

**Determinants and Impact of Health Insurance on Utilization  
of Maternal Health Care in Nepal: Evidence from Multiple  
Indicator Cluster Survey Data**

**Research Report Prepared by**

**Dr. Sharad Kumar Sharma**

**Undersecretary (Statistics)**



**Government of Nepal**

**Office of the Prime Minister and Council of Ministers**

**Result Management Division**

**Statistics Section**

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# Determinants and impact of health insurance on utilization of maternal health care in Nepal: Evidence from Multiple Indicator Cluster Survey Data

## 1. Background

### 1.1. Introduction

Maternal mortality (MM) continues to be the major cause of death among women of reproductive age in many developing countries, more than 80% of which could be prevented. Global maternal mortality ratio (MMR) has been dropped by 38% over the last two decades from 342 per 100,000 live birth (LB) in 2000 to 211 per 100,000 LB in 2017 [1]. In Nepal, pregnancy related mortality ratio (PMR) has been decreased substantially from 543 per 100,000 LB in 1996 [2] to 259 per 100,000 LB in 2016 [3]. This is equivalent to the annual rate of reduction (ARR) of 3.7% per year. To achieve sustainable development goal (SDG) of 70 per 100,000 LB in 2030 [4], Nepal has to increase the average ARR of MMR to 9.3% per year during 2016 and 2030. To address this challenge, improvement in the quality and coverage of antenatal care (ANC), delivery by skilled birth attendants (SBA) and postnatal care (PNC) are required.

Continuum of care has been considered as an important program for improving maternal and newborn care and reducing millions of maternal and child deaths around the globe [5]. Within the continuum of care framework, all women should have access to quality maternal health service during pregnancy, childbirth and postpartum period. For example, better conditions for adolescence girls, including access to family planning services, can contribute to a wanted pregnancy at the right time. Good care during pregnancy increases the chances of a safe birth. Skilled care at an immediately after birth reduces the risk of death or disability for both the mother and baby [6].

Antenatal care is an important component of continuum of care. For antenatal care to be effective, all pregnant women need a minimum of four visit at the fourth, sixth, eighth and ninth month of the pregnancy [7]. Revised World Health Organization (WHO) guideline recommends conducting a minimum of eight contacts to reduce perinatal mortality and improve women's experience of care [8]. In 2016, 84% of pregnant women had at least one ANC contact with skilled birth attendants (SBA). However, only 76% had their first ANC appointment on time and only 59% had four ANC visit. Long waiting times in ANC clinic and poor counselling were some deterring factors [9].

Institutional delivery by SBA is a major determinant of the survival and health of both mother and baby. One way of reducing maternal and newborn mortality is by improving the availability, accessibility, quality and use of service (called emergency obstetric care, EmOC) for the treatment of complications that arises during pregnancy and childbirth. WHO suggests that EmOC is required for about 15% of the pregnant women [10]. The handbook of EmOC monitoring developed by WHO also suggests all women with major obstetric complication should be treated in EmOC facilities and about 5% to 15% of the births should be conducted using caesarean section (CS). Annual health report published by Department of Health Services (DoHS), Nepal indicates that about 20% of the deliveries are conducted by CS and only 11% of the obstetric complications are treated in EmOC facilities [11]. This indicates the fact that pregnant women are not getting quality maternity services despite remarkable (61%) increase in delivery conducted by SBA in Nepal, from 36% in 2011 to 58% in 2016 [12,13].

Postnatal period is also important for both the mothers and baby, because they are more likely to develop life-threatening complication. Postnatal care from health personnel can help to prevent and

treat most of these complications. It is recommended that the mother and baby receive at least three postnatal checkups, the first within 24 hours of delivery, the second on the third day following the delivery and the third on the seventh day after delivery [13]. However, survey results indicate that current coverage level of postnatal care (PNC) for mother and baby is low in Nepal. For example, about 57% of newborn receive PNC within the first two days after birth and only about one in five (21%) newborn had PNC checkup within the first hour of life [13]. WHO recommends that PNC for newborn should start as soon as possible after birth because many neonatal deaths occur within the first 48 hours of life [14].

To achieve the sustainable development goal (SDG) of reducing maternal mortality to 70 per 100,000 LB in 2030, Nepal has to improve in coverage, equity, and quality of maternal and newborn health services. Therefore, understanding about the socio-demographic determinants of these maternal and newborn health services is an important programmatic initiative. This assessment is an examination of the determinants of four important aspects (ANC 4 visit, SBA delivery, CS delivery and PNC for baby) of maternal and newborn health care seeking in Nepal using nationally representative data from the 2019 Nepal Multiple Indicator Cluster Survey (NMICS).

## **1.2. Analytic framework**

A systematic review conducted in Sub-Saharan Africa identified maternal age, education and employment status as predisposing factors influencing antenatal care. Similarly, economic status, place of residence, health insurance coverage and quality of available service as enabling factors and prior pregnancy status and desire of pregnancy as need factor for antenatal care [15]. Age over 30 years, nulliparity, husband's education over 10 years and highest wealth were reported as significant predictor of timely initiation of ANC in Bangladesh [16]. While older, married and educated working women, those in higher economic status and those with health insurance were more likely to complete four or more of their ANC visits in Indonesia [17]. Only about a half of the women received the minimum recommended 4 ANC visits in 2019 in India. The ANC 4 coverage was higher among older and women belonging to richer wealth quintile, covered by health insurance, living in urban area, with unintended and higher order pregnancy [18].

Gorysch S. and Campbell O.M.R. (2009) carried out a systematic review of published literature and found that higher maternal age, education, household wealth, lower parity, urban residence, facility use in previous delivery and antenatal care use were highly predictive to health facility and SBA delivery. The authors also suggested that it is important to consider as many influential factors as possible to draw the valid conclusion [19]. In addition, ownership of health insurance was found to be strong predictor for utilization of delivery service by SBA in Indonesia [20], Ghana [21], Ethiopia [22], Sierra Leone, Niger, Mali [23] and LaoPDR [24].

Previous literature also show that women's age, education, ethnicity, economic status, place of residence, health insurance coverage, parity and prior utilization of health services were significant predictors for postnatal care for mother and baby [25-31]. Contact of health worker during pregnancy, at least three ANC visit and institutional delivery were the strong determinants for utilization of PNC in India [32].

Based on the previous literature and with the help of Andersen Behaviour Model of health service use [33] and framework for determinants of maternal health care seeking used by Mbugua and MacQuarrie (2018) [1], we developed analytic framework for this study to examine variations in utilization of maternal health services by individual women across different socio-demographic characteristics. The

framework assumes that decisions on use of the maternal health services (outcome factors) are influenced by various determinant factors, which are grouped into three factors called predisposing factors, enabling factors and need factors. Predisposing factors include demographic, social structural (age, education and ethnicity) variables, which exist prior to onset of the outcome. These demographic variables such as age and sex are intimately related to health and illness [1]. Different age groups have different types of illness and require different pattern of medical care. The social structure variables such as education and occupation suggest the life style and status of the individual in the society, which lead them to use particular health care [33].

Although individual may be predisposed to use health service, some means must be available for them to do so. A condition, which permits a family to act on a value or satisfy a need regarding health service use, is defined as enabling. Enabling conditions make health service resources available to the individual. Household income, health insurance coverage, place of residence and provinces are considered as enabling factors [33].

