and Nusa Tenggara, Kalimantan, Sulawesi, and Papua. The majority of respondents aged 35–49 years were spread across Indonesia. The distribution data indicate that the majority of respondents were educated to secondary school level,

Table 1. Socio-demographic characteristic based on region (n = 36,028).

Variable	n	%	Region																
			Sumatera (n = 8,344)		Riau (n = 753)		Java (n = 12,336)		Bali & Nusa Tenggara (n = 3,053)		Kalimantan (n = 3,291)		Sulawesi (n = 5,415)		Maluku (n = 1,945)		Papua (n = 891)	
			n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
TT vaccine																		
No	8,893	24.68	2,618	31.38	199	26.43	3,157	25.59	499	16.34	701	21.30	898	16.58	608	31.26	213	23.91
Yes	27,135	75.32	5,726	68.62	554	73.57	9,179	74.41	2,554	83.66	2,590	78.70	4,517	83.42	1,337	68.74	678	76.09
Age																		
35–49 years old	19,697	54.67	4,540	54.41	448	59.50	7,077	57.37	1,649	54.01	1,678	50.99	2,910	53.74	987	50.75	408	45.79
25–34 years old	12,325	34.21	2,955	35.41	253	33.60	3,970	32.18	1,060	34.72	1,216	36.95	1,812	33.46	700	35.99	359	40.29
15–24 years old	4,006	11.12	849	10.17	52	6.91	1,289	10.45	344	11.27	397	12.06	693	12.80	258	13.26	124	13.92
Education level																		
High education	5,251	14.57	1,321	15.83	118	15.67	1,467	11.89	431	14.12	429	13.04	960	17.73	378	19.43	147	16.50
Secondary education	18,770	52.10	4,550	54.53	475	63.08	6,587	53.40	1,349	44.19	1,719	52.23	2,579	47.63	1,074	55.22	437	49.05
Primary education	11,254	31.24	2,323	27.84	152	20.19	4,127	33.45	1,122	36.75	1,075	32.66	1,754	32.39	477	24.52	224	25.14
No education	753	2.09	150	1.80	8	1.06	155	1.26	151	4.95	68	2.07	122	2.25	16	0.82	83	9.32
Wealth quintiles																		
Poorest	8,374	23.24	1,730	20.73	36	4.78	1,145	9.28	1,477	48.38	671	20.39	1,891	34.92	995	51.16	429	48.15
Poorer	7,016	19.47	1,908	22.87	77	10.23	2,047	16.59	543	17.79	683	20.75	1,216	22.46	376	19.33	166	18.63
Middle	6,945	19.28	1,820	21.81	152	20.19	2,594	21.03	364	11.92	774	23.52	862	15.92	259	13.32	120	13.47
Richer	6,952	19.30	1,584	18.98	207	27.49	3,168	25.68	335	10.97	609	18.51	714	13.19	222	11.41	113	12.68
Richest	6,741	18.71	1,302	15.60	281	37.32	3,382	27.42	334	10.94	554	16.83	732	13.52	93	4.78	63	7.07
Residence																		
Urban	18,316	50.84	3,478	41.68	680	90.31	8,228	66.70	1,212	39.70	1,729	52.54	1,978	36.53	774	39.79	237	26.60
Rural	17,712	49.16	4,866	58.32	73	9.69	4,108	33.30	1,841	60.30	1,562	47.46	3,437	63.47	1,171	60.21	654	73.40
Marital status																		
Married	33,294	92.41	7,816	93.67	698	92.70	11,542	93.56	2,677	87.68	3,068	93.22	5,016	92.63	1,764	90.69	713	80.02
Partner	369	1.02	5	0.06	2	0.27	12	0.10	169	5.54	6	0.18	19	0.35	61	3.14	95	10.66
Widowed	884	2.45	217	2.60	18	2.39	281	2.28	84	2.75	78	2.37	128	2.36	46	2.37	32	3.59
Divorced	1,319	3.66	294	3.52	35	4.65	472	3.83	78	2.55	136	4.13	235	4.34	49	2.52	20	2.24
Separated	162	0.45	12	0.14	0	0.00	29	0.24	45	1.47	3	0.09	17	0.31	25	1.29	31	3.48
Visiting health facility																		
No	16,639	46.18	3,751	44.95	384	51.00	5,544	44.94	1,406	46.05	1,454	44.18	2,529	46.70	1,066	54.81	505	56.68
Yes	19,389	53.82	4,593	55.05	369	49.00	6,792	55.06	1,647	53.95	1,837	55.82	2,886	53.30	879	45.19	386	43.32
Health insurance																		
No	13,839	38.41	3,080	36.91	275	36.52	5,032	40.79	1,174	38.45	1,475	44.82	1,732	31.99	853	43.86	218	24.47
Yes	22,189	61.59	5,264	63.09	478	63.48	7,304	59.21	1,879	61.55	1,816	55.18	3,683	68.01	1,092	56.14	673	75.53
Currently working																		
No	14,978	41.57	3,393	40.66	335	44.49	5,478	44.41	1,054	34.52	1,300	39.50	2,247	41.50	840	43.19	331	37.15
Yes	21,050	58.43	4,951	59.34	418	55.51	6,858	55.59	1,999	65.48	1,991	60.50	3,168	58.50	1,105	56.81	560	62.85
Sex of household head																		
Male	32,233	89.47	7,487	89.73	684	90.84	11,057	89.63	2,618	85.75	3,011	91.49	4,847	89.51	1,727	88.79	802	90.01
Female	3,795	10.53	857	10.27	69	9.16	1,279	10.37	435	14.25	280	8.51	568	10.49	218	88.79	89	9.99
Pregnancy																		
No	34,081	94.60	7,832	93.86	711	94.42	11,766	95.38	2,896	94.86	3,106	94.38	5,139	94.90	1,796	92.34	835	93.71
Yes	1,947	5.40	512	6.14	42	5.58	570	4.62	157	5.14	185	5.62	276	5.10	149	7.66	56	6.29

followed by those with primary education. The majority of respondents in the richest quintile and living in an urban area in Riau and Java. The majority of respondents in the poorest quintile and living in a rural area were in Bali and Nusa Tenggara, Sulawesi, Maluku, and Papua. Most of the respondents were married, had health insurance, were working, were not pregnant, and the household head was male. The respondents in Riau, Maluku, and the Papua islands responded stating that they had rarely visited the health facilities in the last six months (Table 1).

