

Regional differences in usage of antenatal care and safe delivery services in Indonesia: findings from a nationally representative survey

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ABSTRACT

Background: Indonesia has shown a nominal increase in antenatal care (ANC) coverage from 93% to 96% in the Indonesia Demographic Health Survey (IDHS)—2012. This is high but for a comprehensive assessment of maternal health coverage in Indonesia, safe delivery services need to be assessed in conjunction with ANC coverage.

Materials and methods: The study uses survey data from the IDHS-2012 that was conducted among women aged 15–49 years who gave birth during the past 3 years preceding the survey. Socioeconomic and demographic factors affecting ANC coverage and safe delivery services are analysed by segregating the data into 7 regions of Indonesia.

Results: Multivariate results show that besides wealth and education differentials, regional differences significantly affect the usage of ANC and safe delivery services across the 7 regions. Univariate analyses show that Sulawesi, Maluku and Western New Guinea islands are at a disadvantage in accessing ANC and safe delivery services.

Conclusions: The study recommends that disaggregated regional targets be set in order to further reduce maternal mortality rates in Indonesia.

INTRODUCTION

Indonesia is the second most populous country in Asia and the fourth largest in the world after the People's Republic of China, India and the USA. It consists of more than 17 000 islands spread over 1.9 million square kilometres and is home to some 240 million people. There are five major islands: Sumatra, Java, Kalimantan, Sulawesi and Papua. Two remaining groups of islands are Maluku and Nusa Tenggara, running from Sulawesi to Papua in the north and from Bali to Timor in the south. The country is divided into 34 provinces that comprise some 500 districts, divided into nearly 7000 sub-districts in which there are almost 80 000

Strengths and limitations of this study

- No prior study has analysed determinants of antenatal care and safe delivery services in Indonesia in a single study.
- The sampling design is robust and is representative of the country.
- The IDHS-2012 covered ever-married and never-married women aged 15–49 years.
- There is a recall bias because of the cross-sectional design of the survey data that are self-reported at a single point of time.
- Most of the variables (age, wealth index, education, occupation) are recorded at the time of the survey rather than at the time of birth of the child and thus may have changed.

villages.¹ For the purposes of this study, we have divided the country into seven regions, Sumatra, Java, Lesser Sunda islands comprising Bali, West and East Nusa Tenggara, Kalimantan, Sulawesi, Maluku islands and Western New Guinea islands.

The United Nations defined millennium development goals (MDGs) 4 and 5 were aimed at reducing under five-child mortality (U5M) by two-thirds and to improve maternal mortality ratios by three-quarters between 1990 and 2015.² Indonesia has recorded a huge reduction in U5M down from 85 to 27 deaths per 1000 live births in 2015.³ The international community has now defined sustainable development goals that look forward to achieving a target of reducing U5M to as low as 25/1000 live births.⁴ According to the IDHS 2012 report, while the number of mothers receiving antenatal care (ANC) has increased from 93% in 2007 to 96% in 2012, more than half of all deliveries still take place at home in the absence of specialised services to deal with potential complications.⁵ The ministry of health reported a wide discrepancy in ANC usage

across provinces with 96% mothers using ANC services in Jakarta compared with only 38% mothers in Papua province.^{6 7} Thus, this study assesses whether regional differences affect ANC coverage and safe delivery services across Indonesia.

METHODS

The study uses raw data from nationally representative samples of women aged 15–49 years in Indonesia Demographic and Health Survey (IDHS-2012) conducted during 7 May–31 July 2012. Among 45 607 women interviewed in the survey with a 96% response rate, a total of 23 809 women gave birth in the 3 years preceding the survey. There were 1558 (6.5%) reported deaths.¹

Ethics statement

The IDHS-2012 was conducted in accordance with internationally agreed ethical principles for the conduct of medical research. Since this study is based on the IDHS data, which are available in the public domain with no identifiable information on the survey participants, this work is exempted from ethical review.¹

Outcome events

For the purposes of analysing ANC coverage, the study population consists of mothers who had at least three ANC visits or at least two tetanus toxoid injections during pregnancy or one tetanus toxoid injection in pregnancy and at least one tetanus toxoid injection in the preceding 3 years and received iron and folic acid tablets for 90 or more days.^{8–10} Safe delivery is described as delivery attended by a general practitioner or obstetrician or nurse or trained midwife who has been educated and trained to manage normal pregnancies while those attended by faith healers or elders or relatives or traditional birth attendants or others are not included in safe delivery.¹¹

Covariates

Data were segregated according to the seven regions in Indonesia. There is merit in segregating data for it allows us to focus on aspects of ANC and safe delivery services that may remain hidden in national level indicators.^{12 13} Selected socioeconomic and demographic factors examined include age, place of residence, education of self and father, occupation of self and father, wealth quintile, frequency of listening to the radio/reading newspapers and magazines, birth order and child status at birth. Though age is a continuous variable, it is tabulated into age groups 15–19 years, 20–24 years, 25–29 years and above 30 years. Place of residence is categorised as rural or urban. Education is classified as no formal education, up to primary level, up to secondary level and higher. Occupation is arranged into categories as not working outside home for money, unskilled or skilled work, or agriculture. A composite

wealth index was computed using principal component analysis of household items related to possession of durable assets, access to utilities and infrastructure, and housing characteristics to assess the economic status of the mothers. Each woman was ranked based on a household asset score and was assigned to wealth quintiles, labelled as poorest, poorer, middle, richer and richest, each comprising 20% of the population. A detailed description on the methodology adopted to construct the wealth index in the IDHS data set is given in the IDHS 2012 report.¹ Public messaging is an important source of getting information for the woman, and therefore the frequency of listening to the radio/reading newspapers and magazines is included to gauge the mother's level of perception regarding family health initiatives.