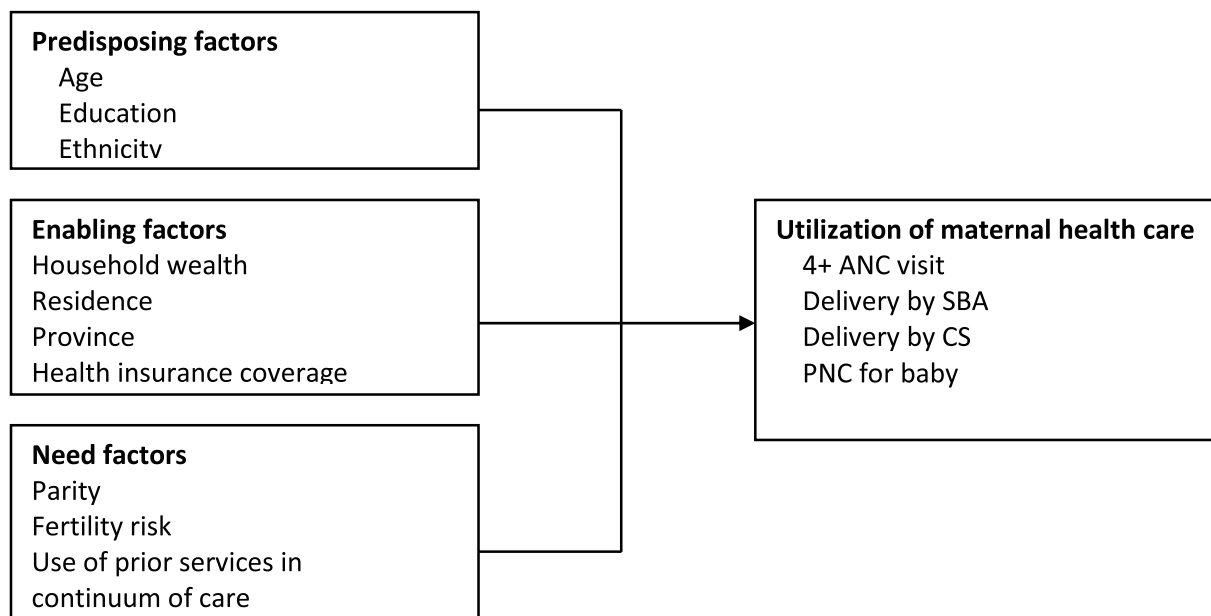


Figure 1. Conceptual framework for examining determinant of maternal health care in Nepal: Modified from the Andersen Behavioral Model of Health Services Use (Andersen and Newman 2005)

Assuming that presence of predisposing and enabling conditions, the individual or his family must perceive need for the use of health services. The need factor consist of both perceived need and evaluated need. Perceived need are self-judgement of urgency and operationalized through self-reported symptom, perception of disability or a self-support of owns general state of health. Evaluated needs are those based on a physical exam, clinical diagnosis or external objective criteria of the need for medical care [33]. We have considered the parity, fertility risk and previous maternal health care as need factor for this analysis.

Figure 1 presents modified Andersen behavioral model used for this analysis. The framework indicates that maternal age, education and ethnicity are predisposing factors, household wealth quintile, place of residence, province and health insurance coverage are enabling factors. While parity, fertility risk and prior use of antenatal care and institutional delivery are considered as need factors. Women with higher fertility risk, or previous childbearing experience, may be more likely to use maternal health services because they might be more likely to experience complication during pregnancy and delivery [1].

The assessment examines these predisposing, enabling and need factors in association with adequate ANC (at least four ANC), SBA delivery, CS delivery and timely PNC (within 48 hours after delivery).

## 2. Methods

### 2.1. Data and study design

This assessment used data from 2019 NMICS. NMICS 2019 survey used a standard questionnaire, based on multi-stage cluster sampling design to gather nationally representative data. More specific information on the sampling design can be explored in NMICS 2019 final report [34].

Figure 2 shows the sample selection criteria used for this assessment. The respondents for this assessment are 2519 women of reproductive age 15-49 year with live births in last two years preceding the survey. Final weighted sample used for ANC 4 visit, delivery by SBA, CS delivery and PNC for baby are 1950. The sample for NMICS 2019 was designed to provide estimates for a large number of indicators including ANC 4 visit, SBA and CS delivery and PNC for baby at the national level and urban-rural of seven provinces.

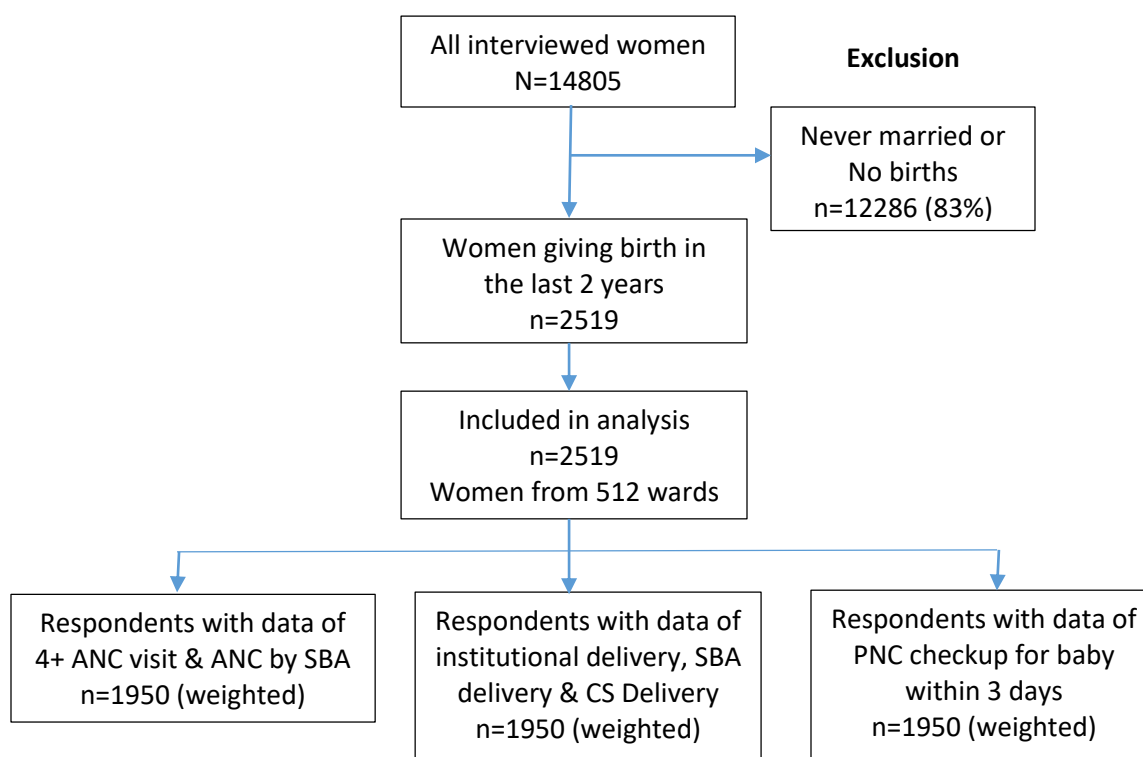


Figure 2. Figure 2. Sample selection flow diagram: ANC, delivery and PNC

### 2.2. Variables

The outcome variables for this assessment are adequate ANC use delivery by SBA and CS and timely PNC for baby. Table 1 presents the description of the outcome and independent variables and the corresponding population base. The independent variables for predisposing factors include maternal age, women's level of education, and ethnicity. Maternal age is computed in completed years and then categorized as younger than age 20, age 20-34 and age 35-49. Women are categorized as having completed no education, primary education (grade 1-8), secondary education (grade 9-12) and higher education. The ethnicity categories used are Brahmin/Kshetri/Thakuri, Janjati (including Newar), Dalit

and other (including Muslim). The independent variables for enabling factors include household wealth quintile, place of residence, province and health insurance coverage. The wealth index is a pre-calculated variable included in standard NMICS data file and is based on set of assets owned by the household. Finally, variables related to need factors include fertility risk and parity (number of children ever born). Women with fertility risk are defined as meeting one of the following criteria: women either younger than age 18 or age 35 or older, or women with four or more birth. In addition to these variables, which can affect all four care, seeking outcomes, use of ANC service can affect use of SBA and CS delivery and PNC, while the facility delivery can affect use of PNC. These variables are also included as need factors in the assessment (Table 1).

