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Research

The Impact of Exposure to Information Technology in Determining Women's Knowledge of Complication during Pregnancy, Labor, and Postnatal

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ABSTRACT

Background: Indonesian Demographic Health Survey (IDHS) 2012 reveals that Maternal Mortality Ratio (MMR) in Indonesia is 359 per 100,000 live births or increase from 228 per 100.000 live births in 2007. Compared to the other ASEAN countries, the risk of maternal death in Indonesia is also relatively high, 1 in 65 mothers. Some researches depict that maternal death is caused by inadequate care during pregnancy and delivery (labor). This condition is caused by the availability of health facility or improper health seeking behaviors. Considering the crucial role of knowledge to determine people behaviors, this paper is aimed to discuss the impact of information technology to shape people knowledge on maternal health.
Subjects and Method: Some variables in Indonesian Health Demographic Survey 2017, identify the subject's knowledge on danger sign of complication during pregnancy, labor/delivery and postnatal periods. In digitalized era, the knowledge may come from many sources. Therefore, the discussion will focus on the impact of subject's accessibility and utilization of internet, mobile phone, radio, TV and newspaper in shaping knowledge of maternal health.
Results: This study found that women with primary education (OR= 1.57; p < 0.001), did not access the internet (OR= 2.49; p= 0.110); the frequency of accessing the internet for health (OR= 1.94; p= 0.083) increased women's knowledge about dangerous signs during pregnancy. While not reading newspapers (OR= 0.66; p < 0.001); not watching television (OR= 0.66; p<0.001), having or not having television (OR= 0.59; p < 0.001); do not have a mobile phone (OR= 0.64; p<0.001); not having a radio (OR= 0.88; p < 0.001) decreased women's knowledge of the danger signs during pregnancy, but this result was statistically significant.
Conclusion: This result reveal that the effectiveness of internet to influence women knowledge on maternal health must be improved because of its potential in this digitalized era and the progressive trend of internet penetration in Indonesia.

Keywords: women health, pregnancy, information technology.

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BACKGROUND

Maternal death is the death of a woman while pregnant or within 42 days after birth, regardless of the length and location of the pregnancy or its handling, but is not caused by accident or accident (WHO, 2004). Statistics of maternal death are important parameter for assessing the

health status of a country, especially in developing countries where high cases of maternal mortality have been found (Titilayo et al., 2015).

The United Nations has set a new target related to maternal mortality in the SDGs third goal, which is targeted by 2030 all UN member states can reduce maternal mortality to less than 70 deaths per 100,000 live births. Indonesia as a member of the United Nations is certainly required to participate in achieving this target. The government has also taken various ways, such as the provision of birth insurance which is used for pregnancy checks, delivery assistance, family planning services, etc. These efforts are in line with the previous global agenda namely as Millennium Development Goals (MDGs). MDGs targets are set to be accomplished on 2015. One of the targets is reducing maternal mortality by three quarter during the periods of 1990 to 2015. Although various government efforts to reduce maternal mortality have been implemented, these efforts have not been able to bring Indonesia to achieve the desired target of MDGs for maternal mortality.

Indonesian Demographic Health Survey (IDHS) 2012 reveals that Maternal Mortality Ratio (MMR) in Indonesia is 359 per 100.000 live births or increase from 228 per 100.000 live births in 2007. Compared to the other ASEAN countries, the risk of maternal death in Indonesia is also relatively high, 1 in 65 mothers. While in Thailand is only 1 in 1,100 mothers (MoH and UNFPA, 2012). These figures indicate that maternal mortality still becomes one main problem in Indonesia. The problem is not only obvious from the high level of MMR but also the tendency that Indonesia's MMR does not experience much change in its level. Indonesia's MMR remains high and does not reach the MDGs Target of MMR.

There are some direct causes and indirect causes of maternal mortality in Indonesia (Soedarmono, 2017). Direct causes of maternal death relate to the maternal health condition of the pregnant women or complication during pregnancy, child birth, and postpartum. Indirect causes are education, economy status, position, and role of the pregnant women. These aspects lead to delay in recognizing dangerous sign and making decision. Therefore, managing the problem of maternal death must deal with the indirect causes since it will stimulate many bad consequences and detrimental for women health. Similarly, WHO (2019) states some factors may prevent women from receiving or seeking care during pregnancy and child birth are poverty such as distance, lack of information, inadequate services, and cultural practices.

