FACTORS AFFECTING ADEQUATE ANTENATAL CARE UTILIZATION IN INDONESIA: IMPLICATIONS FOR POLICIES AND PRACTICES
--Manuscript Draft--

Manuscript Number:	JPHP-D-20-00441
Full Title:	FACTORS AFFECTING ADEQUATE ANTENATAL CARE UTILIZATION IN INDONESIA: IMPLICATIONS FOR POLICIES AND PRACTICES
Article Type:	Original Article
Abstract:	Maternal mortality causes pregnant women's daily death. Most maternal deaths are preventable with a sufficient quality of antenatal care with timely appropriate. The study aimed to examine factors on adequate Antenatal Care (ANC) utilization in Indonesia. The data was obtained from Indonesian Demographic and Health Survey 2017. Our study outcome was adequate ANC utilization (at least 8 times ANC Visits during pregnancy). The explanatory variables consisted of age, experienced pregnancy termination, number of children, education level, working status, pregnancy problems, wealth index, place of residence, region, health insurance coverage, and barriers to access healthcare facilities. Of 3,738 participants, about 39.8% had inadequate antenatal care visits. There was significant association between adequate ANC utilization with complications, distance to healthcare facility, health insurance coverage, awareness on pregnancy problems, and number of children. Therefore, policymakers should improve healthcare facilities' availability, expand the health insurance coverage, and educate women on the importance of ANC.

FACTORS AFFECTING ADEQUATE ANTENATAL CARE UTILIZATION IN INDONESIA: IMPLICATIONS FOR POLICIES AND PRACTICES

Abstract

Maternal mortality causes pregnant women's daily death. Most maternal deaths are preventable with a sufficient quality of antenatal care with timely appropriate. The study aimed to examine factors on adequate Antenatal Care (ANC) utilization in Indonesia. The data was obtained from Indonesian Demographic and Health Survey 2017. Our study outcome was adequate ANC utilization (at least 8 times ANC Visits during pregnancy). The explanatory variables consisted of age, experienced pregnancy termination, number of children, education level, working status, pregnancy problems, wealth index, place of residence, region, health insurance coverage, and barriers to access healthcare facilities. Of 3,738 participants, about 39.8% had inadequate antenatal care visits. There was significant association between adequate ANC utilization with complications, distance to healthcare facility, health insurance coverage, awareness on pregnancy problems, and number of children. Therefore, policymakers should improve healthcare facilities' availability, expand the health insurance coverage, and educate women on the importance of ANC.

Keywords: Adequate antenatal care, Antenatal care utilization, Antenatal care services, Maternal health, Pregnant women

Introduction

Maternal mortality is one of the significant public health issues in many parts of the world. In 2017, it was estimated that more than 295,000 women died during and following pregnancy and childbirth [1]. Nearly all of the maternal deaths occurred in low-resource settings [1]. In Indonesia, the maternal mortality ratio was approximately 177 deaths per 100,000 live births in 2017 [1]. These numbers are remarkably higher than neighbouring countries such as Singapore, Malaysia, Brunei Darussalam, Thailand, and Vietnam [1].

Antenatal care (ANC) can be defined as the care provided by skilled health-care professionals to pregnant women and adolescent girls to ensure the best health conditions for both mother and baby during pregnancy. The components of ANC include risk identification; prevention and management of pregnancy-related or concurrent diseases; and health education and health promotion. ANC reduces maternal and perinatal morbidity and mortality both directly, through detection and treatment of pregnancy-related complications, and indirectly, through the identification of women and girls at increased risk of developing complications during labour and delivery, thus ensuring referral to an appropriate level of care [2].

Most maternal deaths are preventable by providing a sufficient quality of antenatal care with timely appropriate throughout pregnancy period [2]. ANC services enable pregnant women and adolescent girls to obtain essential public health interventions, including health promotion, screening, diagnosis, and disease prevention [2]. The frequency of antenatal visits and content interventions in each visit is an essential issue in ANC practice [2]. An optimum number of ANC visits has been evaluated and updated the recommendations throughout the decades [2]. In 2002,

WHO Antenatal Care Trial Research Group proposed four antenatal visits with restricted tests, clinical procedures, and follow-up actions as the new model of ANC [3]. The evidence showed that the four ANC visits model had not inferior compare to more frequent ANC in terms of the rate of pre-eclampsia, urinary-tract infection, postpartum anaemia, maternal mortality, low birth weight, and perinatal mortality [4, 5]. However, an updated review in 2010 reported an increased risk of perinatal mortality in women who had reduced numbers of antenatal visits [6]. Furthermore, WHO released a new comprehensive guideline that pointed out 49 recommendations, including antenatal care models with a minimum of eight contacts in 2016 [2].

The compliance of the new ANC model is different across the world [7]. Findings of the Demographic Health Survey (DHS) data indicated that the compliance rate varied across Low and Middle-Income Countries (LMIC), ranging from 14.9% in the Democratic Republic of Congo to 89.1% in Jordan [7]. In Indonesia, almost 60% of women in need of ANC have an adequate number of ANC visits [7]. However, less than half of them had received urine, and blood sample taken and height measured [8]. Moreover, there are substantial regional disparities in ANC utilization between Java-Bali and the rest of the regions [9].

The theoretical framework based on Andersen and Newman's Model [10] of the "Healthcare Utilization" suggests that healthcare service utilization depends on the predisposition of individuals to use healthcare service (predisposing), the ability to access (enabling), and the severity of illness (needs). The predisposing factor comprises demographic characteristics, social structure, attitude, and belief about medical care, healthcare professionals, and diseases [10]. The Enabling factor includes income level, health insurance coverage, availability of healthcare

facilities, region, or type of community residence [10]. Ultimately, The need factor refers to the perceived and actual (clinically evaluated) need for healthcare services [10, 11].

In addition to Anderson and Newman's model, we also examined the explanatory variables of ANC services from the previous studies. Observational studies from Indonesia found that wealth index, maternal and husband's education, working status, type of residence, and region were significantly associated with ANC service utilization [12-16]. Another study used propensity score matching analysis found that health insurance enrolment was associated with a higher probability of receiving at least four ANC visits [17].

The 2016 WHO ANC model aims to provide pregnant women with respectful, individualized, person centred care at every contact and to ensure that each contact delivers effective, integrated clinical practices (interventions and tests), provides relevant and timely information, and offers psychosocial and emotional support by practitioners with good clinical and interpersonal skills working in a well-functioning health system. Given evidence that perinatal deaths increase with only four ANC visits and that an increase in the number of ANC contacts, regardless of the country, is associated with an increase in maternal satisfaction, WHO recommends a minimum of eight contacts: five contacts in the third trimester, one contact in the first trimester, and two contacts in the second trimester (see Table 1). WHO assumes each country will tailor the new model to its context based on the country's defined core package of ANC services and consensus on what care is provided at each contact, who provides ANC care (which health cadres), where care is provided (which system level), and how care is provided (platforms) and coordinated across all eight ANC contacts [2].