Statistical analyses

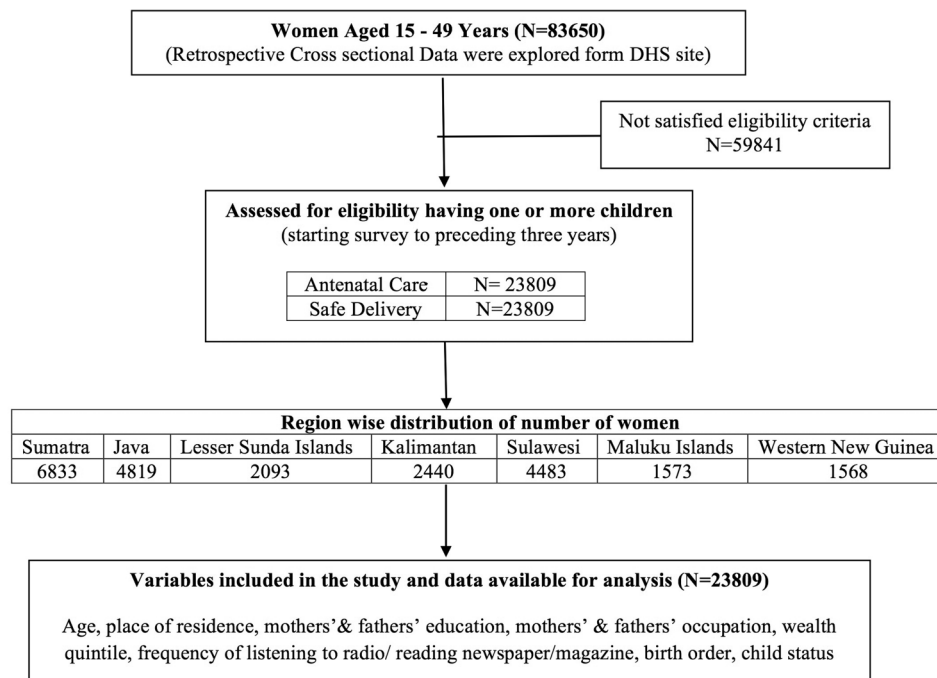
Data were downloaded from the DHS site with due permission for analyses. Frequencies with percentages are calculated for predictors and outcome variables. Relationships of mothers' social and demographic variables and healthcare outcomes data are stratified according to seven regions with the dependent variables as ANC coverage and safe delivery services. χ^2 tests are performed to see associations and univariate logistic regression analysis are performed to know about ORs and 95% CI for all predictors. Multivariate logistic regression analyses are performed and adjusted ORs with 95% CI and p values are presented in the tables.^{14–16} Statistical significance was set at $p < 0.05$.¹⁷ The SPSS 21.0 statistical package is used for the analyses (IBM SPSS. Statistics for windows. Version 21.0. Armonk: IBM Corp, 2012).

RESULTS

Population characteristics of the study population for ANC services

The study population of 23 809 births consisted of 6833 births in the Sumatra region, 4819 births in the Java region, 2093 births in the Lesser Sunda Islands region, 2440 births in Kalimantan, 4483 births in Sulawesi, 1573 births in the Maluku Islands and 1568 births in the Western New Guinea islands (figure 1). Table 1 presents characteristics of mothers using ANC services across the seven regions, including 2744 births in the Sumatra region, 2320 births in the Java region, 847 births in the Lesser Sunda Islands, 999 births in Kalimantan, 1525 births in Sulawesi, 467 births in Maluku Islands and 559 births in the Western New Guinea islands. The table shows the number of mothers in a particular category using ANC services with the accompanying percentage of the total number of mothers in that category. As the age of the mother increases, the usage of ANC decreases across the seven regions ($p = 0.001$), especially for mothers above the age of 25 years. More births took place in rural areas than urban areas in all regions except Java where more births took place in the urban

Figure 1 Flow chart of the process of selection of mothers' sample available for analyses of antenatal care and safe delivery services.



areas. Most mothers and fathers were educated up to the secondary level. The proportion of mothers using ANC services increases as the level of education of mothers and fathers increases ($p=0.001$). Most mothers were not working outside the home across the seven regions, while most fathers were either in unskilled/other occupations (Sumatra, Lower Sunda islands, Kalimantan, Sulawesi) or did skilled work (Java, Maluku and Western New Guinea islands). Except in Java where most mothers belonged to the richest wealth quintile, most mothers belonged to either the poorer (Sumatra, Lower Sunda islands) or poorest (Kalimantan, Sulawesi, Maluku and Western New Guinea) wealth quintiles. The frequency of listening to the radio/reading newspapers/magazines was 'at least once a week' in all regions except Sulawesi which reported 'not at all' as the most frequent response. There were 10 168 births of first order, 6483 of second order, 3468 of third order, 1731 of fourth order and 1959 of fifth and above order births. Most mothers received ANC for their first birth order and most children were born alive.

Univariate analyses for ANC services

Table 2 shows the results of univariate analyses with ORs and 95% CI of socioeconomic and demographic characteristics of mothers who received ANC services according to the seven regions. The ANC services are used by only 6–18% mothers above 30 years of age when compared with those in the 15–19 age groups across all regions. ANC services are used by 94% in the Java region (OR 0.94, 95% CI 0.84 to 1.06), while they are used by <50% in the Western New Guinea region (OR 0.46, 95% CI 0.36 to 0.59) in the rural areas compared with urban areas of residence. Except for the Java island, there is a significant difference between those

who use ANC services in the other six regions between the urban and rural areas. Mothers with primary and secondary level education use ANC services by two and six times, respectively, across the seven regions when compared with mothers with no formal education except in the Lesser Sunda Islands region where primary and no formal education shows no difference. Mothers with higher than secondary education also use ANC varying from two-and-a-half times (Lesser Sunda Islands OR 2.4, 95% CI 1.4 to 3.9) to nine times (Western New Guinea OR 8.9, 95% CI 5.6 to 14.4). Fathers with primary, secondary and higher than secondary level education help mothers use these services when compared with fathers with no formal education across the seven regions except in Lesser Sunda Islands where educational qualifications of fathers do not significantly affect mothers' usage of ANC services (OR 0.9, 95% CI 0.5 to 1.62; OR 1.2, 95% CI 0.7 to 2.2 and OR 1.3, 95% CI 0.7 to 2.5), respectively. Mothers engaged in agriculture are at a significant disadvantage in using ANC services compared with those not working outside the home, skilled and unskilled workers in all the seven regions. Mothers involved in unskilled work are not at a significant disadvantage in using ANC services compared with those not working outside the home except in regions like Sumatra and Western New Guinea where the difference was significant compared with mothers not working outside the home. Father's occupation did not show any difference in the Java region, while in Kalimantan, there was a difference between skilled and unskilled workers, but there was no difference between those not working and those engaged in agriculture. In the other five regions, fathers occupied in agriculture were at a significant disadvantage in accessing ANC services compared with

Table 1 Socioeconomic and demographic characteristics influencing the usage of antenatal care services according to regions in Indonesia, IDHS-2012