On the other hand, majority of maternal death is preventable and curable. Some researches depict that maternal death is caused by inadequate care during pregnancy and delivery (labor). This condition is caused by the availability of health facility or improper health seeking behaviors. Then the government concern on provision of health infrastructure to overcome the problem. Unfortunately, the MMR trend shows that provision is not the only solution to improve maternal health. The availability of facilities presents minimum impact for maternal health if the demand to utilize the infrastructure is quite low.

Theory of planned behaviors mentions the position of intention or motivation to shape behaviors. In this theory, the intention is determined by attitude towards the behaviors, subjective norms, and perceived behavior control (Ajzen, 1991). To do an action, a person will be influenced by the rational consideration

which is built from knowledge, surrounding norm and his/her expectation. Some reserach revealed the positive impact of knowledge to determine people's behaviour. A recent study in Gorontalo, Indonesia, depicts that people's knowledge has positive correlation with attitude for preventing COVID-19 (Ramadhani and Nuryani, 2020). Another research also illustrates similar conclusion. People knolwledge on the sign and symptoms of tuberculosis is in line with the adequate treatment (Saputra et al, 2020). In this case, the kwonledge of TB symptoms determine the health seeking behaviour and hinder the delay of acquiring appropiate treatmets.

Knowledge and awareness about the health of pregnant women was determining the death rate (Utami et al., 2019). From Utami's research, around 57.14 percent of pregnant women have already obtained the knowledge about maternal health. Pregnant women need to be facilitated by government in Mom's Program Magic Car (MMC) to increase knowledge maternal health services that include classical music therapy, online internet, and Interactive CDs (Mikrajab and Rahmawati, 2012). Moreover, knowledge takes a crucial role to determine people's behaviors. In digitalized era, the knowledge may come from many sources, and the impact of information technology can shape people's knowledge on maternal health. Knowledge from that various sources can make people know more about the danger sign of complication during pregnancy, labor/ delivery and postnatal periods, which can help people to prevent maternal mortality through proper precautions. This paper aims to see how these various information sources impact people's knowledge about maternal health and focus on the impact of subject's accessibility and utilization of internet, mobile phone, radio, TV and newspaper in shaping knowledge of maternal health in Indonesia.

There are several studies which have been conducted related to the topics discussed in this paper. Mass media (television, radio, and newspaper) has potential to disseminate information about maternal health care that can improve well-being for mothers and infants, particularly among women with limited educational attainment (Fatema and Lariscy, 2020). Most of the health information seekers in Iran as developing country are passive information seekers than active ones and most common information resource for seeking health information was television (Gavgani et al., 2013). Individuals who learn health information from a variety of television programs are more health oriented than individuals who do not learn health information from the television programs (Dutta, 2007). Mobile phone offers an opportunity to overcome barriers that limit access to quality maternal and child health. Mobile phones such as SMS-based alert system can help women, their families, and local health workers to seek timely, appropriate medical help for an obstetric and new born emergency by reducing the time that elapses between a health crisis and care (Ngabo et al., 2012). Related to education level, the higher education of women, the higher of knowledge pregnancy danger sign she has (Wulandari and Laksono, 2020).

In 21's century, information technology has potential influence to citizen lives in most area. Individuals and household use personal computers, the internet, and mobile phone which are often referred as information technology or information and communication technology (Sara, 2006). Internet as part of information technology has some function which are communication function, information retrieval function, and information search function

(Setiawan, 2009). The number of internet user in Indonesia 2017 54.68%, of Indonesia total population 262 million people (APJII, 2017).

The Internet-enabled knowledge discovery process contains the steps human resource identification, problem specification, data prospecting, domain knowledge elicitation, methodology identification, data pre-processing, pattern discovery, and knowledge post-processing (Buchner et al., 1999). The internet as information source during pregnancy to meet the information needs regarding pregnancy, birth, and postpartum period did not play a significant role in information seeking for more than half of the pregnant women from non-English speaking background in the study because existing sources of information may not meet the needs and the resources may only be provided in English or a few other common languages (Grimes et al., 2014). More educated people, use the internet more effectively for information needs, whereas the less educated seems to be interested for entertainment function of the internet (Bonfadelli, 2002).