Table 2. Bivariate analysis of tetanus toxoid vaccine coverage among women aged 15–49 years in Indonesia (n = 36,028).

Variable	Tetanus toxoid vaccine coverage				χ^2
	No		Yes		
	n	%	n	%	
Regional (island)					
Sumatera	2,618	7.27	5,726	15.89	578.813***
Riau	199	0.55	554	1.54	
Java	3,157	8.76	9,179	25.48	
Bali & Nusa Tenggara	499	1.39	2,554	7.09	
Kalimantan	701	1.95	2,590	7.19	
Sulawesi	898	2.49	4,517	12.54	
Maluku	608	1.69	1,337	3.71	
Papua	213	0.59	678	1.88	
Age					
35–49 years old	4,940	13.71	14,757	40.96	45.499***
25–34 years old	2,830	7.86	9,495	26.35	
15–24 years old	1,123	3.12	2,883	8.00	
Education level					
High education	914	2.54	4,337	12.04	1,200***
Secondary education	3,879	10.77	14,891	41.33	
Primary education	3,631	10.08	7,623	21.16	
No education	469	1.30	284	0.79	
Wealth quintiles					
Poorest	2,710	7.52	5,664	15.72	406.478***
Poorer	1,756	4.87	5,260	14.60	
Middle	1,627	4.52	5,318	14.76	
Richer	1,461	4.06	5,491	15.24	
Richest	1,339	3.72	5,402	14.99	
Residence					
Urban	4,220	11.71	14,096	39.13	54.138***
Rural	4,673	12.97	13,039	36.19	
Marital status					
Married	7,978	22.14	25,316	70.27	127.472***
Partner	113	0.31	256	0.71	
Widowed	313	0.87	571	1.58	
Divorced	430	1.19	889	2.47	
Separated	59	0.16	103	0.29	
Visiting health facility					
No	5,108	14.18	11,531	32.01	601.783***
Yes	3,785	10.51	15,604	43.31	
Health insurance					
No	3,865	10.73	9,974	27.68	127.253***
Yes	5,028	13.96	17,161	47.63	
Currently working					
No	3,911	10.86	11,067	30.72	28.121***
Yes	4,982	13.83	16,068	44.60	
Sex of household head					
Male	7,825	21.72	24,408	67.75	27.295***
Female	1,068	2.96	2,727	7.57	
Pregnancy					
No	8,418	23.37	25,663	71.23	0.091
Yes	475	1.32	1,472	4.09	

***p < 0.01.
**p < 0.05.
*p < 0.1.
χ^2: Chi-squared.

The bivariate analysis showed that the regional variables, age, education level, wealth quintile, residence, marital status, whether they visited the health facilities, health insurance, whether they were currently working, and the sex of the household head have a significant relationship with TT vaccine coverage in women aged 15–49 years. However, the pregnancy variable did not have a significant relationship with TT vaccine coverage (Table 2).

Table 3 shows the results of the multivariate analysis. The data indicate that regional disparities, age, education level, wealth quintile, residence, marital status, whether they had visited the health facilities recently, and having health

Table 3. Multivariate analysis of tetanus toxoid vaccine coverage among women aged 15–49 years in Indonesia (n = 36,028).

Variable	Tetanus toxoid vaccine coverage			
	AOR	p	95%CI	
			Lower	Upper
Regional (island)				
Sumatera	Ref.			
Riau	1.197**	0.044	1.005	1.427
Java	1.353***	0.000	1.266	1.445
Bali & Nusa Tenggara	3.363***	0.000	2.997	3.773
Kalimantan	1.874***	0.000	1.697	2.07
Sulawesi	2.752***	0.000	2.517	3.01
Maluku	1.217***	0.001	1.086	1.362
Papua	2.247***	0.000	1.88	2.686
Age				
35–49 years old	Ref.			
25–34 years old	0.939**	0.031	0.886	0.994
15–24 years old	0.71***	0.000	0.653	0.772
Education level				
High education	Ref.			
Secondary education	0.994	0.901	0.911	1.085
Primary education	0.544***	0.000	0.494	0.599
No education	0.149***	0.000	0.125	0.179
Wealth quintiles				
Poorest	Ref.			
Poorer	1.442***	0.000	1.334	1.558
Middle	1.544***	0.000	1.421	1.676
Richer	1.645***	0.000	1.506	1.798
Richest	1.527***	0.000	1.382	1.687
Residence				
Urban	Ref.			
Rural	1.106***	0.001	1.044	1.173
Marital status				
Married	Ref.			
Partner	0.691***	0.003	0.541	0.882
Widowed	0.675***	0.000	0.573	0.796
Divorced	0.693***	0.000	0.608	0.79
Separated	0.585***	0.002	0.415	0.824
Visiting health facility				
No	Ref.			
Yes	1.693***	0.000	1.609	1.781
Health insurance				
No	Ref.			
Yes	1.176***	0.000	1.117	1.239
Currently working				
No	Ref.			
Yes	1.147***	0.000	1.088	1.208
Sex of household head				
Male	Ref.			
Female	0.939	0.177	0.857	1.029