Variable	Sumatra region ANC (2744)	Java region ANC (2320)	Lesser Sunda Islands region ANC (847)	Kalimantan region ANC (999)	Sulawesi region ANC (1525)	Maluku islands region ANC (467)	Western New Guinea region ANC (559)
Age (years)							
15–19	89 (75.4)	92 (90.2)	35 (85.4)	77 (82.8)	108 (76.6)	20 (66.7)	19 (51.4)
20–24	550 (71.8)	496 (85.2)	187 (70.6)	252 (72.6)	362 (59.9)	111 (54.4)	90 (36.3)
25–29	859 (49.5)	659 (58.1)	254 (49.7)	271 (47.6)	386 (43.7)	113 (36.8)	121 (32.2)
30+	1246 (29.6)	1043 (34.8)	371 (29.1)	399 (27.9)	669 (23.4)	223 (21.6)	143 (15.8)
p Value	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Place of residence							
Urban	1189 (44)	1529 (48)	354 (48.6)	434 (44.3)	605 (39.3)	179 (33.9)	163 (34.2)
Rural	1555 (37.7)	791 (46.5)	493 (36.1)	565 (38.7)	920 (31.3)	288 (27.6)	210 (19.2)
p Value	0.001	0.32	0.001	0.005	0.001	0.009	0.001
Mother's education							
No education	27 (16.4)	13 (21)	30 (32.6)	13 (13.1)	29 (12.3)	5 (12.5)	41 (10.3)
Primary	691 (31.3)	615 (36.3)	271 (32)	322 (34.1)	466 (25.6)	115 (22.4)	85 (18.1)
Secondary	1612 (43.9)	1330 (54.1)	433 (46)	544 (46.2)	790 (40.3)	269 (31.5)	181 (31.7)
Higher	414 (52.5)	332 (55.2)	113 (53.6)	120 (54.8)	240 (51.6)	78 (47)	66 (50.8)
p Value	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Father's education							
No education	16 (14.2)	15 (27.3)	19 (38.8)	14 (18.7)	32 (17.4)	6 (16.7)	17 (8.1)
Primary	753 (3.3)	606 (38.5)	280 (35.3)	296 (32.8)	514 (28.1)	96 (21.6)	70 (17.4)
Secondary	1669 (44.2)	1327 (52.1)	422 (43.1)	550 (45.7)	765 (38.3)	284 (31.6)	217 (28.8)
Higher	303 (46.5)	341 (53.8)	124 (45.8)	139 (53.9)	211 (45.3)	78 (41.5)	65 (36.3)
p Value	0.001	0.001	0.002	0.001	0.001	0.001	0.001
Mother's occupation							
Not working outside home	1342 (43.8)	1210 (46.8)	319 (42)	526 (44.3)	811 (34.8)	263 (31.9)	201 (30.1)
Skilled	814 (42.3)	683 (49)	241 (45.8)	277 (43.9)	453 (39.6)	130 (33.6)	106 (36.3)
Agriculture	317 (31.0)	82 (38)	142 (33.3)	119 (28.6)	140 (22.7)	45 (18.3)	48 (11.4)
Unskilled/others	268 (32.8)	313 (50.4)	145 (38)	75 (36.9)	115 (30.5)	29 (25)	16 (8.7)
p Value	0.001	0.008	0.001	0.001	0.001	0.001	0.001
Father's occupation							
Not working	34 (42)	29 (42)	17 (54.8)	7 (28)	29 (38.2)	21 (38.9)	22 (24.7)
Skilled work	844 (45.8)	1042 (49.4)	266 (45.1)	354 (46.6)	491 (40.1)	155 (35.4)	147 (31.5)
Agriculture	764 (34.9)	218 (41.1)	228 (32.4)	235 (32.2)	443 (27)	138 (22.2)	97 (14.8)
Unskilled/others	1049 (40.3)	999 (47.4)	336 (43.8)	403 (43.6)	554 (36.3)	152 (33.2)	106 (29.9)
p Value	0.001	0.006	0.001	0.001	0.001	0.001	0.001
Wealth quintile							
Poorest	587 (31.4)	186 (35.8)	38 (33.6)	328 (35.3)	597 (27.1)	191 (24.2)	152 (16.2)
Poorer	639 (41.3)	352 (45.7)	187 (42.9)	268 (41.7)	328 (38.7)	103 (29.9)	65 (32.7)
Middle	604 (45.5)	447 (47.2)	131 (46.0)	176 (45.8)	253 (38.2)	86 (38.6)	68 (38)

Continued

Table 2 Univariate analyses of socioeconomic and demographic factors influencing the usage of antenatal care services according to regions in Indonesia, IDHS-2012