**Table1. Definitions of outcome and independent variables**

Indicator	Description	Population base
<b>Outcome variables</b>		
ANC 4 or more visit	Women who have at least four ANC visits during their most recent pregnancy	Women age 15-49 year with a live birth in the two years preceding the survey
Delivery by SBA	Women who were assisted by Doctor, Nurse or Midwives for their most recent pregnancy	Women age 15-49 year with a live birth in the two years preceding the survey
Delivery by CS	Women who were delivered by CS for their most recent pregnancy	Women age 15-49 year with a live birth in the two years preceding the survey
Postnatal care for baby	Women who received PNC checkup for their baby after the delivery before leaving health facility	Women age 15-49 year with a live birth in the two years preceding the survey
<b>Independent variables</b>		<b>Variable category</b>
<b>Predisposing factors</b>		
Age of woman	Completed age of women at the time of survey	1) <20 2) 20-34 3) 35-49
Woman's education	Completed level of education of woman	0) None 1) Basic, grade(1-8) 2) Secondary, grade(9-12) 3) Higher
Ethnicity of head of household	Ethnic categories that an individual falls into	1) Bahun/Kshetri/Thakuri 2) Janjati (including Newar) 3) Dalit 4) Other (including Muslim)
<b>Enabling factors</b>		
Household wealth	Quintiles based on household wealth index	1) Poorest 2) Second 3) Middle 4) Fourth 5) Richest
Place of residence	Urban and rural	1) Urban 2) Rural

Province	Geographical origin of the women	1) Province1 2) Madhesh 3) Bagmati 4) Gandaki 5) Lumbini 6) Karnali 7) Sudurpaschim
Health insurance coverage	Women was covered health insurance	0) No 1) Yes
Need factor		
Parity	Number of children ever born	1) One or less 2) Two or more
Fertility risk	Women in high risk group (age <20 and >=35 and CEB>=4)	0) No 1) Yes
Use of prior services in continuum of care	Received antenatal care (at least one)	0) No 1) Yes
	Institutional delivery	0) No 1) Yes

### 2.3. Data analysis

Data are analyzed using Stata SE15 [35]. Statistics are presented mainly as frequency, percentages, and 95% confidence interval (CI). We fitted an unadjusted logistic regression model to assess whether there are any association between each of the four outcomes (ANC 4 visit, SBA delivery, CS delivery and PNC for baby) and the independent variables. In the multivariable analysis, we fit an adjusted binary logistic regression model while controlling for each factors. The model for each outcome specify a common set of predisposing factors, enabling factors and need.

In our analysis, we adjusted for the complex sampling design using the weights provided in the women's data set in 2019 NMICS, which account for sampling probability and non-response. We also measured the impact of health insurance coverage on four-outcome variable using statistical simulation. In the simulation approach, the predicted probability of women using four maternal health services was compared under alternative scenarios concerning health insurance coverage for respective maternal health services, when the observed effects of the other covariates used in the analysis were held constant at their observed level. In the base line simulation, the value of the health insurance coverage was set at their observed levels. In the second simulation, the health insurance coverage was set equal to zero (0), simulating the scenario of minimum health insurance impact (that is none of the women included in the sample has health insurance coverage). In the final simulation the health insurance coverage was set to one (1) to represent their maximum theoretical value (that is all the women included in the sample had health insurance coverage), to assess hypothetical effects of an optimal health insurance impact. Difference of the predicted probability of maternal health care between the second and final simulation is considered as impact of health insurance for maternal health care [36].

## 3. Results

### 3.1. Sample characteristics

Table 2 shows the characteristics of the respondents grouped by predisposing, enabling and need factors. Among predisposing factors, over four out of five (83%) of the respondents are of age group 20-34 years, about a half (49%) have secondary or higher-level of education and slightly more than one-third (35%) are Janjatis (including Newar). Among the enabling factors, slightly less than a half (44%) respondents are in the poorest or poorer wealth quintiles, and more than a half are distributed among top three wealth quintiles. Two-third (66%) respondents are living in urban areas, one-fifth (20%) respondents are belonged to Bagmati Province and about 5% respondents are covered by health insurance. Among the need factors, more than a half (56%) respondents have two or more children ever born, three-quarter (75%) respondents are in high-risk fertility group, 96% have received at least one ANC and more than three fourth (97.8%) have given birth in health facility.

### **3.2. Use of adequate antenatal care (ANC 4 visit)**

Table 3 shows the percentage distribution of women who obtained four or more ANC grouped by predisposing, enabling and need factors. Overall, 78% of the respondents have obtained at least four ANC visits. By pre-disposing characteristics, ANC 4 visit is highest (79%) among women age less than age 20 and age 20-34 years, women with education over secondary level (98%), and among women belonging to Brahmin/Kshetri/Thakuri (88%). Regarding enabling factors women in richest wealth quintile (95%), living in urban areas (81%), and Gandaki Province (91%), and covered by health insurance (90%) were more likely to use ANC 4 visit compared with their counterparts. According to the need factors, primiparous women (84%), and women with fertility risk are more likely to use ANC 4 plus visit compared with women who have one or less children or women with no fertility risk.

#### **3.2.1. Factors associated with ANC 4 plus visit**

The predisposing, enabling and need factors are used as determinant variable in unadjusted and adjusted odds ratio analysis, as shown in Table 4. Overall the unadjusted odds ratio indicate that multiple predisposing, enabling, and need factors are associated with ANC 4 plus visit.



**Table 2 Sample Profile: Percent distribution of socio-demographic characteristics of respondents (n=1,950)**

Characteristics	N	Percent
<b>Predisposing factors</b>		
<b>Mother's age</b>		
<20	201	10.3
20-34	1610	82.5
35-49	139	7.2
<b>Mother's education</b>		
None	405	20.8
basic grade(1-8)	600	30.7
secondary grade(9-12)	775	39.8
higher	171	8.8
<b>Ethnicity</b>		
Bahun/Kshetri/Thakuri	540	27.7
Janjati (including Newar)	680	34.8
Dalit	305	15.7
Other (including Muslim)	425	21.8
<b>Enabling factors</b>		
<b>Household wealth</b>		
Poorest	442	22.7
Second	414	21.2
Middle	384	19.7
Fourth	384	19.7
Richest	327	16.7
<b>Residence</b>		
Urban	1277	65.5
Rural	673	34.5
<b>Province</b>		
Province-1	306	15.7
Madhesh	417	21.4
Bagmati	384	19.7
Gandaki	153	7.9
Lumbini	371	19.0
Karnali	132	6.8
Sudurpaschim	187	9.6
<b>Health insurance coverage</b>		
no	1856	95.2
yes	94	4.8
<b>Need factors</b>		
<b>Parity</b>		
one or less	851	43.7
two or more	1099	56.4
<b>Fertility risk</b>		
no	479	24.6
yes	1471	75.4
<b>Received ANC</b>		
no	87	4.5
yes	1863	95.5
<b>Institutional delivery</b>		
no	438	22.5
yes	1512	77.5
<b>Total</b>	<b>1950</b>	<b>100.0</b>

**Table 3 Distribution of 4+ ANC across predisposing, enabling, and need factors, 2019 NMICS (n=1950)**

Characteristics	N		Percent	95% CI
<b>Predisposing factors</b>				
<b>Mother's age</b>				
<20	201		78.5	(72.3-83.6)
20-34	1,610		78.3	(76.2-80.2)
35-49	139		70.9	(62.8-77.8)
<b>Mother's education</b>				
None	405		53.4	(48.6-58.3)
Basic grade(1-8)	600		76	(72.5-79.3)
Secondary grade(9-12)	775		87.5	(84.9-89.6)
Higher	171		97.7	(93.9-99.1)
<b>Ethnicity</b>				
Bahun/Kshetri/Thakuri	540		87.6	(84.5-90.1)
Janjati (including Newar)	680		83.7	(80.7-86.3)
Dalit	305		71.2	(65.9-76.0)
Other (including Muslim)	425		60.7	(55.9-65.2)
<b>Enabling factors</b>				
<b>Household wealth</b>				
Poorest	442		69.6	(65.2-73.7)
Second	414		73.3	(68.8-77.4)
Middle	384		75.4	(70.8-79.4)
Fourth	384		80.2	(75.9-83.9)
Richest	327		94.5	(91.4-96.5)
<b>Place of Residence</b>				
Urban	1,277		80.7	(78.4-82.7)
Rural	673		72.3	(68.8-75.6)
<b>Province</b>				
Province-1	306		80.3	(75.5-84.4)
Madhesh	417		56.8	(52.0-61.5)
Bagmati	384		87.2	(83.5-90.2)
Gandaki	153		91.2	(85.6-94.8)
Lumbini	371		80.7	(76.4-84.4)
Karnali	132		72.3	(64.0-79.2)
Sudurpaschim	187		88	(64.0-79.2)
<b>Covered by health insurance</b>				
No	1,856		77.2	(75.2-79.0)
Yes	94		89.8	(81.9-94.5)
<b>Need factors</b>				
<b>Parity</b>				
One or less	851		84	(81.4-86.3)
Two or more	1,099		73	(70.3-75.5)
<b>Fertility risk</b>				
No	479		67.5	(63.2-71.6)
Yes	1,471		81.1	(79.0-83.0)
<b>Total</b>	<b>1,950</b>		<b>77.8</b>	<b>(75.9-79.6)</b>

### 3.2.2. Bivariate logistic regression analysis (unadjusted)

The unadjusted odds ratio analysis for independent variables echoes the findings of bivariate distributional analysis. Mother's age, education and ethnicity are each predisposing factors significantly associated with ANC 4 plus visit in separate bivariate model. Women's age 35-49 have 0.7 times lower odds of ANC 4 plus visit (OR 0.7, CI 0.4-1.0) compared to mothers age less than 20 years. Mothers of age 20-34 year are not significantly different from mother age less than 20 years in their 4 plus ANC care seeking behavior.