***p < 0.01.
**p < 0.05.
*p < 0.1.
AOR: Adjusted odds ratio, CI: confidence interval.

insurance are likely to be associated with TT vaccine coverage in women aged 15–49 years in Indonesia. The regional data shows that the respondents in Bali and Nusa Tenggara are 3.363-times more likely to receive the TT vaccine than the respondents in Sumatera (AOR = 3.363; 95%CI = 2.997–3.773). The respondents aged –24 years old are 0.71-times less likely to receive the TT vaccine than those aged 35–49 years (AOR = 0.71; 95%CI = 0.653–0.772). Regarding education level, the respondents with a primary school level of education were 0.544-times less likely to receive the TT vaccine than the respondents with a higher level of education (AOR = 0.544; 95%CI = 0.494–0.599). Furthermore, the richer respondents were 1.645-times more likely to receive the TT vaccine than the poorest respondents (AOR = 1.645; 95%CI = 1.506–1.798). The respondents living in rural areas were 1.106-times more likely to have had the TT vaccine than those living in urban areas (AOR = 1.106; 95%CI = 1.044–1.173). Divorced respondents were 0.693-times less likely to receive the TT vaccine than married respondents (AOR = 0.693; 95%CI = 0.608–0.79). The respondents who had regularly visited a health facility in the last six months were 1.693-times more likely to receive the vaccine than those who had not (AOR = 1.693; 95%CI = 1.609–1.781). The respondents who had health insurance were 1.176-times more likely to receive the vaccine than those who did not (AOR = 1.176; 95%CI = 1.117–1.239). The respondents who worked were 1.147-times more likely to receive the vaccine than those who did not (AOR = 1.147; 95%CI = 1.088–1.208).

Discussion

In this study, we discussed the gap in the reception of the TT vaccine among women aged 15–49 years in Indonesia by looking at the regional disparities. We also were able to determine the contributions behind the achievement of the TT vaccine coverage in Indonesia as it stands. We found that regional disparities were significantly associated with TT vaccine performance. In addition, the factors of age, education level, wealth quintile, residence, marital status, whether they visited the health facilities, health insurance, and whether they were currently working also contribute to the TT vaccine coverage among women aged 15–49 years in Indonesia.

Regional disparities are one of the demographic factors that contribute greatly to the TT vaccine coverage among women. Indonesia, an archipelago region, can be an inhibiting factor regarding vaccine coverage.[36,37] This geographical condition can affect the coverage in vaccination because it affects the access, availability, distribution of the vaccine supply chain between islands. Differences in culture, region, ethnicity, language, knowledge, and access in Indonesia are important factors to consider when seeking to facilitate access to get a vaccine.[38,39] According to this study, the Bali and Nusa Tenggara regions have a greater chance of administering the TT vaccine to their respective populations than other regions. When viewed according to socio-economic development, Bali and Nusa Tenggara, which are included within Eastern Indonesia, are far behind compared with the Java, Sumatera and Riau.[40,41] This is consistent with the previous research which states that vaccine coverage can be influenced by region, development, knowledge and awareness of the disease and vaccine.[42,43]

We found that the younger respondents, aged 15–24 years, were less likely to receive the TT vaccine than the respondents who were older (35–49 years old). A previous study showed that age is related to the knowledge of the importance of vaccines and the ability to make decisions.[44,45] Therefore, health education is needed among those of a young age about the importance of vaccines. In addition, in this study it is also known that this is less likely for those of a primary education level compared with those with a higher level of education. This is because with a good level of knowledge, TT vaccination coverage can be achieved. In this case, the government and health workers have an important role in distributing knowledge about vaccines to the public. Both previous studies have shown that vaccine performance is influenced by a good level of knowledge.[46,47] Moreover, respondents aged 15-24 years have less experience, beliefs, and family non-supporting about vaccine.[48,49] This condition tendency of less likely to to receive the TT vaccine.

In this study, we found that economic status contributed to the achievement of TT vaccine coverage in women. Based on the finding in this study, respondents with a wealth quintile that is higher and those with a job are more likely to receive the TT vaccine compared with the respondents whose economic level is low and who do not work. Previous research has shown that the respondents with a stable income can easily access private and government health facilities and get vaccines.[50,51] In addition, the respondents who had health insurance were found to be more likely to receive the TT vaccine. This is because the respondent feels calm that their medical costs will be covered by their health insurance. Previous research has shown that with health insurance, vaccine coverage can increase. It was because people should not think about the payment for TT vaccine.[52–54] It can be one of the program from government to reach high vaccination coverage.

In terms of the rural areas, the study found that the residents of these areas are more likely to receive the TT vaccine. This is related to the obedience of the rural population where doctors, nurses and midwives have been able to gain the trust of the community.[55] This closeness is also obtained through the routine outreach process used to engage with the community members.[56] The information obtained by the rural residents tends to be more centralized and there is no

intervention from other sources such as the internet and minimizing false news; the information will be centered on the doctors, nurses and midwives visited at the health facility as a result.[57,58] Also, rural residents rely more on health workers where they live. In this context, it is the midwife who mostly works in remote villages.[17] Rural residents trust these midwives and regard the midwife as a link between them and the health care facilities provided by the government. This is in contrast to the urban residents who prefer to obtain their health-related information independently. They tend to compare the results of the information obtained from the internet with that of the doctors, nurses and midwives at the health facilities. The gaps in the information obtained trigger doubts about the TT vaccine and in the end, there is a delay in getting the vaccine even after marriage.