Variable	Sumatra region OR and 95% CI	Java region OR and 95% CI	Lesser Sunda Islands region OR and 95% CI	Kalimantan region OR and 95% CI	Sulawesi region OR and 95% CI	Maluku islands region OR and 95% CI	Western New Guinea region OR and 95% CI
Age (years)							
15–19	1	1	1	1	1	1	1
20–24	0.83 (0.53 to 1.3)	0.63 (0.32 to 1.3)	0.41 (0.17 to 1.02)	0.55 (0.31 to 0.99)	0.46 (0.30 to 0.70)	0.60 (0.27 to 1.34)	0.54 (0.27 to 1.08)
25–29	0.32 (0.21 to 0.50)	0.15 (0.08 to 0.3)	0.17 (0.07 to 0.41)	0.19 (0.11 to 0.33)	0.24 (0.16 to 0.36)	0.30 (0.13–0.64)	0.45 (0.23 to 0.89)
30+	0.14 (0.09 to 0.21)	0.06 (0.03 to 0.11)	0.07 (0.03 to 0.17)	0.08 (0.05 to 0.14)	0.09 (0.86 to 0.14)	0.14 (0.06 to 0.30)	0.18 (0.09 to 0.35)
Place of residence							
Urban	1	1	1	1	1	1	1
Rural	0.77 (0.7 to 0.8)	0.94 (0.84 to 1.06)	0.60 (0.5 to 0.7)	0.8 (0.67 to 0.93)	0.7 (0.62 to 0.8)	0.74 (0.6 to 0.93)	0.46 (0.36 to 0.59)
Mother's education							
No education	1	1	1	1	1	1	1
Primary	2.3 (1.5 to 3.5)	2.0 (1.2 to 3.9)	0.97 (0.6 to 1.5)	3.4 (1.9 to 6.2)	2.5 (1.6 to 3.7)	2.0 (0.8 to 5.3)	1.9 (1.3 to 2.9)
Secondary	4.0 (2.6 to 6.1)	4.4 (2.4 to 8.2)	1.8 (1.1 to 2.8)	5.7 (3.1 to 10.3)	4.8 (3.2 to 7.2)	3.2 (1.2 to 8.3)	4.0 (2.8 to 5.8)
Higher	5.6 (3.7 to 8.7)	4.7 (2.5 to 8.8)	2.4 (1.4 to 3.9)	8.0 (4.2 to 15.2)	7.6 (5.0 to 11.7)	6.2 (2.3 to 16.6)	8.9 (5.6 to 14.4)
Father's education							
No education	1	1	1	1	1	1	1
Primary	3.0 (1.7 to 5.1)	1.7 (0.9 to 3.0)	0.9 (0.5 to 1.62)	2.1 (1.2 to 3.9)	1.9 (1.2 to 2.8)	1.4 (0.6 to 3.4)	2.4 (1.4 to 4.2)
Secondary	4.8 (2.8 to 8.2)	2.9 (1.6 to 5.3)	1.2 (0.7 to 2.2)	3.7 (2.0 to 6.6)	2.9 (2.0 to 4.4)	2.3 (1.0 to 5.6)	4.6 (2.7 to 7.7)
Higher	5.3 (3.8 to 9.2)	3.1 (1.7 to 5.7)	1.3 (0.7 to 2.5)	5.1 (2.7 to 9.6)	3.9 (2.6 to 6.0)	3.5 (1.4 to 8.9)	6.4 (3.6 to 11.5)
Mother's occupation							
Not working outside home	1	1	1	1	1	1	1
Skilled	0.9 (0.8 to 1.1)	1.1 (0.9 to 1.2)	1.2 (0.9 to 1.5)	1.0 (0.8 to 1.2)	1.2 (1.1 to 1.4)	1.1 (0.8 to 1.4)	1.3 (1.0 to 1.8)
Agriculture	0.6 (0.5 to 0.7)	0.7 (0.5 to 0.9)	0.7 (0.5 to 0.8)	0.5 (0.4 to 0.6)	0.5 (0.4 to 0.7)	0.5 (0.3 to 0.7)	0.3 (0.2 to 0.4)
Unskilled/others	0.6 (0.53 to 0.7)	1.2 (0.9 to 1.4)	0.8 (0.7 to 1.1)	0.7 (0.5 to 1.0)	0.8 (0.6 to 1.04)	0.7 (0.45 to 1.1)	0.2 (0.1 to 0.4)
Father's occupation							
Not working	1	1	1	1	1	1	1
Skilled work	1.2 (0.7 to 1.8)	1.3 (0.8 to 2.2)	0.7 (0.3 to 1.4)	2.2 (0.9 to 5.4)	1.1 (0.7 to 1.7)	0.9 (0.5 to 1.5)	1.4 (0.8 to 2.4)
Agriculture	0.7 (0.5 to 1.2)	1.0 (0.6 to 1.6)	0.4 (0.2 to 0.8)	1.2 (0.5 to 3.0)	0.6 (0.4 to 1.0)	0.4 (0.3 to 0.8)	0.5 (0.3 to 0.9)
Unskilled others	0.9 (0.6 to 1.5)	1.3 (0.8 to 2.0)	0.6 (0.3 to 1.3)	1.9 (0.8 to 4.8)	0.9 (0.6 to 1.5)	0.8 (0.4 to 1.4)	1.3 (0.8 to 2.2)
Wealth quintile							
Poorest	1	1	1	1	1	1	1
Poorer	1.5 (1.3 to 1.8)	1.5 (1.2 to 1.9)	1.5 (1.2 to 1.9)	1.3 (1.1 to 1.6)	1.7 (1.4 to 2.0)	1.5 (1.0 to 1.8)	2.5 (1.8 to 3.5)
Middle	1.8 (1.5 to 2.0)	1.6 (1.3 to 2.0)	1.7 (1.3 to 2.2)	1.6 (1.2 to 2.0)	1.6 (1.3 to 2.0)	2.0 (1.4 to 2.7)	3.2 (2.2 to 4.5)
Richer	1.8 (1.5 to 2.1)	1.8 (1.5 to 2.2)	1.9 (1.4 to 2.6)	1.7 (1.3 to 2.2)	2.3 (1.9 to 2.8)	2.2 (1.5 to 3.1)	3.9 (2.6 to 5.9)
Richest	1.7 (1.4 to 2.0)	1.9 (1.5 to 2.3)	1.8 (1.4 to 2.5)	1.6 (1.2 to 2.0)	2.2 (1.7 to 2.8)	2.0 (1.2 to 3.3)	3.0 (1.9 to 5.2)
Frequency of listening to the radio/reading newspapers/magazines							
Not at all	1	1	1	1	1	1	1
Less than once a week	0.9 (0.6 to 1.4)	2.0 (1.3 to 3.2)	1.3 (0.8 to 2.1)	1.8 (0.9 to 3.7)	1.7 (1.1 to 2.5)	2.6 (1.0 to 6.8)	4.6 (1.9 to 11.2)
At least once a week	1.7 (1.4 to 2.0)	1.8 (1.4 to 2.2)	1.5 (1.2 to 1.8)	1.4 (1.1 to 1.9)	2.0 (1.7 to 2.4)	1.6 (1.2 to 2.0)	2.7 (2.0 to 3.5)

Continued

Table 2 Continued

Variable	Sumatra region	Java region	Lesser Sunda	Kalimantan	Sulawesi region	Maluku islands	Western New
	OR and 95% CI	OR and 95% CI	Islands region OR and 95% CI	region OR and 95% CI	OR and 95% CI	region OR and 95% CI	Guinea region OR and 95% CI
Birth order	1	1	1	1	1	1	1
First	1.6 (1.5 to 1.8)	1.9 (1.6 to 2.0)	1.3 (1.0 to 1.6)	1.4 (1.1 to 1.6)	1.4 (1.2 to 1.7)	1.0 (0.8 to 1.5)	1.1 (0.8 to 1.5)
Second	1.9 (1.7 to 2.2)	1.9 (1.6 to 2.3)	1.7 (1.3 to 2.2)	1.5 (1.2 to 1.9)	1.5 (1.2 to 1.8)	1.6 (1.2 to 2.2)	1.4 (1.0 to 2.0)
Third	2.0 (1.6 to 2.4)	1.3 (1.0 to 1.7)	1.6 (1.1 to 2.2)	1.4 (1.0 to 1.9)	1.6 (1.2 to 1.9)	1.3 (0.9 to 1.9)	1.2 (0.8 to 1.8)
Fourth	1.2 (1.0 to 1.5)	1.1 (0.8 to 1.5)	1.5 (1.0 to 2.0)	1.1 (0.8 to 1.6)	1.1 (0.9 to 1.4)	1.5 (1.0 to 2.0)	1.1 (0.8 to 1.6)
Fifth and above							
Child status	1	1	1	1	1	1	1
Dead	6.3 (4.4 to 8.8)	3.4 (2.5 to 4.7)	3.8 (2.5 to 5.9)	43 (2.7 to 6.8)	5 (3.5 to 7.1)	4.4 (2.4 to 8.1)	2.6 (1.6 to 4.1)
Alive							