Table 1. 2016 WHO ANC Model

Table 1. 2016 WHO ANC model
First trimester
Contact 1: up to 12 weeks
Second trimester
Contact 2: 20 weeks
Contact 3: 26 weeks
Third trimester
Contact 4: 30 weeks
Contact 5: 34 weeks
Contact 6: 36 weeks
Contact 7: 38 weeks
Contact 8: 40 weeks
Return for delivery at 41 weeks if not given birth. *Note:* Intermittent preventive treatment of malaria in pregnancy should be started at ≥ 13 weeks.

Source: (WHO Recommendations on Antenatal Care for a Positive Pregnancy Experience: Summary, 2018)

Despite WHO has introduced the new minimum standard of ANC contact since 2016, all the existing studies still used outdated guidelines for the cut off points of adequate ANC utilization. The goal of the WHO 2016 ANC recommendations is to improve utilization and quality of routine ANC care within the context of person-centred health and well-being as part of a broader, rights-based approach. Successful implementation of these recommendations requires the integrated delivery of maternal, nutrition, immunization, antimalarial, TB, and HIV interventions using ANC as the common platform. Because ANC is often an under-utilized platform for maternal and perinatal health, ANC interventions that are provided through an integrated service delivery platform can support efforts to strengthen health systems [18]. Therefore, this study aimed to examine the factors affecting adequate ANC visits under the new WHO guideline in Indonesia. This study findings would provide insight for the government to develop the public health strategies to improve the compliance of current ANC guideline.

Some terms in maternal and child health care services: Indonesia context

There are two systems of PHC delivery in Indonesia, namely the public and private sectors (see Figure 1). Public PHC services consisting of *Puskesmas* (primary health care center) and their auxiliary networks belong to and are governed by district governments. They conduct two main activities – individual health efforts (UKP) and community health efforts (UKM). Each *Puskesmas* (primary health care center) is responsible for the community health efforts (UKM), consisting of public health activities for the population within their working area. *Puskesmas* (primary health care center) are staffed by multi-professional teams, including general practitioners (GPs) and dentists, nurses, midwives, pharmacists, public health personnel, nutritionists, physiotherapists, and laboratory analysts. On the other hand, private PHC services are delivered by individual practice GPs, midwives, and nurses, as well as private clinics carrying out only individual health efforts (UKP). However, the private facilities have to communicate and collaborate with *Puskesmas* (primary health care center) in terms of the surveillance of communicable diseases and other government public health programmes, such as immunization and family planning. An accreditation system for quality assurance of *puskesmas* (primary health care center) and private PHC facilities has been implemented since 2015 [18]. Integrated service posts called Posyandu, a community-based vehicle to improve health status of women and children that involves increased coverage of health care and intersectoral collaboration since (1983/84-1988/89) [19].
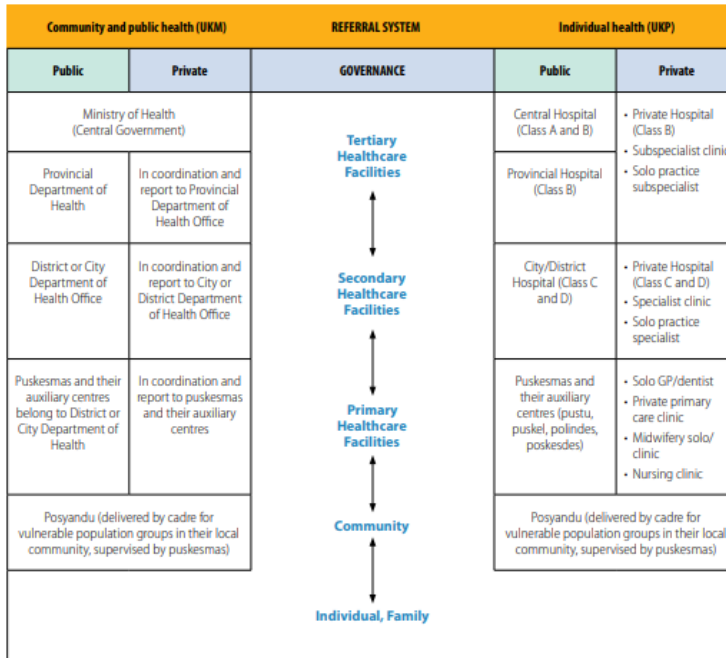
Figure 1. Governance of Indonesia health care delivery system [18]

Materials and methods

This study used data from the Indonesia Demographic and Health Survey (IDHS) 2017. The IDHS 2017 is a nationally representative household survey conducted by the Central Bureau of Statistics Indonesia (BPS) in collaboration with the National Population and Family Planning Board (BKKBN) and the Ministry of Health of Indonesia [20]. The IDHS 2017 provided information on basic demographic and health indicators and an overview of Indonesia's population issues. The data was gathered using a questionnaire by face to face interview. The questionnaires collected the information on background characteristics, fertility, family planning, maternal and child health, awareness on HIV-AIDS and other sexually transmitted infections, and health service utilization.

The sampling design of IDHS 2017 was two stages of stratified sampling. First, the census blocks of the 2010 population census were systematically selected stratified by type of residence (urban vs. rural) and ordered by wealth index. Second, a total of 25 households were systematically

selected from selected census blocks. The final sample of IDHS 2017 involved 19,740 census blocks and 49,250 households. About 49,627 women aged 15-54 years participated in IDHS 2017 [21]. This study only included information from all women who reported giving birth to at least one child in the past year to minimize recall bias. The final sample of this study was 3,738 participants in total.

Study variables

The primary outcome or depended variable of the study was the frequency of ANC visits during the last pregnancy. ANC visits measured whether women received ANC by health professionals such as general practitioners, obstetricians, nurses, midwives, or village midwives. The ANC services could take place in village health post including *Posyandu*, village midwife, mobile clinic, clinic, public health center or *Puskesmas*, specialist clinic, and hospital. WHO recently recommended frequency of ANC visits at least eight times during pregnancy [2]. Therefore, we classified this variable into three categories: 0-3, 4-7, and 8+ visits (adequate).

The explanatory variables included age, experienced pregnancy termination, number of children at home, education level of participants and their husband/partner, current working status, level of pregnancy problems/complications awareness, wealth index, place of residence, region, health insurance coverage, barrier to obtain medical help or visit healthcare facility, such as distance, permission, and money, and number of complications during pregnancy as well.