Research conducted by Gyawali et al. (2013) on knowledge and practices on maternal health care among mothers from rural areas of mid-western development region Nepal showed that three quarters of the participants had correct knowledge regarding minimum numbers of antenatal visits to be done by a pregnant woman (Paneru et al., 2013). Mustafa (2020) also conducted a study about knowledge, attitude, and practice regarding maternal health care services using primary data by interviewing 200 women in Lahore, Pakistan. The study aims to find out the knowledge, and attitude of women regarding antenatal, natal, and postnatal services. The study shows that the level of utilization of maternal health care services is satisfactory. There is a need to educate the married females to regarding utilization of maternal health services to enhance the maternal health and minimize the risk factors in antenatal, natal and postnatal period (Mustafa, 2020).

This part must contain strong rationale for the author to have conducted the current research. The author must formulate the research question and refer the theories that are used to address the research question. This part ends with a statement of the study objective.

SUBJECTS AND METHOD

1. Study Design

The data used in this research is secondary data which comes from Indonesian Demographic Health Survey 2017.This survey was conducted by BPS (Statistics Indonesia Office). The sample of IDHS 2017 covered 34 provinces in Indonesia. The analysis used in this study is descriptive and inferential analysis. Cross tabulation and graphs are deployed to reveal the description of unit analysis or variables included in this research. Data analyse were with logistic regression.

2. Population and Sample

IDHS 2017 applied two stage stratified sampling method (NPFPB, BPS, MoH and ICF, 2018). The first stage selects a number of census block by deploying probability proportional to size method. For information, that BPS has a sampling frame which consists of a list of census block. The total aggregation of census block will cover Indonesian region. The size of census block refers to the number of households live in that area which is recorded during 2010 population census. In this first stage, 1,970 census blocks are selected that represent rural and urban areas. The second stage focused on the selection of 25 households in every selected census block to obtain eligible subject of women aged 15-49 years.

Then, the enumerators visit the sampled households and identified eligible subjects. Based on the IDHS 2017 report, there are 50,730 women were eligible for individual interviews. The result of data collection confirms 98 percent of response rate which mean that 49,627 women competed interviewed.

3. Study Variable

The dependent variable used in this study is the mother's knowledge on the danger sign of complication during pregnancy, labor/ delivery and postnatal periods which is divided into two categories: Do not know (0) and know the danger sign (1). Meanwhile, there are 9 categorical independent variables used in this study such as education attainment, reading newspaper, listening radio, watching tv, use of internet, frequency of using internet, having television, owning mobile phone, and having radio.

4. Operational Definition of Variables

The mother's knowledge on the danger sign of complication during pregnancy, labor/ delivery and postnatal periods which is divided into two categories: do not know (0) and know the danger sign (1).

Educational Attainment refers to the highest level of education that an individual has completed. Categories for education attainment are primary or lower (1), secondary (2), and higher (0).

Reading newspaper, **listening radio, and watching TV** were variables are individual's frequencies to use certain media to get information. Categories for those three variables were not at all (1), less than once a week (2), and at least once a week (0).

Use of internet was a variable that shows whether the subject has ever used the internet or not, the categories used are never (1), yes, before last 12 months (2), and yes, last 12 months (0).

Frequency of using internet was a variable to measure frequency of each subject to use internet, the categories are not at all (1), less than or at least once a week (2), and almost every day (0).

Having television, owning mobile phone, and having radio were variables that indicate the subject's ownership of the media used to obtain information. Categories for these variables are yes (0), and no/ don't know (1).

5. Instrument

The data used in this research is secondary data which comes from Indonesian Demographic Health Survey 2017 (IDHS). IDHS 2017 using questionnaire that is designed to obtain data on a various topic of interest related to health and demography.

6. Data Analysis

This study starts data analysis with perform descriptive statistics using crosstabs and selecting the best model using stepwise regression method. The model is developed by conducting parameter testing simultaneously using G test and partially using Wald test. Binary logistic regression is a regression model with the qualitative dependent variable in the form of a dichotomous category, and independent variables consisting of qualitative and quantitative data (Hosmer et al., 2013), besides that the binary logistic regression model can be used to determine the probability of selecting a category from the dependent variable or to determine the odds ratio between the independent variables and the dependent variable (Agresti, 2003).