This study found that the women who visit the health facility are more likely to receive the TT vaccine. Visiting the health facility will increase their information and knowledge related to vaccines.[59] In addition, each visit can increase their closeness and bond with the health workers. This can convince the women aged 15–49 years old to have the TT vaccine. A visit to a health care facility provides an opportunity for women to clarify and address their concerns regarding the side effects of vaccines by consulting directly with their doctor or nurse.[60] Rumors circulating in the community regarding the TT vaccine also can be explained through counselling during the visits. One of the rumors is that the content of the vaccine material is not halal, so there is resistance from some women. Health workers like the doctors and nurses are needed to clarify the problem.[61]

Those who are divorced are less likely to receive the TT vaccine. This is associated by the decrease or non-existence of motivation from a partner. Women who have lived alone tend to have different views after a divorce. Focus and priorities in life may no longer lead to the fulfillment of health support such as vaccines, but rather to be economically independent and able to meet the needs of daily life. Divorced women do not feel the need to receive the TT vaccine because one of the goals of this vaccine is to reduce the risk of tetanus in women and their unborn baby.[62] If they are divorced, there is no need for the TT vaccine. Indonesian government have many efforts to increase the TT vaccination coverage, such as equitable availability of midwives in rural to remote areas[17] and regulations that require brides to be vaccinated TT according to government regulation number 02 of 1989 about Tetanus Toxoid Immunization before marriage.[63]

The strength of our study is that it provides information on the TT vaccine coverage nationally while highlighting the regional disparities in Indonesia. The results of this study can become basic data for the Indonesian government to use to determine further policies to achieve an improved level of TT vaccine coverage among women. However, this study has limitations in that the researchers looked at the distribution based only on the major islands in Indonesia. Descriptions at the provincial level are needed for the formulation of more specific policies. Meanwhile, the study has assumption of no significant correlation among predictors.

Conclusion

In this study, we found there to be a gap in the TT vaccine uptake among women aged 15–49 years in Indonesia. Indonesia as an archipelago country become one of the considerations and constraints involved in the coverage of the TT vaccine among women. The findings of this study provide an overview about the TT vaccine coverage according to several factors such as the regional disparities and the respondents' socio-economic demographic information. Furthermore, the government can collaborate across different sectors between the central and local governments to achieve the desired TT vaccine coverage. Providing accurate and precise information about the TT vaccine needs to be promoted by healthcare workers in collaboration with the community through online methods to reach the urban population areas in Indonesia. An in-depth exploration with additional factors and sectors involved is needed in terms of the direction of further research.

Data availability

Data used in this study is available online from the Indonesian 2017 Demographic and Health Survey (DHS) website under the 'Individual Recode' section. Access to the dataset requires registration and is granted only for legitimate research purposes. A guide for how to apply for dataset access is available at: https://dhsprogram.com/data/Access-Instructions.cfm.

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Open Peer Review

Current Peer Review Status: ✔ ✔ ❓

Version 2

Reviewer Report 13 September 2021

https://doi.org/10.5256/f1000research.76877.r93100

✔ **Muhammad Hardhantyo** iD

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The manuscript is well-written, including a description of the approach clearly. The authors have addressed all reviewer recommendations given to improve the article's quality. The findings could contribute to enhancing our understanding of tetanus toxoid vaccination coverage of women aged 15–49 years in Indonesia.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Health Policy, Epidemiology, Child Health, Maternal Health

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

Version 1

Reviewer Report 19 August 2021

https://doi.org/10.5256/f1000research.56345.r90139

❓ **Azza Mehanna** iD

Health Administration and Behavioral Sciences Department, HIPH, Alexandria University,
Alexandria, Egypt

Introduction:
- Paragraph 1, last line: Reference 6 is not in English, and on opening it, it seemed to lack some important details such as the target year for national and regional vaccine coverage of at least 90% and 80% respectively and it (target year) was not mentioned in the manuscript either.

  Also: "as an advanced vaccine", what do you mean?

- Paragraph 2, line 4: Reference 12 is rather old, aren't there more recent updates for these figures?

  Also: "and by 45% after the second dose", I don't think this percentage is correct, infant mortality shows more decrease after the second dose.

- Paragraph 2, line 7: Reference 16 is rather old, try to find more recent data.

- Paragraph 2, lines 7-8: you got the data from DHS 2007, isn't there a more recent DHS? You mentioned DHS 2017 in methodology, why haven't you used it in your review?

- Paragraph 3, line 1: "There are still cases of NT in line with the coverage of the national and regional TT vaccines not yet reaching the target." This statement is not clear and needs to be rephrased.

- Paragraph 4, lines 1-2: "Women of reproductive age with knowledge of maternal and neonatal tetanus (MNT)", you probably mean poor knowledge, please clarify.

- Paragraph 4, line 2: "low TT vaccine are 0.435 times more likely to receive the TT", what do you mean by low tetanus toxoid vaccine? "0.435 times more likely to receive the TT vaccine": this is not a good interpretation of the odds ratio.

- I found some difficulty checking on some references, e.g references 6 and 27, as they were written in a different language.

Methods:

You need to elaborate more on methods as follows:
- Sample, lines 3-4: "We managed to reach 36,028 women aged 15– 49 years who have not received the TT vaccine in Indonesia", how did you reach them? Did you give them questionnaires? Please clarify.

- Why haven't you been able to study the whole population mentioned (49,627)? Please clarify.

- This sample of women (36,028) comprises those who received and those who did not receive the vaccine according to Table 1 and not only those who have not received the vaccine as you mentioned.

○ Sample, line 4: "Two-stage stratified cluster sampling was used", what are the two stages? Stratified according to what?

Results:

○ Tables 3 and 4: You don't need to put *P<0.1 in the footnotes.

○ Table 3, last row: Is the value "0.091" the correct value of χ2? Please check.

○ Table 3: Why have you calculated percent from total not from independent variable?

○ Table 4, line 2: "and health insurance", it is better to say "and having health insurance".

Discussion:

○ Paragraph 2, line 2: "Indonesia, which is an archipelago region, can be an inhibiting factor regarding vaccine coverage". This statement needs rephrasing and clarification.

○ Paragraph 2, lines 7-9: "However, it can be seen in this study that the respondents' awareness of the importance of the TT vaccine is very high. This is consistent with the previous research which states that vaccine coverage can be influenced by region, development, knowledge and self-awareness":

   ○ "vaccine coverage can be influenced by region, development": From the context, it seems that you refer to a direct relationship. However, this contradicts your findings as vaccine coverage in Bali and Nusa Tenggara is high (83.66%), despite having a high percentage of the poorest (48.38%) and a relatively low percentage of the richest (10.94%).