Pregnancy termination was assessed by asking whether participants had ever had an abortion, stillbirth, or miscarriage. Participants were asked types of signs of danger or complications that

frequently occur during pregnancy, including prolonged labor, vaginal bleeding, fever, convulsions, faint, baby in the wrong position, swollen limbs, breathlessness, and tiredness. We treated this variable as numeric. Each of the complications identified was awarded 1 score. Therefore, the scores of awareness level were ranged from 0 to 9. The barrier to access medical treatment was assessed by asking participants' opinions about the distance to the health facility, obtaining permission to visit the health facility, and getting the money needed to pay for treatment. The answer was in binary options (not a big problem vs. big problem). Ultimately, the wealth index referred to composite multivariate components of the living standard, including assets, property ownership, type of services and amenities, access to the internet, and educational level. The current IDHS 2017 also constructed the living standard based on the urban-rural specific context.

Statistical Analysis

Stata 16.0 MP-Parallel Edition were used for the statistical analysis. The characteristics of respondents were described in frequency and percentage in a cross-tabulation tables based on the frequency of ANC visits. We also described the proportion of the type of ANC services received during pregnancy. The outcome variable was in the form of three-level of ordinal categories. Thus, ordinal logistic regressions were employed to estimate factors affecting adequate ANC visits. However, some variables violated the proportional odds/parallel-lines model assumptions. Ordinal logistic regression test was conducted to overcome this problem. The method is based on a partial proportional odds assumption, which allowed some variables to have varied odds ratios by cut-off point. Using autofit gamma command Stata, we initially put all variables into the model. The goodness of fit of the models was evaluated by examining changes in the Akaike Information

Criterion (AIC). We excluded all non-significant explanatory variables and added back to the model one by one. The results were presented in estimated adjusted odds ratios with a 95% confidence interval.

Ethical Statement

The IDHS 2017 obtained ethical approval from the Institutional Review Board (IRB) of the National Institute of Health Research and Development Ministry of Health. All participants provided a written informed consent prior interview, and the identifications of the respondents, households, and the sample communities were removed from the datasets. We obtained the approval to use datasets for this study from the ICF international as shown in **supplement 1.**

Results and Discussion

Results

A total of 3,738 participants included in the final analysis. The mean age of the participants was 29.06 years old (SD: ± 6.3). About half of the participants lived in Java (54.1%). There were only 17.4% of participants had a tertiary (higher) educational background. Most of the participants (61.7%) came from low and middle economic level. About 63.7% of participants were covered by health insurance. There were 60.2% of participants visit at least eight times to health professionals for antenatal care.

Characteristics of participants

Table 2 depicts the characteristics of participants by frequency to antenatal care visits. Participants aged 15-19 and above 35 years old tended to have a low proportion of adequate antenatal visits than other age groups. The proportion of frequency of 8 or more antenatal visits was slightly higher among participants who had experienced pregnancy terminated than those who had not (62.1% vs. 59.9%). Participants who lived with three or more children had a low proportion (47.8%) of adequate ANC visits. Less than half of the participants (45.7%) who had primary or no education background adequately visited ANC services. In terms of wealth index different, the proportion of adequate antenatal visits among the richest participants was almost double (75.5% vs. 39.0%) compare to those from the poorest households. The proportion of adequate ANC visits was higher among those living in Java & Bali, covered by health insurance, experiencing pregnancy complications, had no problem with distance to the health facility, and permission to visit health facilities and money to pay health services.

Table 2. Characteristics of participants by frequency of ANC visits (N = 3,738)

Variables	Frequency of ANC Visits		
	0-3	4-7	8+
	n (%)	n (%)	n (%)
Predisposing factors			
Age group (years)			
15-19	38 (19.1)	76 (38.2)	85 (42.7)
20-24	81 (11.1)	212 (29.1)	435 (59.8)
25-29	88 (9.1)	223 (23.2)	651 (67.7)
30-34	83 (9.3)	273 (30.5)	539 (60.2)
≥ 35	82 (11.0)	248 (33.3)	415 (55.7)
Ever had pregnancy terminated			
No	324 (10.8)	880 (29.3)	1,799 (59.9)
Yes	47 (9.0)	152 (29.0)	326 (62.1)
Number of children at home			
0-1	127 (9.8)	311 (24.0)	860 (66.3)

Variables	Frequency of ANC Visits		
	0-3	4-7	8+
	n (%)	n (%)	n (%)
2	120 (8.7)	398 (29.0)	855 (62.3)
≥ 3	124 (14.5)	324 (37.8)	410 (47.8)
Participant's level of education			
≤ Primary	151 (18.2)	300 (36.1)	379 (45.7)
Secondary	191 (9.2)	595 (28.6)	1,297 (62.3)
Higher	29 (4.7)	137 (22.3)	449 (73.0)
Husband/partner's education level			
≤ Primary	127 (13.9)	346 (37.9)	439 (48.1)
Secondary	190 (9.6)	537 (27.0)	1,262 (63.4)
Higher	27 (5.0)	115 (21.1)	402 (73.9)
Participant's current working status			
Not working	268 (11.4)	707 (30.0)	1,379 (58.6)
Working	103 (8.8)	324 (27.7)	743 (63.5)
Participant's awareness on pregnancy complications (scores)			
No (0)	206 (16.8)	418 (34.2)	600 (49.0)
Yes (1-9)	164 (7.1)	615 (26.7)	1,525 (66.2)
Enabling factors			
Wealth index			
Poorest	162 (21.5)	297 (39.4)	294 (39.0)
Poorer	82 (12.3)	220 (33.1)	363 (54.6)
Middle	75 (9.9)	207 (27.3)	477 (62.8)
Richer	35 (5.1)	164 (23.7)	494 (71.3)
Richest	17 (2.6)	144 (21.9)	497 (75.5)
Place of residence			
Urban	133 (7.7)	426 (24.8)	1,158 (67.4)
Rural	237 (13.1)	607 (33.5)	967 (53.4)
Region			
Sumatera	138 (16.0)	313 (36.4)	409 (47.6)
Java & Bali	128 (6.7)	407 (21.3)	1,377 (72.0)
Central & Eastern Indonesia	105 (13.9)	312 (41.2)	340 (44.9)