The response variable y consists of 2 categories, namely success and failure which is denoted by y = 1 (success) and y = 0 (failure). In such circumstances, the y variable follows the Bernoulli distribution for every single observation. The model in this study is a logit transformation model of logistic regression model.

Each independent variable needs to

have a partial test using the Wald test statistics. Individual test results will show whether a predictor variable is eligible to be included in the model or not.

RESULTS

The dependent variable used in this study is "Knowledge About Danger Signs" which is related to the number of women who know any danger signs that can occur during either pregnancy, labor/ delivery, or postnatal that can threaten the mother and baby. For example, the danger signs during pregnancy in question are such as severe vaginal bleeding, difficulty defecating, headaches, and others. Then the danger signs during labor/ delivery are prolonged labor, retained placenta, convulsions, and others. Lastly, the postnatal danger signs include postpartum depression, swelling, and abnormal bleeding.

The results of data processing are presented in the form of graphs and tables. The results of data processing using the graph shown in Figure 1 show that there are 58.9 percent of women who know about the danger signs during either pregnancy, labor/ delivery or postnatal, while 41.1 percent of women still do not know the danger signs. When viewed by area of residence, the percentage of women who know about the danger signs during pregnancy, labor/ delivery or postnatal is more found in urban areas where 59.6% know these signs, while in rural areas there are only around 58.2% (Figure 2). Then when viewed based on the type of knowledge related to danger signs, the percentage of women who know the danger signs during labor/delivery is more than those who know the danger signs during pregnancy and postnatal where 51.5% of women know the danger signs during labor/ delivery, 47.5% know the warning signs danger during pregnancy, and only 36.9% were aware of the postnatal danger signs (Figure 3).

This study found that there are some differences about how many subjects know about dangerous sign during pregnancy (see Table 2). From here, it can be seen that women who don't have TV know less about dangerous sign during pregnancy than women who have TV. It also can be seen that women who own a mobile phone know more about dangerous sign during pregnancy than women who don't own a mobile phone.

Table 3 shows the result of stepwise regression using SPSS software that formed a logistic regression model. Table 3 shows that women with primary education (OR= 1.57; $p < 0.001$), did not access the internet (OR= 2.49; p= 0.110); the frequency of accessing the internet for health (OR= 1.94; p= 0.083) increased women's knowledge about dangerous signs during pregnancy. While not reading newspapers (OR= 0.66; $p < 0.001$); not watching television (OR= 0.66; $p<0.001$), having or not having television (OR= 0.59; $p < 0.001$); do not have a mobile phone (OR= 0.64; $p<0.001$); not having a radio (OR= 0.88; $p < 0.001$) decreased women's knowledge of the danger signs during pregnancy, but this result was statistically significant.