those not working, those engaged in skilled work and unskilled work. The usage of ANC services increases significantly by one-and-a-half to two times for those in poorer to richest wealth quintiles across all regions excepts Western New Guinea where it increases from two-and-a-half times to four times for those in poorer to richest quintiles compared with those in the poorest wealth quintile. The usage of ANC services in Sumatra, Lesser Sunda Islands and Kalimantan regions is not associated with listening to the radio and/or reading newspapers and magazines less than once a week compared with not listening to the radio or reading newspapers at all. Those listening to the radio and/or reading newspapers and magazines at least once a week use ANC services one-and-a-half to two times more than those who do not across all regions except in the Western New Guinea region, where ANC usage increases significantly by almost four-and-a-half times (OR 4.6, 95% CI 1.9 to 11.2). As birth order increases from the first to third birth order, mothers show greater awareness and use ANC services compared with the first birth order across all regions. However, ANC usage shows a decreasing trend with the fourth and fifth and above birth order. Those who reported the status of child at birth as dead did not use ANC services compared with those whose child was alive at birth.

Population characteristics of study population for safe delivery

The total number of safe deliveries in Indonesia in the 3 years preceding the survey is 10 071 or 42.3% of the total burden of deliveries in Indonesia. These comprised 3287 births in the Sumatra region, 2462 births in the Java region, 890 births in the Lesser Sunda Islands region, 1031 births in Kalimantan, 1558 births in Sulawesi, 406 births in the Maluku Islands and 437 births in the Western New Guinea islands. Table 3 shows the number of mothers in a particular category using safe delivery services with the accompanying percentage of the total number of mothers in that category. Most mothers who used safe delivery services were aged over 30 years. More safe deliveries occurred in rural rather than urban places of residence except in Java where it was the opposite. Most mothers and fathers were educated up to the secondary level. Most mothers were not working outside the home and most fathers were engaged in skilled work in Java, Kalimantan, Maluku and Western New Guinea islands, while they were engaged in unskilled or other work in Sumatra, Lower Sunda and Sulawesi islands. Most families were in the richest quintile in the Java islands, in the poorer wealth quintile in Sumatra islands and in the poorest wealth quintile in the rest of the five regions. Most mothers who used safe delivery services listened to the radio, read newspapers/magazines at least once a week. Most safe deliveries were of the first birth order and most children were reported to be alive.

Table 3 Socioeconomic and demographic characteristics influencing the usage of safe delivery services according to regions in Indonesia, IDHS2012

Variable	Sumatra region Safe delivery (3287)	Java region Safe delivery (2462)	Lesser Sunda Islands region Safe delivery (890)	Kalimantan region Safe delivery (1031)	Sulawesi region Safe delivery (1558)	Maluku islands region Safe delivery (406)	Western New Guinea region Safe delivery (437)
Age (years)							
15–19	90 (76.2)	81 (79.4)	34 (82.9)	70 (75.3)	89 (63.1)	10 (33.3)	18 (48.6)
20–24	607 (79.2)	474 (81.6)	190 (71.7)	238 (68.6)	347 (57.5)	101 (49.5)	99 (39.9)
25–29	1056 (60.8)	740 (65.2)	284 (55.6)	288 (50.6)	402 (45.5)	111 (36.2)	142 (37.8)
30+	1534 (36.4)	1167 (38.9)	382 (29.9)	435 (30.4)	720 (25.2)	184 (17.8)	178 (19.6)
p Value	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Place of residence							
Urban	1502 (55.6)	1751 (55)	418 (57.4)	509 (52)	707 (45.9)	193 (36.6)	216 (45.3)
Rural	1785 (43.2)	711 (43.5)	472 (34.6)	522 (35.7)	851 (28.9)	213 (20.4)	221 (20.3)
p Value	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Mother's education							
No education	30 (18.2)	9 (14.5)	24 (26.1)	13 (13.1)	19 (8.1)	4 (10)	31 (7.8)
Primary	753 (34.1)	569 (33.5)	239 (28.2)	293 (31)	378 (20.7)	61 (11.9)	92 (19.6)
Secondary	1972 (53.8)	1469 (59.7)	475 (50.4)	578 (49.1)	857 (43.7)	256 (30)	228 (39.9)
Higher	532 (67.4)	415 (69.1)	152 (72)	147 (67.1)	304 (65.4)	85 (51.2)	86 (66.2)
p Value	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Father's education							
No education	33 (29.2)	16 (29.1)	13 (26.5)	13 (17.3)	26 (14.1)	3 (8.3)	9 (4.3)
Primary	817 (35.87)	556 (35.3)	253 (31.9)	265 (29.3)	454 (24.8)	48 (10.8)	66 (16.4)
Secondary	2027 (53.7)	1470 (57.7)	463 (47.3)	592 (49.2)	814 (40.7)	264 (29.4)	272 (36.1)
Higher	408 (62.7)	418 (65.9)	160 (59)	161 (62.4)	260 (55.8)	88 (46.8)	84 (46.9)
p Value	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Mother's occupation							
Not working outside home	1622 (53)	1271 (49.2)	353 (46.5)	543 (45.7)	849 (36.5)	227 (27.5)	241 (36.1)
Skilled	998 (51.8)	800 (57.4)	283 (53.8)	315 (49.7)	508 (44.4)	138 (35.7)	138 (47.3)
Agriculture	343 (33.5)	66 (30.6)	111 (26.1)	107 (25.7)	81 (13.1)	26 (10.6)	37 (8.8)
Unskilled/others	321 (39.2)	322 (51.9)	143 (37.4)	64 (25.7)	112 (29.7)	15 (12.6)	18 (9.8)
p Value	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Father's occupation							
Not working	41 (50.6)	31 (44.9)	17 (54.8)	10 (40)	31 (40.8)	23 (42.6)	21 (23.6)
Skilled work	1148 (58.8)	1199 (56.8)	321 (54.4)	411 (54.2)	572 (46.7)	165 (37.7)	199 (42.6)
Agriculture	859 (39.2)	211 (39.8)	200 (28.4)	200 (27.4)	352 (21.4)	84 (13.5)	67 (10.2)
Unskilled/others	1236 (47.4)	1018 (48.3)	352 (45.8)	410 (44.4)	593 (38.9)	134 (29.3)	147 (41.5)
p Value	0.001	0.001	0.001	0.001	0.001	0.001	0.001