Variables	Frequency of ANC Visits		
	0-3	4-7	8+
	n (%)	n (%)	n (%)
Covered by health insurance			
No	196 (15.3)	384 (30.0)	700 (54.7)
Yes	175 (7.8)	649 (28.9)	1,425 (63.4)
Distance to health facility			
Not a big problem	280 (9.1)	871 (28.4)	1,921 (62.5)
Big problem	90 (19.8)	160 (35.2)	204 (44.9)
Money needed to pay medical treatment			
Not a big problem	265 (9.0)	819 (28.0)	1,845 (63.0)
Big problem	106 (17.7)	213 (35.6)	280 (46.7)
Husband's permission to visit health facility			
Not a big problem	330 (10.0)	953 (28.9)	2,009 (61.0)
Big problem	40 (16.9)	80 (33.9)	116 (49.2)
Need factors			
Complication during pregnancy			
No	252 (9.0)	865 (30.9)	1,679 (60.1)
Yes	39 (6.0)	166 (25.5)	446 (68.5)

Type of antenatal care services received during pregnancy

Overall, the majority of the participants received abdominal palpation (98.9%), blood pressure measurement (98.8%), height measurement (97.7%), fetal heart monitoring (97.6%) fundal height measurement (88.5%), iron supplementation (87.0%) and routine medical consultation (86.7%). However, the participants who reported checking blood and urine samples during the last pregnancy were about 55.0% and 41.6%, respectively (see Figure 2).
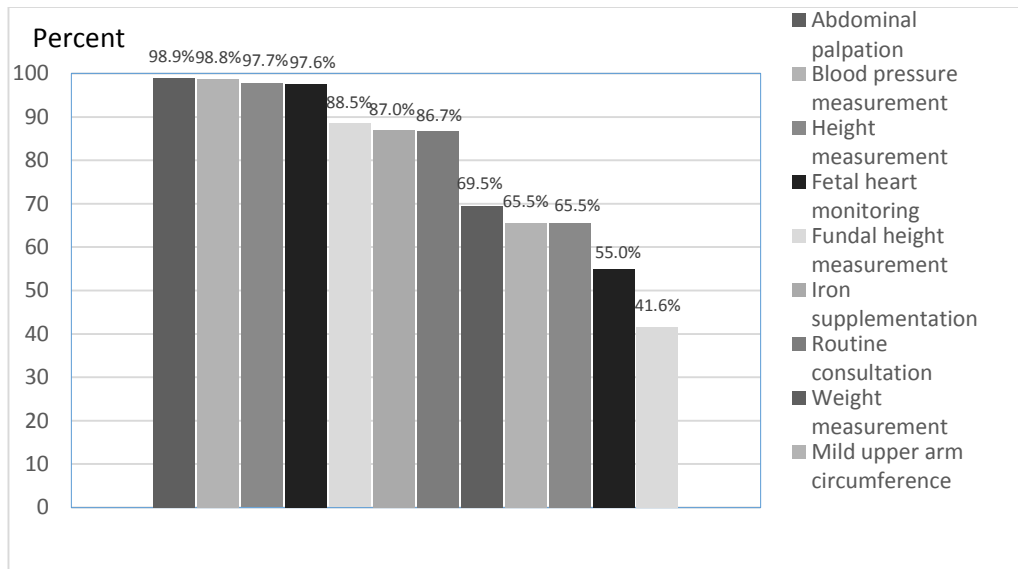
Figure 2. Type of ANC service received during pregnancy, 2017

Factors affecting adequate antenatal visits

The lowest AIC value was found after the variable of permission to visits health facility excluded from the model. Table 3. presents the final model of factors affecting the frequency of ANC visits. Level of awareness about pregnancy complications or problems, distance to the health facility, place of residence, health insurance coverage, number of complications during pregnancy, and wealth index were significantly associated with the frequency of antenatal visits. Increasing in age by 1 year was significantly associated with more likelihood in 4 and above antenatal visits (OR: 1.04, 95% CI: 1.01-1.06) but not in adequate visits (OR: 1.01, 95% CI: 0.99-1.03). Participants lived in Java were two times more likely (OR: 2.42, 95% CI: 1.95-2.99) to have adequate ANC visits than those lived in Sumatera. Participants who perceived a big problem with the distance to health facilities were 31% less likely to have adequate ANC visits.

Table 3. Multivariate analysis for adequate antenatal care visits

Explanatory Variables	Frequency of ANC Visits	
	0-3 vs 4-7, 8+	0-3, 4-7, vs 8+
	OR (95% CI)	OR (95% CI)
Predisposing factors		
Age (years)	1.04 (1.01-1.06)*	1.01 (0.99-1.03)
Ever had pregnancy terminated		
No	1	1
Yes	1.16 (0.90-1.48)	1.16 (0.90-1.48)
Number of children at home	0.74 (0.68-0.82)*	0.74 (0.68-0.82)*
Participant's Level of education		
≤ Primary	1	1
Secondary	1.20 (0.95-1.50)	1.20 (0.95-1.50)
Higher	1.37 (0.96-1.95)	1.37 (0.96-1.95)
Husband/partner's education level		
≤ Primary	1	1
Secondary	1.12 (0.90-1.39)	1.12 (0.90-1.39)
Higher	1.12 (0.78-1.61)	1.12 (0.78-1.61)
Participant's current working status		
No	1	1
Working	0.96 (0.80-1.16)	0.96 (0.80-1.16)
Participant's awareness on pregnancy problem/complications	1.21 (1.12-1.31)*	1.21 (1.12-1.31)*
Enabling factors		
Wealth index		
Poorest	1	1
Poorer	1.33 (1.04-1.70)*	1.33 (1.04-1.70)*
Middle	1.88 (1.46-2.43)*	1.88 (1.46-2.43)*
Richer	2.34 (1.77-3.10)*	2.34 (1.77-3.10)*
Richest	6.05 (3.07-11.96)*	2.65 (1.92-3.68)*
Place of residence		
Urban	1	1
Rural	0.78 (0.64-0.93)*	0.78 (0.64-0.93)*

Explanatory Variables	Frequency of ANC Visits	
	0-3 vs 4-7, 8+	0-3, 4-7, vs 8+
	OR (95% CI)	OR (95% CI)
Region		
Sumatera	1	
Java & Bali	2.42 (1.95-2.99)*	2.42 (1.95-2.99)*
Central & Eastern Indonesia	1.71 (1.31-2.23)*	1.11 (0.91-1.37)
Covered by health insurance		
No	1	1
Yes	1.82 (1.38-2.39)*	1.32 (1.09-1.59)*
Distance to health facility		
Not a big problem	1	1
Big problem	0.69 (0.53-0.89)*	0.69 (0.53-0.89)*
Money needed to pay medical treatment		
Not a big problem	1	1
Big problem	0.85 (0.67-1.08)	0.85 (0.67-1.08)
Need factors		
Number of complications during Pregnancy	1.28 (1.11-1.47)*	1.28 (1.11-1.47)*

*Statistically significant ($p < 0.05$)

DISCUSSION

The current study found that about 9.9% of the participants had 0-3 antenatal care visits, and only 60.2% of the participants visited the ANC services in an adequate amount. Insufficient ANC visits may lead to a devastating effect on the mother and child [2]. A study of IDHS 2006-2007 showed that the higher frequency of ANC visits was associated with a lower risk of neonatal mortality [22]. A multi-country cohort study also found that lack of ANC increased the relative risk of maternal mortality (RR 1.8, 95% CI: 1.2-2.5) [23]. In addition, the frequency of ANC visits according to the schedule has found to be associated with maternal satisfaction [2]. Therefore, the

WHO recommended at least eight ANC contacts during pregnancy to reduce maternal and child mortality and improve women's experience of care [2].