Among enabling factors, level of education is significantly positively associated with ANC 4 plus visit. Mother with basic level of education (grade 1-8) have 2.6 times higher odds (OR 2.6, CI 2.0-3.3), mother with secondary-level of education (9-12 grade) have 5.1 times higher odds (OR 5.1, CI 3.8-6.8) and mother with higher-level of education have 18.8 times higher odds (OR 18.8, CI 9.0-39.2) of receiving ANC 4 plus visit compared with mother with no education. Dalit (OR 0.5, CI 0.3-0.6) and other (including Muslim) (OR 0.3, CI 0.2-0.4) ethnic group have significantly lower odds of ANC 4 visit compared with Brahmin/Kshetri/Thakuri ethnicity. However, Janjati are not significantly different from Brahmin/Kshetri/Thakuri women in their ANC 4 visit.

Women in second, middle, fourth and richest wealth quintiles have significantly higher odds of 4 plus ANC, ranging from 1.5 to 6.2 times than the odds of the poorest wealth quintile. Rural residents have lower odds of ANC 4 plus care compared with urban residents (OR 0.7, CI 0.5-0.9). Compared with Bagmati Province, women living in Province 1, Province 2, Lumbini and Karnali Provinces have significantly lower odds (ranging from 0.2 to 0.6) of ANC 4 visit. However, women living in Gandaki and Sudurpaschim Provinces were not significantly different from women living in Bagmati Province in terms of ANC 4 plus care. Similarly, women covered by health insurance have significantly higher odds (OR 1.8, CI 1.1-3.0) of ANC 4 visit compared to women without any health insurance coverage. Having two or more child have significantly lower odds (OR 0.5, CI 0.4-0.6) of ANC 4 visit compared to women having one or less child. While women with fertility risk have higher odds (OR 2.0, CI 1.6-2.4) of ANC 4 visit compared with women without any fertility risk.

### **3.2.3. Multivariate logistic regression analysis (adjusted)**

Table 4 also shows that, after adjusting for other factors, among the predisposing factors, women's education and ethnicity remain statistically significant in its association with ANC 4 visit, while among the enabling factors wealth and province remain statistically significant and both need factors, parity and fertility risk remain statistically significantly associated with ANC 4 plus visit.

Compared with women with no education, women with basic, secondary and higher education have 1.6 times (aOR 1.6, CI 1.2-2.1), 2.5 times (aOR 2.5, CI 1.8-3.6), and 5.3 times (aOR 5.3, CI 2.5-11.4) statistically significant higher odds of ANC 4 plus visit after controlling for other factors. Dalit and Janjati women are not significantly different in terms of ANC 4 plus visit than Brahmin/Kshetri/Thakuri women, however Muslim, Terai-madhesi and other women have significantly lower odds of ANC 4 plus visit (aOR 0.7, CI 0.5-1.0) than Brahmin/Kshetri/Thakuri.

Women in the second wealth quintile (aOR 2.1, CI 1.5-3.0), middle wealth quintile (aOR 2.5, CI 1.7-3.6), fourth wealth quintile (aOR 2.4, CI 1.6-3.7) and richest wealth quintile (aOR 5.0, CI 2.6-9.4) have significant higher odds of ANC 4 plus visit compared with women in poorest wealth quintile.

**Table 4 Unadjusted and adjusted odds ratios for 4+ antenatal care visit: Results from binary logistic regressions, 2019 NMICS (n=1,950)**

Characteristics	Unadjusted odds ratio	95% CI	Adjusted odds ratio	95% CI
<b>Predisposing factors</b>				
<b>Mother's age</b>				
<20	Ref.		Ref.	
20-34	1.0	(0.8-1.4)	0.7	(0.4 - 1.1)
35-49	0.7*	(0.4-1.0)	1.1	(0.7 - 1.8)
<b>Mother's education</b>				
None	Ref.		Ref.	
basic grade(1-8)	2.6***	(2.0-3.3)	1.6***	(1.2 - 2.1)
secondary grade(9-12)	5.1***	(3.8-6.8)	2.5***	(1.8 - 3.6)
higher	18.8***	(9.0-39.2)	5.3***	(2.5 - 11.4)
<b>Ethnicity of head of household</b>				
Bahun/Kshetri/Thakuri	Ref.		Ref.	
Janjati (including Newar)	0.8	(0.6-1.1)	1.0	(0.7 - 1.4)
Dalit	0.5***	(0.3-0.6)	0.9	(0.6 - 1.3)
Other (including Muslim)	0.3***	(0.2-0.4)	0.7*	(0.5 - 1.0)
<b>Enabling factors</b>				
<b>Household wealth</b>				
Poorest	Ref.		Ref.	
Second	1.5**	(1.1-2.1)	2.1***	(1.5 - 3.0)
Middle	1.4**	(1.0-2.0)	2.5***	(1.7 - 3.6)
Fourth	1.8***	(1.3-2.6)	2.4***	(1.6 - 3.7)
Richest	6.2***	(3.6-10.6)	5.0***	(2.6 - 9.4)
<b>Place of residence</b>				
Urban	Ref.		Ref.	
Rural	0.7***	(0.5-0.9)	1.0	(0.7 - 1.3)
<b>Province</b>				
Province-1	0.5***	(0.3-0.8)	0.8	(0.5 - 1.2)
Madhesh	0.2***	(0.1-0.3)	0.3***	(0.2 - 0.5)
Bagmati	Ref.		Ref.	
Gandaki	1.4	(0.8-2.4)	1.5	(0.9 - 2.6)
Lumbini	0.6**	(0.4-0.9)	0.9	(0.5 - 1.4)
Karnali	0.4**	(0.2-0.7)	1.1	(0.6 - 1.9)
Sudurpaschim	1.1	(0.6-1.8)	2.3***	(1.3 - 4.1)
<b>Covered by health insurance</b>				
No	Ref.		Ref.	
Yes	1.8**	(1.1-3.0)	0.9	(0.5 - 1.7)
<b>Need factors</b>				
<b>Parity</b>				
One or less	Ref.		Ref.	
Two or more	0.5***	(0.4-0.6)	0.8**	(0.6 - 1.0)
<b>Fertility risk</b>				
No	Ref.		Ref.	
Yes	2.0***	(1.6-2.4)	1.7***	(1.2 - 2.4)

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Similarly, compared with Bagmati Province, women in Madhesh Province (aOR 0.3, CI 0.2-0.5) have lower odds of ANC 4 visit when controlling for other factors. While women in Sudurpaschim Province (aOR 2.3, CI 1.3-4.1) have higher odds of ANC 4 plus visit than women in Bagmati Province in adjusted model. No other regional differences in ANC 4 plus visit are significant.

The adjusted odds of ANC 4 visit are significantly lower for women with two or more parity (aOR 0.8, CI 0.6-1.0) compared with those with one or less parity and it is higher for women with fertility risk (aOR 1.7, CI 1.2-2.4) compared with women with no fertility risk. The predisposing factors of maternal age and the enabling factors of place of residence and health insurance coverage are no longer statistically significant in the multivariate model.

### **3.3 SBA delivery**

Overall, more than three-fourth (77%) of women in Nepal delivered their most recent birth supported by SBA according to the NMICS 2019 (Table 5). Among predisposing factors, women older than age 34 have the lowest rate of SBA delivery (71%) compared with all other age groups, while women age less than 20 years have the highest rate (80%). Women with higher level of education are more likely to have SBA delivery (98%) compared with the other education categories and those with no education are least likely (53%) to have SBA delivery. Proportion of SBA delivery is highest among Brahmin/Kshetri/Thakuri (87%) followed by Janjati (including Newar) (79%), Dalit (72%), and other ethnic groups including Muslim (65%).