Continued

Univariate analyses for safe delivery services

Table 4 presents the results of univariate analyses of socioeconomic and demographic characteristics of safe delivery according to seven regions in Indonesia. Mothers who are 25 years and older have significantly less chances of safe delivery compared with those in the 15–19 age group in Sumatra, Java, Lesser Sunda Islands, Kalimantan and Sulawesi, while in Maluku and Western New Guinea islands, mothers over 30 are less likely to have safe delivery. Mothers living in rural places of residence have significantly less chances of safe delivery when compared with those in urban places of residence in Sumatra, Java, Lesser Sunda Islands, Kalimantan, Sulawesi, Maluku Islands and Western New Guinea islands, respectively. The chances of safe delivery for mothers with primary and secondary and above level education increase by 2–23 times in Sumatra, Java, Kalimantan, Sulawesi and Western New Guinea islands, respectively, when compared with mothers with no formal education. Fathers' education to secondary and higher levels significantly increases the chances of safe delivery compared with those fathers with no formal education. In Kalimantan, Sulawesi and Western New Guinea, even up to primary level education of fathers shows significant difference in the usage of safe delivery services compared with fathers with no formal education. Mothers engaged in agriculture are at a disadvantage in all regions compared with mothers not working outside the home. However, mothers engaged in skilled work are significantly advantaged in using safe delivery services across all regions. Mothers who are in unskilled or other jobs are at a significant disadvantage in having safe delivery except in the Java region where there is no difference between unskilled/others and those not working outside the home (OR 1.1, 95% CI 0.9 to 1.3). Fathers who are in agriculture are at a statistically significant disadvantage compared with those not working in ensuring safe delivery in all regions except the Kalimantan and Java regions. Fathers engaged in skilled work are at an advantage in all regions except the Maluku Islands region (OR 0.8, 95% CI 0.5 to 1.4), though this association is not significant. Fathers engaged in unskilled work use safe delivery services on par with those not working except in the Western New Guinea region where they are two times more likely to have safe delivery (OR 2.3, 95% CI 1.3 to 4.0). As the wealth index increases, safe deliveries increase from two to eight times in all regions. Those listening to the radio and/or reading newspapers and magazines less than once a week or at least once a week are more likely to have safe deliveries by about two to four times compared with those who do not, except in the Sumatra region. In Sumatra, as birth order increases from the first to fourth birth order, mothers use safe delivery services, though there is no difference for the fifth and above birth order compared with the first birth order. In Java, there is a significant difference from the first to third, but there is no difference for the fourth and fifth and above birth

order. In Lesser Sunda islands, Sulawesi and Maluku islands, there is no significant difference between the first four birth orders, but there is a significant decline (30–40%) in ensuring safe deliveries for the fifth and above birth order. In Kalimantan and Western New Guinea islands, there is no difference between the first and higher birth orders. Those who reported the status of child at birth as dead did not avail safe delivery services across all regions compared with those who reported the status of the child as alive at birth.

Multivariate analyses

Findings of selected socioeconomic and demographic predictors related to ANC coverage and safe delivery services after adjusting mother's age at childbirth, mother's occupation, father's occupation, frequency of listening to the radio/reading newspapers/magazines, birth order and child status are presented in table 5. Mothers residing in rural areas are only slightly more likely (OR 1.02, 95% CI 0.95 to 1.1) to receive ANC than those living in urban areas. However, mothers living in rural areas are 14% less likely (OR 0.86, 95% CI 0.80 to 0.92) to have safe delivery compared with those in urban areas. Different regions show significant differences in the usage of ANC. ANC usage is significantly more in Java and Lesser Sunda Islands, compared with the Sumatra and Kalimantan regions. Safe delivery services show no difference in Java and Lesser Sunda Islands but are significantly less in Kalimantan, Sulawesi, Maluku Islands and Western New Guinea islands when compared with the Sumatra region. An increase in the wealth index ensures better usage of ANC and safe delivery services. Mother's education and father's education have comparable and significant roles in the usage of ANC services and in ensuring safe delivery. No formal education is a disadvantage in the usage of ANC and safe delivery services, while higher than secondary level education of mothers is an advantage in the usage of ANC services (OR 6.2, 95% CI 4.87 to 7.85) and ensuring safe delivery (OR 10.37, 95% CI 8.06 to 13.3). Listening to the radio/reading newspapers and magazines at least once a week has an impact on usage of ANC and safe delivery services. However, listening to the radio/reading newspapers less than once a week has an impact on safe delivery but not on ANC services where not listening to the radio/reading newspapers and magazines or listening to the radio/reading newspapers and magazines less than once a week makes no difference.

DISCUSSION

This study examines the factors that affect the usage of ANC and safe delivery services in Indonesia. Since Indonesia is geographically spread over a wide area, there are regional disparities in the usage of ANC and safe delivery services across its many islands. Our study proves that there are socioeconomic and demographic

Table 4 Univariate analyses of socioeconomic and demographic factors influencing the usage of safe delivery services according to regions in Indonesia, IDHS-2012