The results found that lived in Java and Bali has a higher probability of making adequate ANC visits (OR: 2.42, 95% CI: 1.95-2.99) than those in other regions. This finding is similar to previous studies in Indonesia that showed significant regional differences in ANC visits between Java-Bali and the rest of the region [9, 11]. The regional disparity of ANC used may be caused by a bigger structural problem. There is a significant disparity in health workforce density and the availability of healthcare facilities and equipment between regions [24]. Although decentralization has a glimpse of a positive impact on local health system performance, some local governments do not sufficient fiscal capacity to finance the health system adequately [25]. They could not provide complete healthcare facilities and decent incentives to attract healthcare workforces. Besides, there is still a wide gap in infrastructure development progress between regions. For instance, many areas outsides Java and Bali still have no adequate road, transportation, communication, electricity, water, and sanitation infrastructure [24]. Therefore, health workers may feel reluctant to practice in the less developed regions due to a lack of opportunities for continuing education and social mobility/carrier promotion.

Besides the regional disparity, our study also found that place of residence and perceived distance to health facilities were significantly associated with the usage of ANC services. This result is consistently supported by the study conducted in Ethiopia, which showed that the place of residence influenced ANC utilization [26]. A higher level of maternal health care services was observed among urban women [26]. This finding may relate to the fact that health facilities are

more accessible in urban areas and that urban people have a closer connection with maternal healthcare services than those in rural area [24]. A total of 430 subdistricts in Indonesia (6.3%) do not have primary healthcare center or Puskesmas. There are 380 *Puskesmas* without any medical doctor in place. Most of these problems occur in rural areas outsides Java [24].

The lesser the estimated odds ratio (OR: 0.74, 95% CI: 0.68-0.82) that the number of antenatal care visits, the higher the number of children the mother has. This was evidenced by the study, which suggested that women with first pregnancy were about twice more likely to encounter early ANC visits than those with more children [27]. The parity may influence the initiation of ANC as the higher the number of children the mother has, the more experience from previous pregnancies. This may lead to the situation that these women might feel more confident and safer, considering that antenatal care is less urgent.

In this study, women from the richest households were more likely (OR: 2.65, 95% CI: 1.92-3.68) to have adequate ANC visits than those from the poorest households. This is quite similar to the study in which the findings revealed that women in higher wealth quintiles were more likely to make more ANC visits than women in the lowest one [28]. This findings indicate that socioeconomic inequality in accessing maternal healthcare services remain high even though Indonesia has launched a comprehensive national health insurance program since 2014 [29].

In addition to the wealth of households, health insurance coverage also needs to increase to counter the low utilization of maternal health care services by lowering the financial barrier. This is important, as our study found out that women covered by health insurance were more likely to

commit eight or more antenatal care visits (OR: 1.32, 95% CI: 1.09-1.59). The study was conducted in Tanzania also in line with our results where low health insurance coverage and low usage of maternal health care services [30].

It is important to note that previous history of reproductive consequences is a strong factor. The odds of having more complications during previous pregnancy were higher (OR: 1.28, 95% CI: 1.11-1.47) among mothers who had more than 8 ANC visits. This is supported by the study, where the greater use of ANC services was related to pregnancy complications [31]. However, the experience of pregnancy termination was not significantly associated with ANC utilization in the final model. This result is controversial to the finding which found that previous experience of suffering miscarriages or stillbirths was determined to be a powerful predictor for utilizing ANC services [27].

This is the first study in Indonesia to examine factors affecting ANC services utilization based on current WHO's guidelines. Another strength of this study is that it covers important explanatory variables in the analysis so the factors influencing on adequate ANC utilization could be determined. However, the study subjects to a limitation due to its cross-sectional study that may prevent to conclude the causal relationship between independent and dependent variables.

Conclusions

The number of children, awareness of pregnancy complications, wealth index, pregnancy complications, residence, region, and distance to health facility were associated with ANC visits. The magnitude of association was different between 4-7, and 8 or more visits in health insurance

coverage and wealth index variables. The findings showed the inequity in accessing ANC services between regions and economic status remains significant even though universal health coverage has been introduced since 2014 in Indonesia. Therefore, the study proposed implications for policies and practices were 1) Expanding the availability of ANC services and health professionals particularly outsides Java and Bali; 2) Introducing mobile ANC clinics in the rural area to reach out more pregnant women and to reduce travel costs; (3) Educating pregnant women and their family on the importance of ANC service to avoid adverse pregnancy complications; (4) Re-promoting family planning program; and (5) Expanding the coverage and benefit package of national health insurance particularly for maternal care.

Acknowledgements

References

[1] World Health Organization, United Nations Children's Fund, United Nations Population Fund, World Bank Group, and United Nations Population Division, *Trends in maternal mortality 2000 to 2017: estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division*. Geneva: World Health Organization, 2019.

[2] World Health Organization, *WHO recommendations on antenatal care for a positive pregnancy experience*. Geneva, Switzerland: WHO Press, 2016.

[3] World Health Organization, "WHO antenatal care randomized trial : manual for the implementation of the new model," ed. Geneva: World Health Organization, 2002.

[4] G. Carroli *et al.*, "WHO systematic review of randomised controlled trials of routine antenatal care," *The Lancet,* vol. 357, no. 9268, pp. 1565-1570, 2001, doi: 10.1016/S0140-6736(00)04723-1.

[5] J. Villar *et al.*, "WHO antenatal care randomised trial for the evaluation of a new model of routine antenatal care," (in eng), *The Lancet,* vol. 357, no. 9268, pp. 1551-64, May 19 2001, doi: 10.1016/s0140-6736(00)04722-x.

[6] T. Dowswell *et al.*, "Alternative versus standard packages of antenatal care for low-risk pregnancy," (in eng), *The Cochrane database of systematic reviews,* no. 10, p. Cd000934, Oct 6 2010, doi: 10.1002/14651858.CD000934.pub2.