For the enabling factors, wide provincial disparity exists with highest SBA delivery in Bagmati (87%) followed by Gandaki (86%), and Sudurpaschim (86%) Provinces and it is lowest in Madhesh Province (64%) followed by Karnali Province (66%). Higher percentages of women in richest (94%) and fourth wealth quintile (87%) have given birth with support from SBA compared with women in poorest wealth quintile (58%), as is also true for women in urban areas (83%) compared with rural areas (66%). Proportion of SBA delivery is also higher among women with health insurance coverage (95%) than among those without health insurance coverage (76%). For need factors, women with one or less parity (87%) and women with fertility risk (80%) are more likely to have SBA delivery than women with two or more parity (70%) and women with no fertility risk (69%). Women who obtain ANC during pregnancy have a higher proportion (80%) of SBA delivery compared with women who did not receive any ANC during pregnancy (17%).

#### **3.3.1. Factors associated with SBA delivery**

Table 6 shows result of bivariate and multivariate analysis with SBA delivery as the outcome variable and predisposing, enabling, and need factors as possible determinants. The results of the unadjusted (bivariate) odds ratio analysis indicate that all variables in each of the three factors are significantly related to the SBA delivery.

#### **3.3.2. Bivariate logistic regression analysis (unadjusted)**

For the predisposing factors, women in age 35-49 years have significant lower odds (OR 0.6, CI 0.4-1.0) of SBA delivery than women in age under 20 years. The odds of SBA delivery increased considerably with level of education. Women with higher education have the highest odds (OR 33.8, CI 13.7-83.7). Janjati (including Newar), Dalit and other (including Muslim) have lower odds (OR 0.6, CI 0.4-0.9; OR 0.4, CI 0.3-0.6; and OR 0.4, CI 0.3-0.5) respectively of SBA delivery than Brahmin/Kshetri/Thakuri. With regard to the four enabling factors, odds of SBA delivery increased substantially with household wealth. Women in

the richest wealth quintile have 12.8 times the odds of women in poorest wealth quintile (OR 12.8, CI 7.1-23.1). SBA delivery is also significantly varies across Provinces. Women in Madhesh and Karnali Provinces have significantly lower odds of SBA delivery compared to the women in Bagmati Province. While SBA delivery is not significantly different in Province 1, Gandaki, Lumbini and Sudurpaschim Provinces, compared with Bagmati. Similarly, women in rural communities have 0.4 times lower odds (OR 0.4, CI 0.3-0.5) of SBA delivery compared to women in urban residents. In addition, the odds of women with health insurance coverage have 4.1 times higher odds (OR 4.1, CI 2.0-8.7) of SBA delivery compared to women without health insurance coverage.

Regarding need factors, women with two or more parity have 0.4 times lower odds (OR 0.4, CI 0.3-0.5) of SBA delivery compared with women with one or less parity. Similarly, women with fertility risk have 1.9 times higher odds (OR 1.9, CI 1.5-2.3) of SBA delivery compared to women with not fertility risk, and women receiving ANC during pregnancy have 19.8 times higher odds (OR 19.8, CI 11.8-33.1) compared to women who do not receive ANC during pregnancy.

### **3.3.3 Multivariate logistic regression analysis (adjusted)**

After adjusting for other factors in multivariate analysis, the predisposing factor of mother's age is no longer significantly associated with SBA delivery. While more educated women continue to have higher odds of SBA delivery, they have smaller odds ratios than in unadjusted regression analysis. In the adjusted model, women with basic education have 1.3 times higher odds (aOR 1.3, CI 1.0-1.8), those with secondary education have 1.8 times higher odds (aOR 1.8, CI 1.3-2.5) and women with higher education have 4.9 times higher odds (aOR 4.9, CI 2.0-12.4) of SBA delivery compared to those with no education.

Among the enabling factors, wealth quintile, place of residence, certain provinces and ownership of health insurance coverage remain significantly associated with SBA delivery after adjusting for other factors. The odds of SBA delivery increases systematically with increasing level of wealth. Women in richest wealth quintile have the highest odds (aOR 9.2, CI 4.1-15.3) of SBA delivery compared with the women in poorest wealth quintile. Rural residence is negatively associated with SBA delivery (aOR 0.6, CI 0.5-0.8) compared with urban residence. With Bagmati Province as the reference category, women in Madhesh Province have 0.5 times lower odds (aOR 0.5, CI 0.3-0.8) and Sudurpaschim Province have 2.8 times higher odds (aOR 2.8, CI 1.5-5.3) of SBA delivery. Four other provinces are no longer significantly associated with SBA delivery after controlling for other factors. In the adjusted model, women with health insurance coverage have 2.5 times higher odds (aOR 2.5, CI 1.1-5.9) of SBA delivery compared to women without health insurance coverage.

All the three need factors remain significantly associated with SBA delivery. Women with two or more parity have 0.4 time lower odds (aOR 0.4, CI 0.3-0.6). Women with fertility risk have 1.4 times higher odds (aOR 1.4, CI 1.0-1.9) and women receiving ANC during pregnancy have 9 times higher odds (aOR 9.0, CI 5.3-15.5) of SBA delivery compared with their counterparts (reference categories).

**Table 5 Distribution of SBA delivery across predisposing, enabling, and need factors, 2019 NMICS (n=1950)**

Characteristics	N	Percent	95% CI
<b>Predisposing factors</b>			
<b>Mother's age</b>			
<20	201	79.7	(73.6-84.7)
20-34	1,610	77.4	(75.3-79.4)
35-49	139	71.3	(63.2-78.2)
<b>Mother's education</b>			
None	405	53.0	(48.1-57.8)
Basic grade(1-8)	600	75.3	(71.6-78.6)
Secondary grade(9-12)	775	86.7	(84.2-89.0)
Higher	171	98.3	(94.7-99.4)
<b>Ethnicity</b>			
Bahun/Kshetri/Thakuri	540	87.1	(84.0-89.7)
Janjati (including Newar)	680	79.4	(76.2-82.3)
Dalit	305	71.5	(66.2-76.3)
Other (including Muslim)	425	65.2	(60.6-69.6)
<b>Enabling factors</b>			
<b>Household wealth</b>			
Poorest	442	57.7	(53.0-62.2)
Second	414	72.4	(67.9-76.5)
Middle	384	80.5	(76.2-84.2)
Fourth	384	87.0	(83.3-90.0)
Richest	327	94.4	(91.3-96.4)
<b>Place of Residence</b>			
Urban	1,277	83.2	(81.1-85.2)
Rural	673	65.8	(62.1-69.3)
<b>Province</b>			
Province-1	306	79.2	(74.3-83.4)
Madhesh	417	63.6	(58.9-68.1)
Bagmati	384	86.6	(82.8-89.6)
Gandaki	153	86.4	(80.1-91.0)
Lumbini	371	77.2	(72.7-81.2)
Karnali	132	65.8	(57.3-73.3)
Sudurpaschim	187	85.5	(79.7-89.9)
<b>Covered by health insurance</b>			
No	1,856	76.3	(74.3-78.2)
Yes	94	95.3	(88.7-98.2)
<b>Need factors</b>			
<b>Parity</b>			
One or less	851	87.2	(84.8-89.3)
Two or more	1,099	69.5	(66.7-72.1)
<b>Fertility risk</b>			
No	479	68.8	(64.5-72.7)
Yes	1,471	80.0	(77.8-81.9)
<b>Received ANC</b>			
No	87	16.9	(10.4-26.2)
Yes	1,863	80.1	(78.2-81.8)
<b>Total</b>	<b>1,950</b>	<b>77.2</b>	<b>(75.3-79.0)</b>

**Table 6 Unadjusted and adjusted odds ratios for SBA delivery: Results from binary logistic regressions, 2019 NMICS (n=1,950)**