   ○ "self-awareness": Self-awareness was not studied in this research and it is a totally different concept, I think you mean awareness of the disease and vaccine.

   ○ "it can be seen in this study that the respondents' awareness of the importance of the TT vaccine is very high": Awareness of the vaccine and of its importance was not studied in this research, in fact, awareness of the vaccine and of its importance could just be some of the possible factors underlying high coverage rates. You may point to awareness as an inference not as a finding. Please note that awareness of the vaccine is not the same as awareness of the importance of the vaccine.

○ Paragraph 3: Why do you relate your studied variables as age and education to knowledge and you continue referring to it (knowledge) despite not being studied in this research? In fact, many other variables could underlie and explain high coverage, such as: applying a good coverage policy, life experiences and beliefs, culture, physicians' attitude and behavior regarding vaccine, availability and accessibility of vaccine, and social support/pressure.

○ Paragraph 3, line 7: "the previous study", which study? You put two references not one.

○ Paragraph 4, lines 1-2: "It is known that respondents with a wealth quintile that is higher and those with a job are more likely to receive the TT vaccine compared with the respondents whose economic level is low and who do not work":

- ○ "it is known that": From where? Opposite findings are displayed in other studies, for example, Mehanna A, Ali MH, Kharboush I: Knowledge and health beliefs of reproductive-age women in Alexandria about tetanus toxoid immunization. J Egypt Public Health Assoc. 2020; 95(1): 1–11 (Reference 23).

- ○ Paragraph 4, lines 6-7: "Previous research has shown that with health insurance, vaccine coverage can increase", this statement may be too simple, it needs rephrasing.

- ○ Paragraph 5: You pointed out that residents of rural areas are more likely to receive the TT vaccine, and you attributed that to their obedience to their doctors and nurses. Well, perhaps there are other justifications; maybe physicians in rural areas - who usually work in health units or hospitals affiliated to the ministry of health (MOH) - are more committed to vaccinate or recommend vaccination to their female clients. Maybe females in urban areas rely more on private physicians who may not always adhere to the instructions and regulations of the MOH regarding vaccination.

- ○ Paragraph 6: You found that women who visited the health facility were more likely to receive the TT vaccine, then you started explaining your finding. You gave a good interpretation, however, some information was repeated, e.g "Routine visits to the health facilities can also overcome obstacles that have previously been a barrier to vaccines, including a lack of knowledge and excessive concern about the side effects of the vaccine". This is a repetition of what you have just said. You may rephrase this paragraph to explain your point without redundancy.

- ○ Paragraph 7: The same comment as paragraph 6. Please rephrase this paragraph to avoid redundancy.

- ○ Paragraph 7, line 4 "Although the TT vaccine is actually a requirement before marriage takes place", please identify the regulations and policy of the Ministry of Health in Indonesia regarding TT vaccination for females.

- ○ Paragraph 7, line 5 "vaccine can be missed because of the assumption that you have received the vaccine before", isn't there vaccination cards or records to refer to by the health personnel to make sure that the female client has been vaccinated? Is vaccine given only in health facilities affiliated with the MOH or it may be administered in private clinics? Please clarify.

- ○ Paragraph 7, lines 5-6: "There is still the assumption that the vaccine is not necessary", you need to elaborate a little more on this point and identify the rationale beyond this assumption.

Conclusion
- ○ Line 1: "we found there to be a gap in the TT vaccine uptake among women aged –49 years old in Indonesia", if you mean the age group 35-49 then this conclusion contradicts your findings as this group is the highest in vaccine uptake. If you mean 15-49 then you need to explain your conclusion, especially that your results (Table 2) and your Discussion ("However, it can be seen in this study that the respondents' awareness of the importance of the TT vaccine is very high") referred to the high TT vaccine coverage rates.

- ○ Lines 2-3: "Indonesia as a whole, which is an archipelago, is one of the considerations and constraints involved in the coverage of the TT vaccine among women", you need to clarify this point a little.

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

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

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

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

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

Are the conclusions drawn adequately supported by the results?
Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Behavioral Sciences, Health promotion, Health Education

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

Author Response 22 Aug 2021
Hidayat Arifin, Universitas Padjadjaran, Bandung, Indonesia

Dear Dr. Azza Mehanna,

Thank you very much for the comments and suggestions. Here we put some revisions based on your suggestions.

Paragraph 1, last line: Reference 6 is not in English, and on opening it, it seemed to lack some important details such as the target year for national and regional vaccine coverage of at least 90% and 80% respectively and it (target year) was not mentioned in the manuscript either.
- ○ Thank you for the correction. The Government of Indonesia through the regulation of the Minister of Health no 12 of 2017 concerning the implementation of immunization stipulates a national immunization coverage of at least 90% and immunization

coverage in districts/cities of at least 80%.

Also: "as an advanced vaccine", what do you mean?
- ○ Thank you for the correction. We mean "continued vaccine".

Paragraph 2, line 4: Reference 12 is rather old, aren't there more recent updates for these figures?
- ○ Thank you for the suggestion. We have found and added the more recent data. "Minimum 2 doses of TT vaccine were identified can reduce neonatal mortality"

Also: "and by 45% after the second dose", I don't think this percentage is correct, infant mortality shows more decrease after the second dose.
- ○ Thank you for the correction. In line with the addition of recent data in references 1 and 12 (paragraph 2), we also update this percentage. "TT vaccination contributes to the reduction of neonatal mortality due to tetanus by 85% from 2000 to 2018".

Paragraph 2, line 7: Reference 16 is rather old, try to find more recent data.
- ○ Thank you for the suggestion. We have found and added the more recent data. "TT vaccination contributes to the reduction of neonatal mortality due to tetanus by 85% from 2000 to 2018".

Paragraph 2, lines 7-8: you got the data from DHS 2007, isn't there a more recent DHS? You mentioned DHS 2017 in methodology, why haven't you used it in your review?
- ○ We used 2007 DHS data as an initial overview of TT immunization coverage in the introduction. DHS 2017 data is the data we analyzed, so the review is only written in the method, result, discussion section.