Variable	Sumatra region OR and 95% CI	Java region OR and 95% CI	Lesser Sunda Islands region OR and 95% CI	Kalimantan region OR and 95% CI	Sulawesi region OR and 95% CI	Maluku islands region OR and 95% CI	Western New Guinea region OR and 95% CI
Age (years)							
15–19	1	1	1	1	1	1	1
20–24	1.2 (0.8 to 1.9)	1.1 (0.7 to 1.9)	0.5 (0.2 to 1.2)	0.7 (0.4 to 1.2)	0.8 (0.5 to 1.2)	2.0 (0.9 to 4.4)	0.7 (0.4 to 1.4)
25–29	0.5 (0.3 to 0.7)	0.5 (0.3 to 0.8)	0.3 (0.1 to 0.6)	0.3 (0.2 to 0.6)	0.5 (0.3 to 0.7)	1.1 (0.5 to 2.5)	0.6 (0.3 to 1.3)
30+	0.2 (0.1 to 0.3)	0.2 (0.1 to 0.3)	0.1 (0.04 to 0.2)	0.1 (0.09 to 0.2)	0.2 (0.1 to 0.3)	0.4 (0.2 to 0.9)	0.3 (0.1 to 0.5)
Place of residence							
Urban	1	1	1	1	1	1	1
Rural	0.6 (0.5 to 0.7)	0.6 (0.56 to 0.71)	0.4 (0.3 to 0.5)	0.5 (0.4 to 0.6)	0.5 (0.4 to 0.5)	0.4 (0.3 to 0.6)	0.3 (0.2 to 0.47)
Mother's education							
No education	1	1	1	1	1	1	1
Primary	2.3 (1.6 to 3.5)	3.0 (1.5 to 6.0)	1.1 (0.7 to 1.8)	3.0 (1.6 to 5.4)	3.0 (1.8 to 4.8)	1.2 (0.4 to 3.5)	2.9 (1.9 to 4.4)
Secondary	5.2 (3.5 to 7.8)	8.7 (4.0 to 17.7)	2.9 (1.8 to 4.7)	6.4 (3.5 to 11.6)	8.9 (5.5 to 14.3)	3.9 (1.4 to 11.0)	7.8 (5.2 to 11.7)
Higher	9.3 (6.1 to 14.2)	13.0 (6.0 to 27.0)	7.3 (4.0 to 12.7)	13.5 (7.0 to 25.8)	21.6 (13 to 35.8)	9.4 (3.2 to 27.7)	23.0 (13.7 to 38.7)
Father's education							
No education	1	1	1	1	1	1	1
Primary	1.4 (0.9 to 2.0)	1.3 (0.7 to 2.4)	1.3 (0.7 to 2.5)	2.0 (1.1 to 3.7)	2.0 (1.3 to 3.0)	1.3 (0.4 to 4.5)	4.4 (2.0 to 8.9)
Secondary	2.8 (1.9 to 4.2)	3.3 (1.8 to 5.9)	2.5 (1.3 to 4.8)	4.6 (2.5 to 8.5)	4.0 (2.7 to 6.4)	4.6 (1.4 to 15)	12.5 (6.0 to 24.9)
Higher	4.0 (2.6 to 6.3)	4.7 (2.6 to 8.6)	4.0 (2.0 to 7.9)	8.0 (4.1 to 15.1)	7.7 (4.9 to 12.0)	9.7 (3.0 to 32)	20.0 (9.0 to 40.8)
Mother's occupation							
Not working	1	1	1	1	1	1	1
Skilled	1.0 (0.9 to 1.1)	1.4 (0.3 to 0.6)	1.3 (1.1 to 1.7)	1.2 (1.0 to 1.4)	1.4 (1.2 to 1.6)	1.5 (1.1 to 1.9)	1.6 (1.2 to 2.0)
Agriculture	0.95 (0.40 to 0.5)	0.5 (0.3 to 0.6)	0.4 (0.3 to 0.5)	0.4 (0.3 to 0.5)	0.3 (0.2 to 0.3)	0.3 (0.2 to 0.5)	0.2 (0.1 to 0.2)
Unskilled/others	0.60 (0.5 to 0.7)	1.1 (0.9 to 1.3)	0.7 (0.5 to 0.9)	0.5 (0.4 to 0.8)	0.7 (0.6 to 0.9)	0.4 (0.2 to 0.7)	0.2 (0.1 to 0.3)
Father's occupation							
Not working	1	1	1	1	1	1	1
Skilled work	1.4 (0.9 to 2.2)	1.6 (1.0 to 2.6)	1.0 (0.5 to 2.3)	1.2 (1.0 to 1.4)	1.4 (1.2 to 1.6)	0.8 (0.5 to 1.4)	2.4 (1.4 to 4.0)
Agriculture	0.6 (0.4 to 0.9)	0.8 (0.5 to 1.3)	0.3 (0.2 to 0.7)	0.4 (0.3 to 0.5)	0.3 (0.2 to 0.3)	0.2 (0.1 to 0.4)	0.4 (0.2 to 0.6)
Unskilled others	0.9 (0.6 to 1.4)	1.1 (0.7 to 1.9)	0.7 (0.3 to 1.4)	0.5 (0.4 to 0.8)	0.7 (0.6 to 0.9)	0.6 (0.3 to 1.0)	2.3 (1.3 to 4.0)
Wealth quintile							
Poorest	1	1	1	1	1	1	1
Poorer	1.7 (1.5 to 2.0)	1.9 (1.5 to 2.3)	2.0 (1.6 to 2.5)	1.6 (1.3 to 2.0)	2.3 (1.9 to 2.7)	2.2 (1.6 to 3.0)	3.4 (2.4 to 4.7)
Middle	2.1 (1.8 to 2.4)	2.3 (1.8 to 2.9)	2.9 (2.2 to 3.9)	2.5 (2.0 to 3.0)	2.9 (2.4 to 3.4)	4.5 (3.0 to 6.3)	5.1 (3.6 to 7.2)
Richer	2.2 (1.9 to 2.6)	2.7 (2.2 to 3.4)	3.7 (2.7 to 5.0)	2.7 (2.0 to 3.6)	4.4 (3.5 to 5.4)	6.1 (4.2 to 8.9)	8.2 (5.4 to 12.2)
Richest	2.4 (2.0 to 2.8)	3.3 (2.6 to 4.0)	3.8 (2.8 to 5.1)	3.0 (2.2 to 4.0)	3.8 (3.0 to 4.8)	5.9 (3.5 to 10.0)	4.9 (3.0 to 7.9)
Frequency of listening to the radio/reading newspapers/magazines							
Not at all	1	1	1	1	1	1	1
Less than once a week	1.0 (0.7 to 1.5)	2.6 (1.7 to 3.9)	1.8 (1.1 to 2.9)	2.5 (1.2 to 5.3)	1.9 (1.2 to 2.8)	5.6 (2.2 to 14.6)	5.8 (2.4 to 14.2)
At least once a week	1.8 (1.6 to 2.2)	2.2 (1.7 to 2.7)	2.3 (1.9 to 2.8)	2.0 (1.5 to 2.6)	2.9 (2.4 to 3.6)	1.8 (1.4 to 2.4)	4.2 (3.3 to 5.3)

Continued

Table 4 Continued

Variable	Sumatra region OR and 95% CI	Java region OR and 95% CI	Lesser Sunda Islands region OR and 95% CI	Kalimantan region OR and 95% CI	Sulawesi region OR and 95% CI	Maluku islands region OR and 95% CI	Western New Guinea region OR and 95% CI
Birth order	1	1	1	1	1	1	1
1st	1.3 (1.1 to 1.4)	1.7 (1.5 to 2.0)	1.0 (0.8 to 1.2)	1.2 (0.9 to 1.4)	1.1 (0.9 to 1.3)	0.8 (0.6 to 1.1)	1.0 (0.7 to 1.3)
2nd	1.6 (1.4 to 1.9)	1.7 (1.4 to 2.1)	1.1 (0.8 to 1.4)	1.3 (0.9 to 1.6)	1.1 (0.9 to 1.3)	0.9 (0.7 to 1.2)	1.1 (0.8 to 1.5)
3rd	1.6 (1.3 to 2.0)	1.0 (0.8 to 1.3)	0.9 (0.6 to 1.3)	1.3 (0.9 to 1.8)	1.1 (0.9 to 1.4)	0.8 (0.5 to 1.2)	1.1 (0.8 to 1.7)
4th	1.1 (0.9 to 1.3)	0.9 (0.7 to 1.2)	0.7 (0.5 to 0.9)	1.0 (0.7 to 1.5)	0.7 (0.6 to 0.9)	0.6 (0.4 to 0.9)	0.8 (0.5 to 1.1)
5th and above							
Child status	1	1	1	1	1	1	1
Dead	3.3 (2.5 to 4.2)	2.0 (1.5 to 2.6)	3.0 (2.0 to 4.5)	3.0 (2.0 to 4.4)	3.5 (2.6 to 4.7)	3.6 (2.0 to 6.6)	2.6 (1.6 to 4.6)
Alive							

disparities that affect the use of ANC and safe delivery services and that these need to be addressed urgently.