<b>Characteristics</b>	<b>Unadjusted</b>	<b>95% CI</b>	<b>Adjusted odds</b>	<b>95% CI</b>
<b>Predisposing factors</b>				
<b>Mother's age</b>				
<20	Ref.		Ref.	
20-34	0.9	(0.7-1.3)	0.9	(0.5-1.6)
35-49	0.6**	(0.4-1.0)	1.5	(0.8-2.8)
<b>Mother's education</b>				
None	Ref.		Ref.	
basic grade(1-8)	2.4***	(1.8-3.1)	1.3*	(1.0-1.8)
secondary grade(9-12)	5.1***	(3.9-6.9)	1.8***	(1.3-2.5)
higher	33.8***	(13.7-83.7)	4.9***	(2.0-12.4)
<b>Ethnicity of head of household</b>				
Bahun/Kshetri/Thakuri	Ref.		Ref.	
Janjati (including Newar)	0.6**	(0.4-0.9)	0.7**	(0.5-0.9)
Dalit	0.4***	(0.3-0.6)	0.8	(0.5-1.1)
Other (including Muslim)	0.4***	(0.3-0.5)	0.5***	(0.4-0.8)
<b>Enabling factors</b>				
<b>Household wealth</b>				
Poorest	Ref.		Ref.	
Second	2.0***	(1.5-2.8)	2.6***	(1.8-3.8)
Middle	2.9***	(2.1-4.1)	5.2***	(3.0-7.0)
Fourth	4.5***	(3.0-6.8)	6.1***	(3.5-9.1)
Richest	12.8***	(7.1-23.1)	9.2***	(4.1-15.3)
<b>Place of residence</b>				
Urban	Ref.		Ref.	
Rural	0.4***	(0.3-0.5)	0.6***	(0.5-0.8)
<b>Province</b>				
Province-1	0.7	(0.4-1.2)	1.1	(0.7-1.8)
Madhesh	0.3***	(0.2-0.5)	0.5***	(0.3-0.8)
Bagmati	Ref.		Ref.	
Gandaki	1.1	(0.6-2.1)	1.2	(0.7-2.0)
Lumbini	0.6	(0.4-1.1)	0.9	(0.5-1.5)
Karnali	0.4***	(0.2-0.6)	1.1	(0.6-2.1)
Sudurpaschim	1.2	(0.7-2.1)	2.8***	(1.5-5.3)
<b>Covered by health insurance</b>				
No	Ref.		Ref.	
Yes	4.1***	(2.0-8.7)	2.5**	(1.1-5.9)
<b>Need factors</b>				
<b>Parity</b>				
One or less	Ref.		Ref.	
Two or more	0.4***	(0.3-0.5)	0.4***	(0.3-0.6)
<b>Fertility risk</b>				
No	Ref.		Ref.	
Yes	1.9***	(1.5-2.3)	1.4*	(1.0-1.9)
<b>Received ANC</b>				
No	Ref.		Ref.	
Yes	19.8***	(11.8-33.1)	9.0***	(5.3-15.5)

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1



### **3.4. Caesarean Section (CS) delivery**

As shown in Table 7, 15% of the deliveries are conducted by CS in Nepal in 2019. Among predisposing factors, women older than 34 year have the highest rate of CS delivery (23%), while women age 20-34 year have CS delivery of 15% and women age below 20 year have lowest rate of CS delivery (9%). Women with higher level of education are more likely to have CS delivery (32%) compared with women with secondary-level (19%), basic education (11%) and no education (8%). Similarly, proportion of CS delivery is highest among Brahmin/Kshetri/Thakuri (19%), followed by Janjati (including Newar) (17%), other (including Muslim) (12%) and Dalit (8%),

For the enabling factors, proportion of CS delivery is highest among richest women (36%), followed by women in fourth (21%), middle (12%), second (8%) and it is lowest among poorest women (5%). Similarly, rate of CS delivery is highest in urban residence (19%) than in rural areas (8%). There is wide provincial disparity in CS delivery, with highest proportion of CS delivery in Bagmati (25%), followed by Province 1 (22%), Gandaki Province (19%), Madhesh Province (12%), Lumbini (9%) and lowest proportion of CS delivery is in Karnali and Sudurpaschim Provinces (7%). Proportion of CS delivery is higher among women with health insurance coverage (28%) than among women without health insurance coverage (15%).

For the need factors, women with one or less parity have higher proportion of CS delivery (18%) than women with two or more parity (13%). Similarly, women with fertility risk have higher proportion of CS delivery (16%) than women with no fertility risk (12%), and women receiving ANC during pregnancy are more likely to have CS delivery (16%) than women who do not have ANC during pregnancy (2%).

#### **3.4.1. Factors associated with CS delivery**

Table 8 shows result of bivariate and multivariate analysis with CS delivery as the outcome variable and predisposing, enabling and need factors as determinants. The result of the unadjusted (bivariate) odds ratio analysis indicate that all variables in each of the three factors are significantly related to CS delivery.

#### **3.4.2. Bivariate logistic regression analysis (unadjusted) for CS delivery**

For the predisposing factors, older women have higher odds of CS delivery than younger women, with odds increasing as women's age increase. Women of age 20-34 years have 2.4 times greater odds (OR 2.4, CI 1.4-4.1) of CS delivery and women age 35-49 have 3.6 times greater odds (OR 3.6, CI 1.9-6.8) of CS delivery compared to women of age below 20 years. The odds of CS delivery also increase consistently with education level; women with higher education have highest odds of CS delivery (OR 6.2, CI 3.9-9.7). Dalit and other (including Muslim) ethnic group have significantly lower odds of CS delivery compared to Brahmin/Kshetri/Thakuri. While there is no significant difference on CS delivery between Janjati and Brahmin/Kshetri/Thakuri.

With regard to four enabling factors, women in rural communities have 0.4 times lower odds of CS delivery (OR 0.4, CI 0.3-0.5). The odds of CS delivery increase substantially with higher household wealth. Women in richest wealth quintile have 10.8 times the odds of CS among women in the poorest wealth quintile (OR 10.8, CI 7.1-16.4). Province is similarly associated with CS delivery. All Provinces except Province 1 and Gandaki Province have significantly lower odds of CS delivery compared to Bagmati Province. There is no significant difference of CS delivery among Province 1, Gandaki and

Bagmati Provinces. Women covered with health insurance are also 2.6 times more likely to have CS delivery (OR 2.6, CI 1.8-3.8) compared to women without health insurance coverage.

Women with two or more parity have 0.7 times lower odds of CS delivery (OR 0.7, CI 0.6-0.9) compared with women with one or less parity. Similarly, women with fertility risk have 1.5 times higher odds of CS delivery (OR 1.5, CI 1.1-1.9) and women receiving ANC during pregnancy have 6.2 times higher odds (OR 6.2, CI 1.9-19.8) of CS delivery compared to women who do not receive ANC during pregnancy.

### **3.4.3. Multivariate logistic regression analysis (adjusted)**

After adjusting for other factors in multivariate analysis, the predisposing factors of mother's education is no longer significantly associated with CS delivery, while older women continue to have higher adjusted odds of CS delivery albeit with larger odds ratios than in unadjusted regression analysis. Women with age 20-34 year have 2.4 times higher odds (aOR 2.4, CI 1.0-5.5) and women with age 35-49 have 4.2 times higher odds (aOR 4.2, CI 2.1-8.4) of CS delivery compared to women under age 20. Similarly, Dalit women have 0.4 times lower odds (aOR 0.4, CI 0.3-0.7) and other (including Muslim) have 0.6 time lower odds (aOR 0.6, CI 0.4-0.9) of CS delivery compared to Brahmin/Kshetri/Thakuri (Table 8).

Among the enabling factors, wealth, certain Provinces and health insurance remained significantly associated with CS delivery after adjusting for other factors. The odds of CS delivery increases systematically with increasing level of wealth. Women in richest wealth quintile have the highest odds (aOR 7.4, CI 4.1-13.6) of CS delivery compared with the poorest wealth quintile. In adjusted model, women in Province 1 have 2.2 times higher odds of CS delivery (aOR 2.2, CI 1.5-3.4) compared to women in Bagmati Province. It is to be noted that Province 1 is not significant in unadjusted model. Similarly women in Lumbini Province have 0.6 times lower odds (aOR 0.6, CI 0.4-0.9) of CS delivery compared to women in Bagmati Province. Rest of the Provinces are not significantly different with Bagmati Province in terms of CS delivery. Although OR of health insurance coverage decreased a little bit in adjusted model than in unadjusted, women with health insurance coverage have 1.6 times higher odds of CS delivery (aOR 1.6, CI 1.1-2.4) compared to women without health insurance coverage.

Among three need factors, fertility risk is not significant in adjusted model. However, women with two or more parity have 0.7 times significant lower odds of CS delivery (aOR 0.7, CI 0.5-1.0) compared to women with one or less parity. Similarly, women receiving ANC during pregnancy are 3.1 times more likely to have CS delivery (aOR 3.1, CI 0.9-10.8) compared to women who do not receive ANC during pregnancy.