Paragraph 3, line 1: "There are still cases of NT in line with the coverage of the national and regional TT vaccines not yet reaching the target." This statement is not clear and needs to be rephrased.
- ○ Thank you for the correction, we have paraphrased the sentence.

Paragraph 4, lines 1-2: "Women of reproductive age with knowledge of maternal and neonatal tetanus (MNT)", you probably mean poor knowledge, please clarify.
- ○ Thank you for the correction. "Women with poor knowledge of MNT and TT vaccine".

Paragraph 4, line 2: "low TT vaccine are 0.435 times more likely to receive the TT", what do you mean by low tetanus toxoid vaccine? "0.435 times more likely to receive the TT vaccine": this is not a good interpretation of the odds ratio.
- ○ Thank you for the correction. We have revised it to be less likely to receive the TT vaccine.

I found some difficulty checking on some references, e.g references 6 and 27, as they were written in a different language.
- ○ Thank you for your attention. We used those references because they are related to the statements.

Sample, lines 3-4: "We managed to reach 36,028 women aged 15– 49 years who have not received the TT vaccine in Indonesia", how did you reach them? Did you give them questionnaires? Please clarify.

○ In this study, we used secondary data from the Indonesian Demographic Health Survey (IDHS) 2017 that is part of the Inner-City Fund (ICF) International data. All the data collection was collected by questionnaire and managed by IDHS. Thus, we managed to reach 36,028 women aged 15– 49 years who have and have not received the TT vaccine in Indonesia.

Why haven't you been able to study the whole population mentioned (49,627)? Please clarify.

○ We were not the whole population to be analyzed because we found many missing data and should be excluded. We weighted the data set to make sure the equal portion in each province of Indonesia. Then, we used syntax "keep if" in STATA to exclude the missing data from the analysis.

This sample of women (36,028) comprises those who received and those who did not receive the vaccine according to Table 1 and not only those who have not received the vaccine as you mentioned.

○ Thank you, we have revised it. We managed to reach 36,028 women aged 15– 49 years who received and did not receive the TT vaccine in Indonesia.

Sample, line 4: "Two-stage stratified cluster sampling was used", what are the two stages? Stratified according to what?

○ The sample was obtained through a two-stage stratified cluster sampling technique including select clusters from each stratum and a list of households in selected clusters. The researchers then selected the households to be interviewed.

Tables 3 and 4: You don't need to put *P<0.1 in the footnotes.

○ Thank you for the correction.

Table 3, last row: Is the value "0.091" the correct value of $\chi 2$? Please check.

○ Yes, the analysis is correct based on chi-square analysis.

Table 3: Why have you calculated percent from total not from independent variable?

○ Because we would like to know the distribution of the percentage of each category.

Table 4, line 2: "and health insurance", it is better to say "and having health insurance".

○ Thank you for the correction.

Paragraph 2, line 2: "Indonesia, which is an archipelago region, can be an inhibiting factor regarding vaccine coverage". This statement needs rephrasing and clarification.

○ Thank you for your suggestion. Indonesia is a country that has many islands. This geographical condition can affect the coverage in vaccination because it affects the access, availability, distribution of the vaccine supply chain between islands.

Paragraph 2, lines 7-9: "However, it can be seen in this study that the respondents' awareness of the importance of the TT vaccine is very high. This is consistent with the previous research which states that vaccine coverage can be influenced by region, development, knowledge and self-awareness": "vaccine coverage can be influenced by region, development": From the context, it seems that you refer to a direct relationship. However, this contradicts your findings as vaccine coverage in Bali and Nusa Tenggara is high (83.66%), despite having a high percentage of the poorest (48.38%) and a relatively low percentage of the richest (10.94%).

- Thank you for the correction. We have deleted the sentence because of incoherence with the previous sentences.

"self-awareness": Self-awareness was not studied in this research and it is a totally different concept, I think you mean awareness of the disease and vaccine.

- Thank you for the correction.

"it can be seen in this study that the respondents' awareness of the importance of the TT vaccine is very high": Awareness of the vaccine and of its importance was not studied in this research, in fact, awareness of the vaccine and of its importance could just be some of the possible factors underlying high coverage rates. You may point to awareness as an inference not as a finding. Please note that awareness of the vaccine is not the same as awareness of the importance of the vaccine.

- Thank you for the correction. We have deleted the sentence because of incoherence with the previous sentences.

Paragraph 3: Why do you relate your studied variables as age and education to knowledge and you continue referring to it (knowledge) despite not being studied in this research? In fact, many other variables could underlie and explain high coverage, such as: applying a good coverage policy, life experiences and beliefs, culture, physicians' attitude and behavior regarding vaccine, availability and accessibility of vaccine, and social support/pressure.

- We discussed age, knowledge, and level of education because we found many references about it. Moreover, we added that less experience, beliefs, and support from family are also related in this case.

Paragraph 3, line 7: "the previous study", which study? You put two references not one.

- We mean both previous studies.

Paragraph 4, lines 1-2: "It is known that respondents with a wealth quintile that is higher and those with a job are more likely to receive the TT vaccine compared with the respondents whose economic level is low and who do not work": "it is known that": From where? Opposite findings are displayed in other studies, for example, Mehanna A, Ali MH, Kharboush I: Knowledge and health beliefs of reproductive-age women in Alexandria about tetanus toxoid immunization. J Egypt Public Health Assoc. 2020; 95(1): 1–11 (Reference 23).

- We wrote the sentence referring to the result of our study.

Paragraph 4, lines 6-7: "Previous research has shown that with health insurance, vaccine

coverage can increase", this statement may be too simple, it needs rephrasing.
  ○ Previous research has shown that with health insurance, vaccine coverage can increase. It was because people should not think about the payment for the TT vaccine. It can be one of the programs from the government to reach high vaccination coverage.