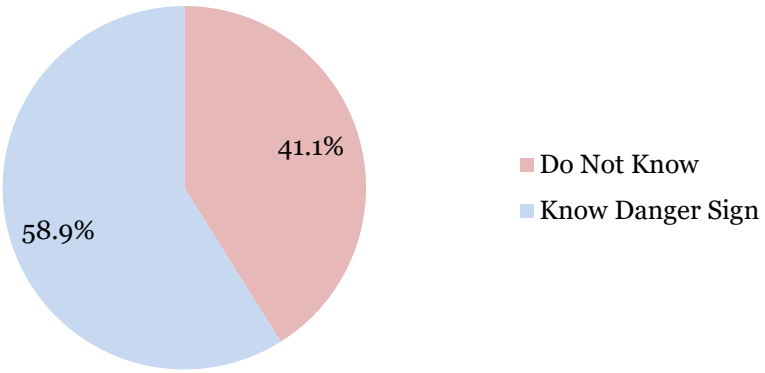

Figure 1. Women's Knowledge About Danger Sign

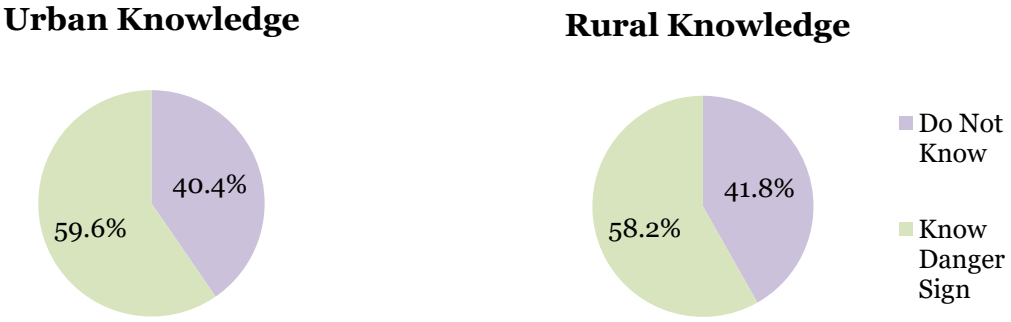

Figure 2. Women's Knowledge About Danger Sign by area of residence

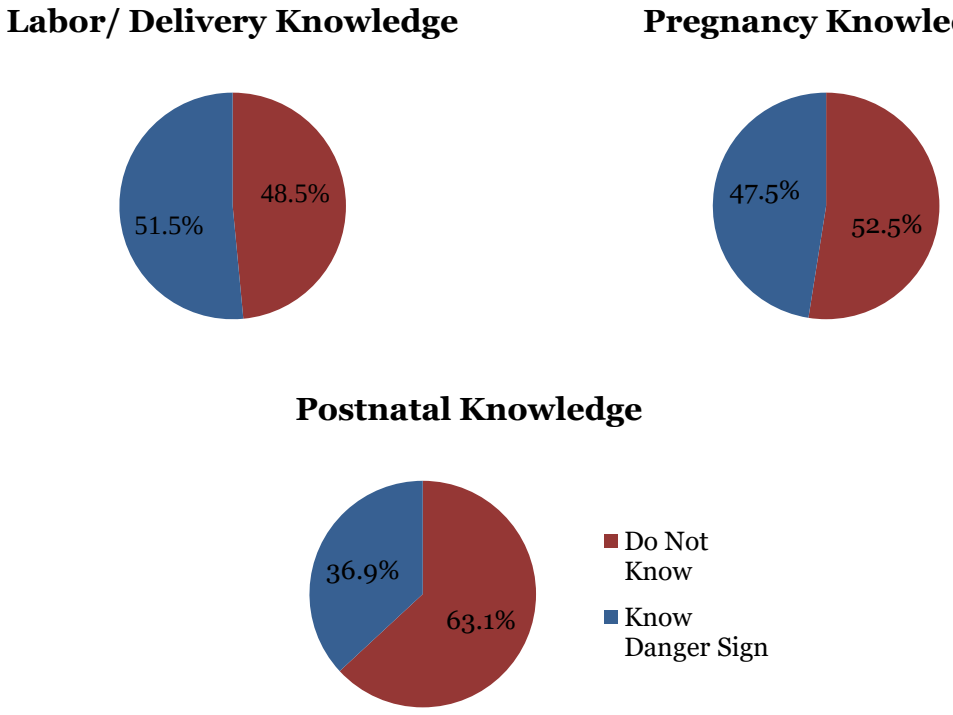

Figure 3. Women's Knowledge About Danger Sign by type of knowledge

Table 2. Characteristics of women's knowledge about dangerous sign during pregnancy

Variables	Do not know	Know Danger Sign	Total
Education Attainment			
Primary or Lower	38.24	61.76	100
Secondary	41.60	58.40	100
Higher	44.65	55.35	100
Reading Newspaper			
Not At All	39.95	60.05	100
Less than once a week	42.73	57.27	100
At least once a week	42.96	57.04	100
Listening Radio			
Not At All	40.46	59.54	100
Less than once a week	42.30	57.70	100
At least once a week	41.54	58.46	100
Watching TV			
Not At All	55.84	44.16	100
Less than once a week	48.50	51.50	100
At least once a week	39.38	60.62	100
Use of Internet			
Never	33.50	66.50	100
Yes. before last 12 months	35.91	64.09	100
Yes. last 12 months	49.22	50.78	100
Frequency of Using Internet			
Not At All	33.57	66.43	100
Less than or at least once a week	47.01	52.99	100
Almost every day	50.08	49.92	100
Having Television			
No / Don't Know	55.00	45.00	100
Yes	39.53	60.47	100
Owning Mobile Phone			
No	42.29	57.71	100
Yes	40.78	59.22	100
Having Radio			
No / Don't Know	41.73	58.27	100
Yes	38.97	61.03	100