[7] L. Benova, Ö. Tunçalp, A. C. Moran, and O. M. R. Campbell, "Not just a number: examining coverage and content of antenatal care in low-income and middle-income countries," *BMJ Global Health,* vol. 3, no. 2, p. e000779, 2018, doi: 10.1136/bmjgh-2018-000779.

[8] Statistics Indonesia - Badan Pusat Statistik (BPS), National Population Family Planning Board (BKKBN), Ministry of Health - Kementerian Kesehatan (Kemenkes), and ICF International, "Indonesia Demographic and Health Survey 2012," BPS, BKKBN, Kemenkes, and ICF International, Jakarta, Indonesia, 2013.

[9] A. D. Laksono, R. Rukmini, and R. D. Wulandari, "Regional disparities in antenatal care utilization in Indonesia," (in eng), *PloS one,* vol. 15, no. 2, p. e0224006, 2020, doi: 10.1371/journal.pone.0224006.

[10] R. Andersen and J. F. Newman, "Societal and Individual Determinants of Medical Care Utilization in the United States," (in eng), *Milbank Mem Fund Q Health Soc,* vol. 51, no. 1, pp. 95-124, 1973.

[11] V. Tripathi and R. Singh, "Regional differences in usage of antenatal care and safe delivery services in Indonesia: findings from a nationally representative survey," (in eng), *BMJ open,* vol. 7, no. 2, p. e013408, Feb 3 2017, doi: 10.1136/bmjopen-2016-013408.

[12] C. R. Titaley, M. J. Dibley, and C. L. Roberts, "Factors associated with underutilization of antenatal care services in Indonesia: results of Indonesia Demographic and Health Survey 2002/2003 and 2007," (in eng), *BMC public health,* vol. 10, p. 485, Aug 16 2010, doi: 10.1186/1471-2458-10-485.

[13] A. Kurniati, C. M. Chen, F. Efendi, and S. M. Berliana, "Factors influencing Indonesian women's use of maternal health care services," (in eng), *Health care for women international,* vol. 39, no. 1, pp. 3-18, Jan 2018, doi: 10.1080/07399332.2017.1393077.

[14] M. Hardhantyo and Y. C. Chuang, "Multilevel Factors Associated With Pregnancy-Related Health Behaviors in Indonesia: Evidence From the 2007, 2012, and 2017 Indonesian Demographic Health Surveys," (in eng), *Asia-Pacific journal of public health,* p. 1010539519872346, Sep 15 2019, doi: 10.1177/1010539519872346.

[15] F. Efendi, C. M. Chen, A. Kurniati, and S. M. Berliana, "Determinants of utilization of antenatal care services among adolescent girls and young women in Indonesia," (in eng), *Women & health,* vol. 57, no. 5, pp. 614-629, May-Jun 2017, doi: 10.1080/03630242.2016.1181136.

[16] H. Y. Nababan, M. Hasan, T. Marthias, R. Dhital, A. Rahman, and I. Anwar, "Trends and inequities in use of maternal health care services in Indonesia, 1986-2012," (in eng), *International journal of women's health,* vol. 10, pp. 11-24, 2018, doi: 10.2147/ijwh.S144828.

[17] K. Anindya, J. T. Lee, B. McPake, S. A. Wilopo, C. Millett, and N. Carvalho, "Impact of Indonesia's national health insurance scheme on inequality in access to maternal health services: A propensity score matched analysis," (in eng), *Journal of global health,* vol. 10, no. 1, p. 010429, Jun 2020, doi: 10.7189/jogh.10.010429.

[18] World Health Organization, "Primary health care systems (PRIMASYS): case study from Indonesia, abridged version.," 2017.

[19] S. L. Leimena, "Posyandu: A Community Based Vehicle to Improve Child Survival and Development," *Asia Pacific Journal of Public Health,* vol. 3, no. 4, pp. 264-267, 1989/10/01 1989, doi: 10.1177/101053958900300402.

[20] Statistics Indonesia - Badan Pusat Statistik (BPS), National Population Family Planning Board (BKKBN), Ministry of Health - Kementerian Kesehatan (Kemenkes), and ICF International, "Indonesia Demographic and Health Survey 2017," BPS, BKKBN, Kemenkes, and ICF International, Jakarta, Indonesia, 2018.

[21] National Population and Family Planning Board (BKKBN), Statistics Indonesia (BPS), Ministry of Health (Kemenkes), and ICF, *Indonesia Demographic and Health Survey 2017.* Jakarta, Indonesia: BKKBN, BPS, Kemenkes, and ICF, 2018.

[22] J. Ibrahim, T. Yorifuji, T. Tsuda, S. Kashima, and H. Doi, "Frequency of antenatal care visits and neonatal mortality in Indonesia," (in eng), *Journal of tropical pediatrics,* vol. 58, no. 3, pp. 184-8, Jun 2012, doi: 10.1093/tropej/fmr067.

[23] M. Bauserman *et al.*, "Risk factors for maternal death and trends in maternal mortality in low- and middle-income countries: a prospective longitudinal cohort analysis," (in eng), *Reproductive health,* vol. 12 Suppl 2, no. Suppl 2, p. S5, 2015, doi: 10.1186/1742-4755-12-s2-s5.

[24] Y. Mahendradhata *et al.*, *The Republic of Indonesia Health System Review*, Health Systems in Transition, Vol-7 No.1 ed. New Delhi: WHO Regional Office for South-East Asia (in en), 2017.

[25] T. Rakmawati, R. Hinchcliff, and J. F. Pardosi, "District-level impacts of health system decentralization in Indonesia: A systematic review," (in eng), *The International journal of health planning and management,* vol. 34, no. 2, pp. e1026-e1053, Apr 2019, doi: 10.1002/hpm.2768.

[26] A. N. Terefe and A. B. Gelaw, "Determinants of Antenatal Care Visit Utilization of Child-Bearing Mothers in Kaffa, Sheka, and Bench Maji Zones of SNNPR, Southwestern Ethiopia," (in eng), *Health services research and managerial epidemiology,* vol. 6, p. 2333392819866620, Jan-Dec 2019, doi: 10.1177/2333392819866620.

[27] S. Aziz Ali, S. Aziz Ali, A. Feroz, S. Saleem, Z. Fatmai, and M. M. Kadir, "Factors affecting the utilization of antenatal care among married women of reproductive age in the rural Thatta, Pakistan: findings from a community-based case-control study," *BMC Pregnancy and Childbirth,* vol. 20, no. 1, p. 355, 2020/06/10 2020, doi: 10.1186/s12884-020-03009-4.

[28] E. Arthur, "Wealth and antenatal care use: implications for maternal health care utilisation in Ghana," (in eng), *Health economics review,* vol. 2, no. 1, p. 14, Aug 6 2012, doi: 10.1186/2191-1991-2-14.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

[29] R. Agustina *et al.*, "Universal health coverage in Indonesia: concept, progress, and challenges," *The Lancet,* vol. 393, no. 10166, pp. 75-102, 2019, doi: 10.1016/S0140-6736(18)31647-7.