Multivariate analyses show that there are no differences in the usage of ANC services among the rural and urban areas. This is against the disparities associated with mothers living in urban and rural areas in other studies.^{18–21} It is also against our own univariate findings that highlight disparities in the usage of ANC services across the seven regions. This may be due to adjusting of other important variables for ANC services like age, education and wealth quintile in the study.

Multivariate analyses reveal that compared with Sumatra, mothers in Java and Lesser Sunda islands are significantly better, mothers in Kalimantan are comparable while mothers in Sulawesi, Maluku and Western New Guinea islands are significantly disadvantaged in using ANC services. Though regional disparities are known to exist in Indonesia, multivariate results are closer to the univariate results in Java. This may be because 58% of Indonesia's population resides in Java.²² It justifies the need to disaggregate the data so that regional disparities are brought into focus.

It is known that differences in the wealth index affect mothers using ANC services.^{23–26} Our univariate analyses reveal that mothers in the richer and richest wealth quintiles are two times more likely in Java, Sumatra and Kalimantan and three times more likely in Sulawesi, Maluku and Western New Guinea islands to use ANC services than those in the poorest wealth quintile.

While differences in education levels of mothers and fathers affect ANC usage, mothers' education level has proved to be a significant factor in the usage of ANC services.^{7 18 20 27} Mothers educated up to primary, secondary and higher levels use ANC services almost two, three and six times more than those who have received no education. It is also significant that listening to the radio/reading newspapers and magazines at least once a week significantly affects the usage of ANC services.⁷

Multivariate Analyses of Safe Delivery services show that safe deliveries are significantly less in rural areas compared with urban areas.^{28–30} While Sumatra, Java and Lesser Sunda islands are comparable in mothers' usage of safe delivery services, mothers are significantly disadvantaged in Kalimantan, Sulawesi, Maluku and Western New Guinea islands. Wealth differentials affect the use of safe delivery services, while low education levels of mothers are disadvantageous to their use of safe delivery services. Though there is no significant difference between fathers with no formal education and those educated up to only the primary level, fathers with secondary and higher levels of education are positively associated with the use of safe delivery services in Indonesia. Listening to the radio/reading newspapers and magazines also affects the use of safe delivery services positively.

Thus, in low–middle-income countries, including Indonesia, access to safe delivery services remains a great challenge.^{31 32} This, along with the fact of low

Table 5 Multivariate analyses of selected socioeconomic predictors for complete antenatal care coverage and safe delivery services in Indonesia

Variable	Antenatal care			Safe delivery		
	OR	95% CI	p Value	OR	95% CI	p Value
Place of residence						
Urban	1.0			1.0		
Rural	1.02	0.95 to 1.10	0.58	0.86	0.80 to 0.92	0.001
Region						
Sumatra	1	–	–	1	–	–
Java	1.50	1.32 to 1.59	0.001	0.99	0.90 to 1.08	0.80
Lesser Sunda Islands	1.22	1.08 to 1.37	0.001	0.96	0.86 to 1.09	0.54
Kalimantan	1.07	0.96 to 1.20	0.23	0.79	0.71 to 0.88	0.001
Sulawesi	0.76	0.70 to 0.83	0.001	0.56	0.51 to 0.61	0.001
Maluku Islands	0.56	0.49 to 0.64	0.001	0.30	0.26 to 0.35	0.001
Western New Guinea	0.46	0.40 to 0.54	0.001	0.44	0.38 to 0.51	0.001
Wealth quintile						
Poorest	1	–	–	1	–	–
Poorer	1.45	1.32 to 1.60	0.001	1.64	1.50 to 1.80	0.001
Middle	1.57	1.42 to 1.74	0.001	1.89	1.70 to 2.10	0.001
Richer	1.75	1.56 to 1.96	0.001	2.02	1.81 to 2.26	0.001
Richest	1.52	1.33 to 1.73	0.001	1.72	1.51 to 1.96	0.001
Mother's education						
No education	1	–	–	1	–	–
Primary	1.85	1.51 to 2.27	0.001	2.06	1.65 to 2.56	0.001
Secondary	2.94	2.40 to 3.63	0.001	3.98	3.19 to 4.97	0.001
Higher	6.20	4.87 to 7.85	0.001	10.37	8.06 to 13.3	0.001
Father's education						
No education	1	–	–	1	–	–
Primary	1.50	1.18 to 1.90	0.001	1.16	0.91 to 1.47	0.24
Secondary	1.81	1.43 to 2.31	0.001	1.61	1.26 to 2.05	0.001
Higher	1.79	1.37 to 2.33	0.001	1.68	1.28 to 2.20	0.001
Frequency of listening to radio/reading newspaper/magazine						
Not all	1			1		
Less than once a week	1.16	0.94 to 1.44	0.18	1.25	1.01 to 1.55	0.01
At least once a week	1.24	1.13 to 1.37	0.001	1.26	1.15 to 1.39	0.001

Mother's age at childbirth, mother's occupation, father's occupation, birth order and child status are controlled in multivariate analyses.

household health insurance coverage and high out-of-pocket spending on health, impedes universal health coverage.³³ These need to be corrected further because regional and wealth inequalities affect maternal mortality and U5M in Indonesia.

CONCLUSION

We surmise that ANC services have increased nominally from the last IDHS survey. However, since it is still not 100%, we need to look at factors affecting poor coverage by ANC and safe delivery services. Poor usage of these services is related to a complex set of social and demographic factors that affect the use, accessibility, affordability and perception about the need and utility of such services.^{34–36} While being poor with no formal education was a deterrent to accessing ANC services, the odds of using ANC and safe delivery services were significantly less in the Sulawesi, Maluku and Western New Guinea islands. This means that the areas covered by trained nurses/midwives are increased and special incentives are

offered to train women social workers in the Sulawesi, Maluku and Western New Guinea islands. The study recommends that disaggregated regional targets be set so as to further reduce maternal mortality rates in Indonesia.

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