**Table 7 Distribution of CS delivery across predisposing, enabling, and need factors, 2019 NMICS (n=1950)**

Characteristics	N	Percent	95% CI
<b>Predisposing factors</b>			
<b>Mother's age</b>			
<20	201	9.1	(5.8-14.0)
20-34	1610	15.4	(13.7-17.2)
<b>35-49</b>	139	23.0	(16.8-30.7)
<b>Mother's education</b>			
None	405	8.3	(6.0-11.4)
Basic grade(1-8)	600	10.9	(8.6-13.6)
Secondary grade(9-12)	775	18.6	(16.0-21.5)
<b>Higher</b>	171	32.3	(27.7-39.7)
<b>Ethnicity</b>			
Bahun/Kshetri/Thakuri	540	18.9	(15.8-22.4)
Janjati (including Newar)	680	17.4	(14.7-20.4)
Dalit	305	8.4	(5.7-12.0)
Other (including Muslim)	425	12.4	(9.6-15.9)
<b>Enabling factors</b>			
<b>Household wealth</b>			
Poorest	442	5.2	(3.5-7.7)
Second	414	8.1	(5.8-11.2)
Middle	384	11.7	(8.9-15.4)
Fourth	384	21.1	(17.3-25.5)
Richest	327	35.5	(30.4-40.8)
<b>Place of Residence</b>			
Urban	1277	19.1	(17.1-21.4)
Rural	673	8.0	(6.2-10.3)
<b>Province</b>			
Province-1	306	22.3	(18.0-27.3)
Madhesh	417	12.1	(9.3-15.6)
Bagmati	384	24.5	(20.4-29.0)
Gandaki	153	19.2	(13.7-26.2)
Lumbini	371	9.0	(6.5-12.4)
Karnali	132	7.0	(3.7-12.8)
Sudurpaschim	187	7.1	(4.2-11.7)
<b>Covered by health insurance</b>			
No	1856	14.7	(13.1-16.4)
Yes	94	27.5	(19.4-37.4)
<b>Need factors</b>			
<b>Parity</b>			
One or less	851	17.9	(15.5-20.7)
Two or more	1,099	13.2	(11.4-15.4)
<b>Fertility risk</b>			
No	479	12.2	(9.5-15.4)
Yes	1471	16.3	(14.5-18.3)
<b>Received ANC</b>			
No	87	2.3	(1.0-8.7)
Yes	1863	15.9	(14.3-17.6)
<b>Total</b>	1950	15.3	(13.8-17.0)

**Table 8 Unadjusted and adjusted odds ratios for CS delivery: Results from binary logistic regressions, 2019 NMICS (n=1,950)**

<b>Characteristics</b>	<b>Unadjusted</b>	<b>95% CI</b>	<b>Adjusted</b>	<b>95% CI</b>
<b>Predisposing factors</b>				
<b>Mother's age</b>				
<20	Ref.		Ref.	
20-34	2.4**	(1.4-4.1)	2.4**	(1.0-5.5)
35-49	3.6***	(1.9-6.8)	4.2***	(2.1-8.4)
<b>Mother's education</b>				
None	Ref.		Ref.	
basic grade(1-8)	1.5*	(1.0-2.2)	1.0	(0.7-1.6)
secondary grade(9-12)	2.4***	(1.7-3.6)	1.1	(0.7-1.8)
higher	6.2***	(3.9-9.7)	1.4	(0.7-2.5)
<b>Ethnicity of head of household</b>				
Bahun/Kshetri/Thakuri	Ref.		Ref.	
Janjati (including Newar)	0.9	(0.7-1.2)	0.9	(0.7-1.2)
Dalit	0.3***	(0.2-0.5)	0.4***	(0.3-0.7)
Other (including Muslim)	0.6**	(0.4-0.9)	0.6***	(0.4-0.9)
<b>Enabling factors</b>				
<b>Household wealth</b>				
Poorest	Ref.		Ref.	
Second	2.0***	(1.3-3.1)	2.0***	(1.2-3.3)
Middle	2.9***	(1.8-4.5)	2.7***	(1.6-4.5)
Fourth	5.0***	(3.2-7.8)	4.3***	(2.6-7.4)
Richest	10.8***	(7.1-16.4)	7.4***	(4.1-13.6)
<b>Place of residence</b>				
Urban	Ref.		Ref.	
Rural	0.4***	(0.3-0.5)	0.8	(0.6-1.1)
<b>Province</b>				
Province-1	1.1	(0.7-1.6)	2.2***	(1.5-3.4)
Madhesh	0.4***	(0.2-0.7)	0.9	(0.5-1.5)
Bagmati	Ref.		Ref.	
Gandaki	0.9	(0.6-1.3)	1.3	(0.8-2.0)
Lumbini	0.3***	(0.2-0.5)	0.6**	(0.4-0.9)
Karnali	0.3***	(0.2-0.5)	1.1	(0.6-2.1)
Sudurpaschim	0.3***	(0.2-0.5)	0.7	(0.4-1.2)
<b>Covered by health insurance</b>				
No	Ref.		Ref.	
Yes	2.6***	(1.8-3.8)	1.6**	(1.1-2.4)
<b>Need factors</b>				
<b>Parity</b>				
One or less	Ref.		Ref.	
Two or more	0.7**	(0.6-0.9)	0.7**	(0.5-1.0)
<b>Fertility risk</b>				
No	Ref.		Ref.	
Yes	1.5**	(1.1-1.9)	0.9	(0.5-1.7)
<b>Received ANC</b>				
No	Ref.		Ref.	
Yes	6.2***	(1.9-19.8)	3.1*	(0.9-10.8)

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

### 3.5. Postnatal care for baby

Table 9 presents results of bivariate analysis of the distribution of postnatal care for baby within 48 hours across predisposing, enabling, and need factors. Overall, 68% of women received PNC for baby from health care worker within 48 hours after delivery. Regarding predisposing factors, proportion of PNC for baby is highest among mothers of age 20-34 (69%) followed by mother of age 35-49 year (67%) and least among mothers under age of 20 year (66%). PNC for baby increase with level of education and it is highest among the women with higher education (91%). While Brahmin/Kshetri/Thakuri women have highest proportion of PNC for baby (76%) and it is least among other (including Muslim) ethnic groups (60%).

Among enabling factors, PNC for baby is highest among richest wealth quintile (89%) and lowest among poorest wealth quintile (48%). Similarly, urban residents (74%) have higher use of PNC for baby than rural residents. Among women in seven Provinces, highest proportion of PNC for baby is found in Gandaki Province (80%), followed by in Bagmati Province (79%), Province 1 (75%), Sudurpaschim Province (70%). PNC for baby is lowest in Karnali Province (49%), followed by in Madhesh Province (57%), Lumbini Province (65%). Women with health insurance coverage also have higher proportion of PNC for baby (88%) compared with women without health insurance coverage (67%).

Among the need factors, bivariate analysis reveals that PNC for baby is more common among women with parity less than one (76%). Women with fertility risk (71%), women receiving ANC during pregnancy (71%) and among women giving birth in health facility (85%).

#### 3.5.1. Factors associated with PNC for baby within 48 hours of delivery

Table 10 shows the result of bivariate analysis with PNC for baby as the outcome variable. The determinant variables include the predisposing, enabling and need factors as well as ANC during pregnancy and uptake of institutional delivery in odds ratio analysis in both unadjusted (bivariate) and adjusted multivariate forms.

#### 3.5.2. Bivariate logistic regression analysis (unadjusted)

Analysis of the unadjusted odds for receiving PNC for baby within the first 48 hours of after delivery shows significant association with all three predisposing factors. Odds of PNC for baby increase with level of education with highest odds 9.4 of PNC for baby among women with higher level of education (OR 9.4, CI 5.9-15.0) compared to women with no education. Janjati (including Newar) (OR 0.8, CI 0.6-1.0), Dalit (OR 0.6, CI 0.5-0.8) and other (including Muslim) (OR 0.6, CI 0.4-0.8) ethnic groups have significant lower odds of PNC for baby compared to Brahmin/Kshetri/Thakuri.

In bivariate analysis PNC for baby is also associated with enabling factors of wealth, place of residence, Province and health insurance coverage. There is a significant patten of increasing odds of receiving PNC for baby across the wealth quintile, with women in richest quintile having highest odds (OR 7.3, CI 4.8-10.9) compared with women in poorest wealth quintile. Women in rural areas have 0.5 times lower odds (OR 0.5, CI 0.4-0.7) of receiving PNC for baby compared to those living in urban areas. Similarly, compared with Bagmati Province, there provinces (Madhesh, Lumbini and Karnali) have significantly lower odds of PNC for baby and Gandaki Province has significantly higher odds of PNC for baby compared to women in Bagmati Province. Province 1 and Sudurpaschim provinces are not significantly different from Bagmati Province in terms of PNC for baby and women with health insurance coverage have higher odds of PNC for baby compared with women without health insurance coverage.