Paragraph 5: You pointed out that residents of rural areas are more likely to receive the TT vaccine, and you attributed that to their obedience to their doctors and nurses. Well, perhaps there are other justifications; maybe physicians in rural areas - who usually work in health units or hospitals affiliated to the ministry of health (MOH) - are more committed to vaccinate or recommend vaccination to their female clients. Maybe females in urban areas rely more on private physicians who may not always adhere to the instructions and regulations of the MOH regarding vaccination.
  ○ Thank you for the suggestion. We have elaborated the sentence. Rural residents rely more on health workers where they live. In this context, it is the midwife who mostly works in remote villages. Rural residents trust these midwives and regard the midwife as a link between them and the health care facilities provided by the government.

Paragraph 6: You found that women who visited the health facility were more likely to receive the TT vaccine, then you started explaining your finding. You gave a good interpretation, however, some information was repeated, e.g "Routine visits to the health facilities can also overcome obstacles that have previously been a barrier to vaccines, including a lack of knowledge and excessive concern about the side effects of the vaccine". This is a repetition of what you have just said. You may rephrase this paragraph to explain your point without redundancy.
  ○ Thank you for your suggestion. We have paraphrased the sentence. This study found that the women who visit the health facility are more likely to receive the TT vaccine. Visiting the health facility will increase their information and knowledge related to vaccines. In addition, each visit can increase their closeness and bond with the health workers. This can convince the women aged 15–49 years old to have the TT vaccine. A visit to a health care facility provides an opportunity for women to clarify and address their concerns regarding the side effects of vaccines by consulting directly with their doctor or nurse. Rumors circulating in the community regarding the TT vaccine also can be explained through counselling during the visits. One of the rumors is that the content of the vaccine material is not halal, so there is resistance from some women. Health workers like the doctors and nurses are needed to clarify the problem.

Paragraph 7: The same comment as paragraph 6. Please rephrase this paragraph to avoid redundancy.
  ○ Thank you for your suggestion. We have paraphrased the sentence. Those who are divorced are less likely to receive the TT vaccine. This is related to the decrease or absence of motivation from the partner. Women who have lived alone tend to have different views after a divorce. Focus and priorities in life may no longer lead to the fulfillment of health support such as vaccines, but rather to be economically independent and able to meet the needs of daily life.

Paragraph 7, line 4 "Although the TT vaccine is actually a requirement before marriage takes place", please identify the regulations and policy of the Ministry of Health in Indonesia regarding TT vaccination for females.
  ○ Thank you, we have deleted the sentences because they are not relevant to the previous sentences.

Paragraph 7, line 5 "vaccine can be missed because of the assumption that you have received the vaccine before", isn't there vaccination cards or records to refer to by the health personnel to make sure that the female client has been vaccinated? Is vaccine given only in health facilities affiliated with the MOH or it may be administered in private clinics? Please clarify.
  ○ Thank you, we have deleted the sentences because they are not relevant to the previous sentences.

Paragraph 7, lines 5-6: "There is still the assumption that the vaccine is not necessary", you need to elaborate a little more on this point and identify the rationale beyond this assumption.
  ○ Thank you for your correction, we have rewritten the sentence.

Line 1: "we found there to be a gap in the TT vaccine uptake among women aged –49 years old in Indonesia", if you mean the age group 35-49 then this conclusion contradicts your findings as this group is the highest in vaccine uptake. If you mean 15-49 then you need to explain your conclusion, especially that your results (Table 2) and your Discussion ("However, it can be seen in this study that the respondents' awareness of the importance of the TT vaccine is very high") referred to the high TT vaccine coverage rates.
  ○ Thank you, we mean gaps among women aged 15-49 years. We have revised the sentences. "However, it can be seen in this study that the respondents' awareness of the importance of the TT vaccine is very high" referred to the high TT vaccine coverage rates in Bali and Nusa Tenggara regions.

Lines 2-3: "Indonesia as a whole, which is an archipelago, is one of the considerations and constraints involved in the coverage of the TT vaccine among women", you need to clarify this point a little.
  ○ Thank you, we have clarified it.

Competing Interests: None

Reviewer Report 09 August 2021

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Muhammad Hardhantyo iD

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1. Please clarify the sudden increase of pregnant TT vaccine coverage in Indonesia from 2007 to 2008. It was mentioned that the vaccine coverage was 26% in 2007 and significantly increased to 65.2% in 2008. The strategies might benefit to improve the coverage in reproductive age women vaccination also.

2. Please determine the framework or theoretical model to decide the independent variables used in the study.

3. How was the categorization of household wealth determined by the authors of this article?

4. Please clarify the sampling method used in the articles, in the sample section the authors managed to reach **36,028** women aged 15– 49 years **who have not received the TT vaccine in Indonesia**. However, in the results section, the authors found that **the coverage of the TT vaccine** in Indonesia reached **75.32% out of the 36,028** respondents. Both statements were contradictory.

5. Please explain the process of handling the missing data and whether these might cause a bias in the estimation of parameters.

6. To reduce the number of tables, Tables 1 and 2 could be combined together.

7. Need to add 1 row to correct the position of the p-value and 95% Confidence Interval column in Table 4.

8. Underprivileged communities such as poor, low-educated women, single parents did not have any health insurance and the unemployed were less likely to have received TT vaccination compared to their counterparts. However, an interesting finding in the rural area where rural women are more likely to have received TT vaccination. Authors need to find more explanations and references.

9. Please provide reference to this statement "*The information obtained by the rural residents tends to be more centralized and there is no intervention from other sources such as the internet and minimizing false news; the information will be centered on the doctors, nurses and midwives visited at the health facility as a result. This is in contrast to the urban residents who prefer to obtain their health-related information independently. They tend to compare the results of the information obtained from the internet with that of the doctors, nurses, and midwives at the health facilities*."

10. In the Discussion section, please have a comment on any current public health efforts from the Indonesian government to increase immunization coverage?