DISCUSSION

According to Petty and Potter (2006) that one of the factors that influence pain is age, different ages will give different responses to pain. Based on the data which is used in this study (Indonesia Demographic Health Survey 2017). It can be concluded that women's education attainment, frequency of reading newspaper, frequency of watching TV, women's ownership of television, mobile phone, and radio has association with the women's knowledge of dangerous sign but there is anomaly for accessing internet. This is in line with some other research, such as research by Wulandari and Laksono (2020) that stated that the level of education is in line with the level of knowledge about dangerous signs during pregnancy. This is also in line with Dutta (2007) that stated that individuals who learn health information from a variety of television programs are more health oriented than individuals who do not learn health information from the television programs.

Table 3. Stepwise Regression Result

Variable	B	OR	p
Education Attainment			
Primary or Lower	0.45	1.57	<0.001
Secondary	-0.24	0.79	<0.001
Reading Newspaper			
Not at all	-0.14	0.87	<0.001
Less than once a week	-0.12	0.89	0.001
Watching TV			
Not at all	-0.4	0.66	<0.001
Less than once a week	-0.26	0.77	<0.001
Use of Internet			
Never	0.92	2.49	0.110
Yes. before last 12 months	0.52	1.67	0.242
Frequency of Using Internet			
Not at all	0.36	1.43	0.299
Less than or at least once a week	0.30	1.35	<0.001
Having Television			
No/Don't Know	-0.53	0.59	<0.001
Owning Mobile Phone			
No	-0.44	0.64	<0.001
Having Radio			
No/Don't Know	-0.13	0.88	<0.001
Frequency of Using Internet * Education Attainment			
Not at all * Primary or Lower	-0.99	0.9	0.847
Not at all * Secondary	0.66	1.94	0.083
Less than or at least once a week * Primary or Lower	-0.32	0.73	0.024
Less than or at least once a week * Secondary	-0.09	0.92	0.302
Education Attainment * Use of Internet			
Primary or Lower * Never	-0.93	0.39	0.071
Primary or Lower * Yes. before last 12 months	-0.47	0.62	0.436
Secondary * Never	-0.70	0.49	0.076
Secondary * Yes. before last 12 months	-0.77	0.46	0.106
N Observation = 49,627			
-2 log likelihood = 64148.50			
Nagelkerke R^2 = 7.4%			

DISCUSSION

Subject who accesses internet tend to have lower knowledge on maternal health. The variable interaction of education and frequency of using internet revealed that combination of higher education and using internet every day tend to have higher knowledge on maternal health, however this result did not consistent across different categories. The variable interaction of education and access internet depicted a consistent result that subject with higher education and access internet in the last 12 months have higher knowledge on maternal health. This result reveal that the effectiveness of internet to influence women knowledge on maternal health must be improved because of its potential in this digitalized era and the progressive trend of internet penetration in Indonesia.

Then the study also recommends for government to take the advantages of the

availability of advances information technology. Owning mobile phone and accessing internet is common among the population. This condition is potential resources for health intervention. Unfortunately, this study indicates that accessing internet is not in line with obtaining knowledge on maternal health. This means that the potential resource of advances technology information is still underutilized. Therefore, Government especially Health Department can develop a maternal health information system that is put on the internet such as web and use social media technology (e.g., Facebook, Instagram, and WhatsApp). Moreover, an interactive mobile or android application for pregnant women which is facilitated with maternal health information and interactive discussion or chat with medical workers (doctors/ midwife) must be developed. The information center and application should provide essential information such as an emergency contact for critical condition of pregnant women and show the near location of health facilities.

AUTHORS CONTRIBUTIONS

Teguh Sugiyarto defines the topics, conducts literature review, analyze data, edits the draft and finalize the essay. Joseph Gabriel Napitupulu performs data processing and performs some revisions. Erna Nurmawati develops the literature review, analyze data and edits the drafts.

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This study did not receive funds or sponsors because the data used were secondary data obtained from BPS.

CONFLICT OF INTEREST

This research has no conflict of interest with any party.

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