[30] S. M. Kibusi, B. F. Sunguya, E. Kimunai, and C. S. Hines, "Health insurance is important in improving maternal health service utilization in Tanzania-analysis of the 2011/2012 Tanzania HIV/AIDS and malaria indicator survey," (in eng), *BMC health services research,* vol. 18, no. 1, p. 112, Feb 13 2018, doi: 10.1186/s12913-018-2924-1.

[31] H. H. Hijazi, M. S. Alyahya, A. M. Sindiani, R. S. Saqan, and A. M. Okour, "Determinants of antenatal care attendance among women residing in highly disadvantaged communities in northern Jordan: a cross-sectional study," (in eng), *Reproductive health,* vol. 15, no. 1, p. 106, Jun 7 2018, doi: 10.1186/s12978-018-0542-3.

Table 1. 2016 WHO ANC Model

Table 1. 2016 WHO ANC model
First trimester
Contact 1: up to 12 weeks
Second trimester
Contact 2: 20 weeks
Contact 3: 26 weeks
Third trimester
Contact 4: 30 weeks
Contact 5: 34 weeks
Contact 6: 36 weeks
Contact 7: 38 weeks
Contact 8: 40 weeks
Return for delivery at 41 weeks if not given birth. *Note:* Intermittent preventive treatment of malaria in pregnancy should be started at ≥ 13 weeks.

Source: (WHO Recommendations on Antenatal Care for a Positive Pregnancy Experience: Summary, 2018)

Table 2. Characteristics of participants by frequency of ANC visits (N = 3,738)

Variables	Frequency of ANC Visits		
	0-3	4-7	8+
	n (%)	n (%)	n (%)
Predisposing factors			
Age group (years)			
15-19	38 (19.1)	76 (38.2)	85 (42.7)
20-24	81 (11.1)	212 (29.1)	435 (59.8)
25-29	88 (9.1)	223 (23.2)	651 (67.7)
30-34	83 (9.3)	273 (30.5)	539 (60.2)
≥ 35	82 (11.0)	248 (33.3)	415 (55.7)
Ever had pregnancy terminated			
No	324 (10.8)	880 (29.3)	1,799 (59.9)
Yes	47 (9.0)	152 (29.0)	326 (62.1)
Number of children at home			
0-1	127 (9.8)	311 (24.0)	860 (66.3)
2	120 (8.7)	398 (29.0)	855 (62.3)
≥ 3	124 (14.5)	324 (37.8)	410 (47.8)
Participant's level of education			
≤ Primary	151 (18.2)	300 (36.1)	379 (45.7)
Secondary	191 (9.2)	595 (28.6)	1,297 (62.3)
Higher	29 (4.7)	137 (22.3)	449 (73.0)
Husband/partner's education level			
≤ Primary	127 (13.9)	346 (37.9)	439 (48.1)
Secondary	190 (9.6)	537 (27.0)	1,262 (63.4)
Higher	27 (5.0)	115 (21.1)	402 (73.9)
Participant's current working status			
Not working	268 (11.4)	707 (30.0)	1,379 (58.6)
Working	103 (8.8)	324 (27.7)	743 (63.5)
Participant's awareness on pregnancy complications (scores)			
No (0)	206 (16.8)	418 (34.2)	600 (49.0)
Yes (1-9)	164 (7.1)	615 (26.7)	1,525 (66.2)
Enabling factors			

Variables	Frequency of ANC Visits		
	0-3	4-7	8+
	n (%)	n (%)	n (%)
Wealth index			
Poorest	162 (21.5)	297 (39.4)	294 (39.0)
Poorer	82 (12.3)	220 (33.1)	363 (54.6)
Middle	75 (9.9)	207 (27.3)	477 (62.8)
Richer	35 (5.1)	164 (23.7)	494 (71.3)
Richest	17 (2.6)	144 (21.9)	497 (75.5)
Place of residence			
Urban	133 (7.7)	426 (24.8)	1,158 (67.4)
Rural	237 (13.1)	607 (33.5)	967 (53.4)
Region			
Sumatera	138 (16.0)	313 (36.4)	409 (47.6)
Java & Bali	128 (6.7)	407 (21.3)	1,377 (72.0)
Central & Eastern Indonesia	105 (13.9)	312 (41.2)	340 (44.9)
Covered by health insurance			
No	196 (15.3)	384 (30.0)	700 (54.7)
Yes	175 (7.8)	649 (28.9)	1,425 (63.4)
Distance to health facility			
Not a big problem	280 (9.1)	871 (28.4)	1,921 (62.5)
Big problem	90 (19.8)	160 (35.2)	204 (44.9)
Money needed to pay medical treatment			
Not a big problem	265 (9.0)	819 (28.0)	1,845 (63.0)
Big problem	106 (17.7)	213 (35.6)	280 (46.7)
Husband's permission to visit health facility			
Not a big problem	330 (10.0)	953 (28.9)	2,009 (61.0)
Big problem	40 (16.9)	80 (33.9)	116 (49.2)
Need factors			
Complication during pregnancy			
No	252 (9.0)	865 (30.9)	1,679 (60.1)
Yes	39 (6.0)	166 (25.5)	446 (68.5)

Table 3. Multivariate analysis for adequate antenatal care visits

Explanatory Variables	Frequency of ANC Visits	
	0-3 vs 4-7, 8+	0-3, 4-7, vs 8+
	OR (95% CI)	OR (95% CI)
Predisposing factors		
Age (years)	1.04 (1.01-1.06)*	1.01 (0.99-1.03)
Ever had pregnancy terminated		
No	1	1
Yes	1.16 (0.90-1.48)	1.16 (0.90-1.48)
Number of children at home	0.74 (0.68-0.82)*	0.74 (0.68-0.82)*
Participant's Level of education		
≤ Primary	1	1
Secondary	1.20 (0.95-1.50)	1.20 (0.95-1.50)
Higher	1.37 (0.96-1.95)	1.37 (0.96-1.95)
Husband/partner's education level		
≤ Primary	1	1
Secondary	1.12 (0.90-1.39)	1.12 (0.90-1.39)
Higher	1.12 (0.78-1.61)	1.12 (0.78-1.61)
Participant's current working status		
No	1	1
Working	0.96 (0.80-1.16)	0.96 (0.80-1.16)
Participant's awareness on pregnancy problem/complications	1.21 (1.12-1.31)*	1.21 (1.12-1.31)*
Enabling factors		
Wealth index		
Poorest	1	1
Poorer	1.33 (1.04-1.70)*	1.33 (1.04-1.70)*
Middle	1.88 (1.46-2.43)*	1.88 (1.46-2.43)*
Richer	2.34 (1.77-3.10)*	2.34 (1.77-3.10)*
Richest	6.05 (3.07-11.96)*	2.65 (1.92-3.68)*
Place of residence		
Urban	1	1
Rural	0.78 (0.64-0.93)*	0.78 (0.64-0.93)*