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

Yes

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

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

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

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

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Health Policy, Epidemiology, Child Health, Maternal Health

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

Author Response 22 Aug 2021

Hidayat Arifin, Universitas Padjadjaran, Bandung, Indonesia

Dear Muhammad Hardhantyo, PhD.

Thank you very much for the comments and suggestions. Here we put some revisions based on your suggestions.

1. Please clarify the sudden increase of pregnant TT vaccine coverage in Indonesia from 2007 to 2008. It was mentioned that the vaccine coverage was 26% in 2007 and significantly increased to 65.2% in 2008. The strategies might benefit to improve the coverage in reproductive age women vaccination also.
   ○ Thank you for the suggestion. The difference in coverage from the highest and lowest during the period was possible due to differences in perceptions of the operational definition, problems in recording, reporting formats, and others. So there needs to be an effort to organize a recording and reporting system for pregnant women TT vaccination.

2. Please determine the framework or theoretical model to decide the independent variables used in the study.
   ○ Thank you for the suggestion. The independent variables in this study were obtained

from similar previous research variables, then adjusted to the demographic data in Indonesia.

3. How was the categorization of household wealth determined by the authors of this article?
   - ○ The wealth quintiles were divided into five categories based on principal component analysis (PCA). The wealth quintiles were measured by the percentage distribution of the de jure population using the wealth quintiles and the Gini coefficient. For the percentage distribution, the numerators were divided by the denominators multiplied by 100. The results were then divided into five equal parts from quintile one (poorest) to quintile five (richest); each included 20% of the total population. Then, it was categorized into the poorest, poorer, middle, richer, and richest respectively.

4. Please clarify the sampling method used in the articles, in the sample section the authors managed to reach 36,028 women aged 15– 49 years who have not received the TT vaccine in Indonesia. However, in the results section, the authors found that the coverage of the TT vaccine in Indonesia reached 75.32% out of the 36,028 respondents. Both statements were contradictory.
   - ○ Thank you for the correction. We have mistaken the sentences. We reached 36,028 women aged 15– 49 years who have and have not received the TT vaccine in Indonesia.

5. Please explain the process of handling the missing data and whether these might cause a bias in the estimation of parameters.
   - ○ In the beginning, we weighted the data set to make sure the equal portion in each province of Indonesia. Then, we used syntax "keep if" in STATA to exclude the missing data from the analysis.

6. To reduce the number of tables, Tables 1 and 2 could be combined together.
   - ○ We combined Table 1 and Table 2.

7. Need to add 1 row to correct the position of the p-value and 95% Confidence Interval column in Table 4.
   - ○ Yes, we have added the suggestion.

8. Underprivileged communities such as poor, low-educated women, single parents did not have any health insurance and the unemployed were less likely to have received TT vaccination compared to their counterparts. However, an interesting finding in the rural area where rural women are more likely to have received TT vaccination. Authors need to find more explanations and references.
   - ○ Thank you for the suggestion. "Number of midwives in rural to remote areas facilitate access for pregnant women to check up pregnancy, including the TT vaccine".

9. Please provide reference to this statement "The information obtained by the rural residents tends to be more centralized and there is no intervention from other sources such

as the internet and minimizing false news; the information will be centered on the doctors, nurses and midwives visited at the health facility as a result. This is in contrast to the urban residents who prefer to obtain their health-related information independently. They tend to compare the results of the information obtained from the internet with that of the doctors, nurses, and midwives at the health facilities."

- ○ Thank you for the suggestion. We have added the references. "The information obtained by the rural residents tends to be more centralized and there is no intervention from other sources such as the internet and minimizing false news; the information will be centered on the doctors, nurses and midwives visited at the health facility as a result. This is in contrast to the urban residents who prefer to obtain their health-related information independently. They tend to compare the results of the information obtained from the internet with that of the doctors, nurses, and midwives at the health facilities."

10. In the Discussion section, please have a comment on any current public health efforts from the Indonesian government to increase immunization coverage?

- ○ Thank you for the suggestion. The Indonesian government has many efforts to increase the TT vaccination coverage, such as equitable availability of midwives in rural to remote areas and regulations that require brides to be vaccinated TT according to government regulation number 02 of 1989 about Tetanus Toxoid Immunization before marriage.

Competing Interests: None

Reviewer Report 23 July 2021

https://doi.org/10.5256/f1000research.56345.r87631

✅   **Heri Kuswanto**

Center for Disaster Mitigation and Climate Change, Institut Teknologi Sepuluh Nopember, Surabaya, Indonesia

This paper has been written very well, with a structure that is easily understood. However, there is a minor comment that might be considered to improve the quality of the paper:

The interpretation of the logistic regression model is done partially without trying to interrelate the finding on another variable. In this paper, since the authors did not conduct a collinearity test, some findings need to be clarified further. For instance, I guess women in rural areas are mostly without insurance, but the statistical test showed that either women in rural areas or women with insurance are likely to be vaccinated. This finding seems to contradict each other which might be

caused by a high degree of correlation between variables (considering the fact that the odds ratio is also very close to 1). If it is difficult to be done, I would suggest that the authors state the assumption of no significant correlation among predictors.

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

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

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

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

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

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Statistical data analysis, econometrics

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

Author Response 22 Aug 2021

Hidayat Arifin, Universitas Padjadjaran, Bandung, Indonesia

Dear Prof. Heri Kuswanto

Thank you very much for your comments and suggestion to improve the quality of our manuscript. we have added in the limitations of the study that there is the assumption of no significant correlation among predictors.

Competing Interests: None

Comments on this article

Version 1

Reader Comment 14 Jul 2021

Yohanes Andy Rias, Taiwan Medical University, Taipei, Taiwan

It is an interesting topic where the authors raised the topic of the tetanus toxoid vaccine among women aged 15–49 years in Indonesia. It can be useful information to readers around the world and especially in Indonesia.

Competing Interests: None

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