Explanatory Variables	Frequency of ANC Visits	
	0-3 vs 4-7, 8+	0-3, 4-7, vs 8+
	OR (95% CI)	OR (95% CI)
Region		
Sumatera	1	
Java & Bali	2.42 (1.95-2.99)*	2.42 (1.95-2.99)*
Central & Eastern Indonesia	1.71 (1.31-2.23)*	1.11 (0.91-1.37)
Covered by health insurance		
No	1	1
Yes	1.82 (1.38-2.39)*	1.32 (1.09-1.59)*
Distance to health facility		
Not a big problem	1	1
Big problem	0.69 (0.53-0.89)*	0.69 (0.53-0.89)*
Money needed to pay medical treatment		
Not a big problem	1	1
Big problem	0.85 (0.67-1.08)	0.85 (0.67-1.08)
Need factors		
Number of complications during Pregnancy	1.28 (1.11-1.47)*	1.28 (1.11-1.47)*

* Statistically significant ($p < 0.05$)

Jul 24, 2020

Ridhwan Fauzi
Universitas Muhammadiyah Jakarta
Indonesia
Phone: +628121914211
Email: ridhwanfauzi@umj.ac.id
Request Date: 07/24/2020

Dear Ridhwan Fauzi:

This is to confirm that you are approved to use the following Survey Datasets for your registered research paper titled: "Predictors of Antenatal Care Utilization in Indonesia; Finding from Indonesian Demographic and Health Survey 2017":

Indonesia

To access the datasets, please login at: https://www.dhsprogram.com/data/dataset_admin/login_main.cfm. The user name is the registered email address, and the password is the one selected during registration.

The IRB-approved procedures for DHS public-use datasets do not in any way allow respondents, households, or sample communities to be identified. There are no names of individuals or household addresses in the data files. The geographic identifiers only go down to the regional level (where regions are typically very large geographical areas encompassing several states/provinces). Each enumeration area (Primary Sampling Unit) has a PSU number in the data file, but the PSU numbers do not have any labels to indicate their names or locations. In surveys that collect GIS coordinates in the field, the coordinates are only for the enumeration area (EA) as a whole, and not for individual households, and the measured coordinates are randomly displaced within a large geographic area so that specific enumeration areas cannot be identified.

The DHS Data may be used only for the purpose of statistical reporting and analysis, and only for your registered research. To use the data for another purpose, a new research project must be registered. All DHS data should be treated as confidential, and no effort should be made to identify any household or individual respondent interviewed in the survey. Please reference the complete terms of use at: https://dhsprogram.com/Data/terms-of-use.cfm.

The data must not be passed on to other researchers without the written consent of DHS. However, if you have coresearchers registered in your account for this research paper, you are authorized to share the data with them. All data users are required to submit an electronic copy (pdf) of any reports/publications resulting from using the DHS data files to: references@dhsprogram.com.

Sincerely,

Bridgette Wellington

Bridgette Wellington
Data Archivist
The Demographic and Health Surveys (DHS) Program

JPHP-D-20-00441R1 - Invitation to review revised MS
1 message

Dear Professor Martini,

Thank you for reviewing the manuscript FACTORS AFFECTING ADEQUATE ANTENATAL CARE UTILIZATION IN INDONESIA: IMPLICATIONS FOR POLICIES AND PRACTICES for us. We have received the revised manuscript and would be grateful to know if you feel the authors have sufficiently addressed your comments and suggestions

Manuscript Number: JPHP-D-20-00441R1

Abstract: Maternal mortality causes pregnant women's daily death. Most maternal deaths are preventable with a sufficient quality of antenatal care with timely appropriate. The study aimed to examine factors on adequate Antenatal Care (ANC) utilization in Indonesia. The data was obtained from Indonesian Demographic and Health Survey 2017. Our study outcome was adequate ANC utilization (at least 8 times ANC Visits during pregnancy). The explanatory variables consisted of age, experienced pregnancy termination, number of children, education level, working status, pregnancy problems, wealth index, place of residence, region, health insurance coverage, and barriers to access healthcare facilities. Of 3,738 participants, about 39.8% had inadequate antenatal care visits. There was a significant association between adequate ANC utilization with experienced pregnancy complications, distance to the healthcare facility, health insurance coverage, place of residence, region, awareness on pregnancy problems, and the number of children. Therefore, .should improve healthcare facilities' availability, expand the health insurance coverage, and educate women on the importance of ANC.

To review this submission please click on this link:

https://www.editorialmanager.com/jphp/l.asp?i=52744&l=FO1S2NS7

If you do not have time to do this, or do not feel qualified, please click on this link:

https://www.editorialmanager.com/jphp/l.asp?i=52745&l=U1OQFFBN

We hope you are willing to review the manuscript. If so, would you be so kind as to return your review to us within 14 days of agreeing to review? Thank you.

You are requested to submit your review online by using the Editorial Manager system which can be found at:
https://www.editorialmanager.com/jphp/

Your username is: SantiMartini
If you forgot your password, you can click the 'Send Login Details' link on the EM Login page.

In order to keep delays to a minimum, please accept or decline this invitation online as soon as possible.

If you have any questions, please do not hesitate to contact us. We appreciate your assistance.

Sincerely,
Elena Naumova, PhD, Editor-in-Chief
Meghan Hartwick, PhD, Editorial Assistant
JOURNAL OF PUBLIC HEALTH POLICY

Our flexible approach during the COVID-19 pandemic

If you need more time at any stage of the peer-review process, please do let us know. While our systems will continue to remind you of the original timelines, we aim to be as flexible as possible during the current pandemic.

This letter contains confidential information, is for your own use, and should not be forwarded to third parties.

Recipients of this email are registered users within the Editorial Manager database for this journal. We will keep your information on file to use in the process of submitting, evaluating and publishing a manuscript. For more information on how we use your personal details please see our privacy policy at https://www.springernature.com/production-privacy-policy. If you no longer wish to receive messages from this journal or you have questions regarding database management, please contact the Publication Office at the link below.
PublicationOfficeSPS@springernature.com

In compliance with data protection regulations, you may request that we remove your personal registration details at any time. (Use the following URL: https://www.editorialmanager.com/jphp/login.asp?a=r). Please contact the publication office if you have any questions.