Regarding need factors, women with two or more parity have lower odds of PNC for baby compared to primary parous women (OR 0.6, CI 0.5-0.7). While women with fertility risk have 1.7 times higher odds of PNC for baby (OR 1.7, CI 1.4-2.0) compared to women with no fertility risk. Women who obtain ANC during pregnancy have higher odds of PNC for baby (OR 15.4, CI 8.8-26.9) compared to women who did not and women who give birth in health facility are 45.2 times more likely to have PNC for baby (OR 45.2, CI 33.4-61.4) compared to those who do not give birth in health facility.

### **3.5.3. Multivariate logistic regression analysis (adjusted) of PNC for baby**

Table 10 also shows that adjusting for other factors in multivariate model, two out of three predisposing factors, two out of four enabling factors and two out of four need factors remain significantly associated with receiving PNC for baby within 48 hours after delivery.

After adjusting for other factors, women of age 35-49 years are more likely to receive PNC for baby (aOR 1.6, CI 0.9-3.0) compared to women below age 20 years. It is to be noted that mother's age was not significantly associated with PNC for baby in unadjusted model. Adjusted model also shows that women with basic education (grade 1-8) (aOR 1.5, CI 1.1-2.2) or women with higher education (aOR 1.9, CI 1.1-3.4) continue to have increased odds of PNC for baby relative to women with no education. Ethnicity is no longer associated with PNC for baby when controlled for other factors.

Women living in wealthier household have higher odds of PNC for baby compared with those in poorest wealth quintile. This pattern holds across all wealth quintile, with women in the richest quintile having the highest odds (aOR 2.2, CI 1.3-3.8) of receiving PNC for baby within 48 hours of delivery.

Most Provinces show no association with PNC for baby after controlling for other factors. However, women in Province 1 (aOR 1.9, CI 1.2-3.2) have significantly higher odds of PNC for baby compared with Bagmati Province. Place of residence and health insurance coverage show no association with PNC for baby after controlling for other factors.

After adjusting for other factors, parity and fertility risk as need factors no longer remain significantly associated with PNC for baby. However, women receiving ANC during pregnancy have significant higher odds (aOR 3.0, CI 1.5-5.8) of PNC for baby compared to women not receiving ANC during pregnancy and women giving birth in health facility have 34.5 times higher odds (aOR 34.5, CI 24.5-48.0) for PNC for baby compared to women not giving birth in health facility, after controlling for other factors.

**Table 9 Distribution of PNC for baby across predisposing, enabling, and need factors, 2019 NMICS (n=1950)**

<b>Characteristics</b>	<b>N</b>		<b>Percent</b>	<b>95% CI</b>
<b>Predisposing factors</b>				
<b>Mother's age</b>				
<20	201		65.9	(59.2-72.2)
20-34	1,610		68.6	(66.3-70.8)
35-49	139		66.5	(58.3-73.9)
<b>Mother's education</b>				
None	405		46.4	(41.6-51.3)
Basic grade(1-8)	600		64.4	(60.5-68.1)
Secondary grade(9-12)	775		77.4	(74.3-80.2)
Higher	171		90.9	(85.6-94.4)
<b>Ethnicity</b>				
Bahun/Kshetri/Thakuri	540		75.7	(71.9-79.2)
Janjati (including Newar)	680		69.0	(65.5-72.4)
Dalit	305		63.6	(58.1-68.8)
Other (including Muslim)	425		60.4	(55.7-64.9)
<b>Enabling factors</b>				
<b>Household wealth</b>				
Poorest	442		48.0	(43.4-52.7)
Second	414		64.4	(59.6-68.8)
Middle	384		70.1	(65.3-74.4)
Fourth	384		76.3	(71.8-80.3)
Richest	327		88.5	(84.5-91.5)
<b>Place of Residence</b>				
Urban	1,277		73.7	(71.2-76.1)
Rural	673		57.6	(53.9-61.3)
<b>Province</b>				
Province-1	306		75.0	(69.8-79.5)
Madhesh	417		56.8	(52.0-61.5)
Bagmati	384		79.2	(74.8-83.0)
Gandaki	153		79.7	(72.6-85.4)
Lumbini	371		64.9	(59.9-69.6)
Karnali	132		49.0	(40.6-57.5)
Sudurpaschim	187		70.1	(63.1-76.2)
<b>Covered by health insurance</b>				
No	1,856		67.1	65.0-69.2)
Yes	94		88.1	(79.9-93.3)
<b>Need factors</b>				
<b>Parity</b>				
One or less	851		75.7	(72.7-78.5)
Two or more	1,099		62.3	(59.4-65.1)
<b>Fertility risk</b>				
No	479		59.7	(55.3-64.0)
Yes	1,471		70.9	(68.5-73.2)
<b>Received ANC</b>				
No	87		13.4	(7.7-22.2)
Yes	1,863		70.7	(68.6-72.7)
<b>Institutional delivery</b>				
No	438		9.2	(6.8-12.2)
Yes	1,512		85.1	(83.4-87.0)
<b>Total</b>	<b>1,950</b>		<b>68.2</b>	<b>(66.1-70.2)</b>

**Table 10 Unadjusted and adjusted odds ratios for PNC for baby: Results from binary logistic regressions, 2019 NMICS (n=1,950)**

<b>Characteristics</b>	<b>Unadjusted</b>	<b>95% CI</b>	<b>Adjusted</b>	<b>95% CI</b>
<b>Predisposing factors</b>				
<b>Mother's age</b>				
<20	Ref.		Ref.	
20-34	1.1	(0.9-1.5)	1.1	(0.6-1.9)
35-49	0.9	(0.6-1.3)	1.6*	(0.9-3.0)
<b>Mother's education</b>				
None	Ref.		Ref.	
basic grade(1-8)	2.2***	(1.7-2.7)	1.5**	(1.1-2.2)
secondary grade(9-12)	3.7***	(2.9-4.6)	1.7***	(1.1-2.4)
higher	9.4***	(5.9-15.0)	1.9**	(1.1-3.4)
<b>Ethnicity of head of household</b>				
Bahun/Kshetri/Thakuri	Ref.		Ref.	
Janjati (including Newar)	0.8*	(0.6-1.0)	0.8	(0.6-1.1)
Dalit	0.6**	(0.5-0.8)	1.3	(0.9-1.9)
Other (including Muslim)	0.6***	(0.4-0.8)	1.2	(0.8-1.8)
<b>Enabling factors</b>				
<b>Household wealth</b>				
Poorest	Ref.		Ref.	
Second	2.1***	(1.6-2.8)	1.4*	(1.7-3.1)
Middle	2.7***	(2.0-3.7)	1.6**	(1.1-2.4)
Fourth	3.4***	(2.5-4.7)	1.5**	(1.1-2.3)
Richest	7.3***	(4.8-10.9)	2.2***	(1.3-3.8)
<b>Place of residence</b>				
Urban	Ref.		Ref.	
Rural	0.5***	(0.4-0.7)	1.0	(0.8-1.3)
<b>Province</b>				
Province-1	0.9	(0.6-1.4)	1.9**	(1.2-3.2)
Madhesh	0.4***	(0.3-0.6)	0.8	(0.5-1.3)
Bagmati	Ref.		Ref.	
Gandaki	1.5*	(0.9-2.4)	1.6	(0.8-3.0)
Lumbini	0.6**	(0.4-0.9)	0.7	(0.5-1.1)
Karnali	0.3***	(0.2-0.5)	0.7	(0.4-1.3)
Sudurpaschim	0.8	(0.6-1.3)	1.0*	(0.6-1.7)
<b>Covered by health insurance</b>				
No	Ref.		Ref.	
Yes	2.5***	(1.6-4.1)	1.3	(0.7-2.5)
<b>Need factors</b>				
<b>Parity</b>				
One or less	Ref.		Ref.	
Two or more	0.6***	(0.5-0.7)	1.1	(0.9-1.5)
<b>Fertility risk</b>				
No	Ref.		Ref.	
Yes	1.7***	(1.4-2.0)	1.1	(0.7-1.7)
<b>Received ANC</b>				
No	Ref.		Ref.	
Yes	15.4***	(8.8-26.9)	3.0***	(1.5-5.8)
<b>Institutional delivery</b>				
No	Ref.		Ref.	
Yes	45.2***	(33.4-61.9)	34.5***	(24.5-48.6)

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

#### Impact of health insurance on maternal health care

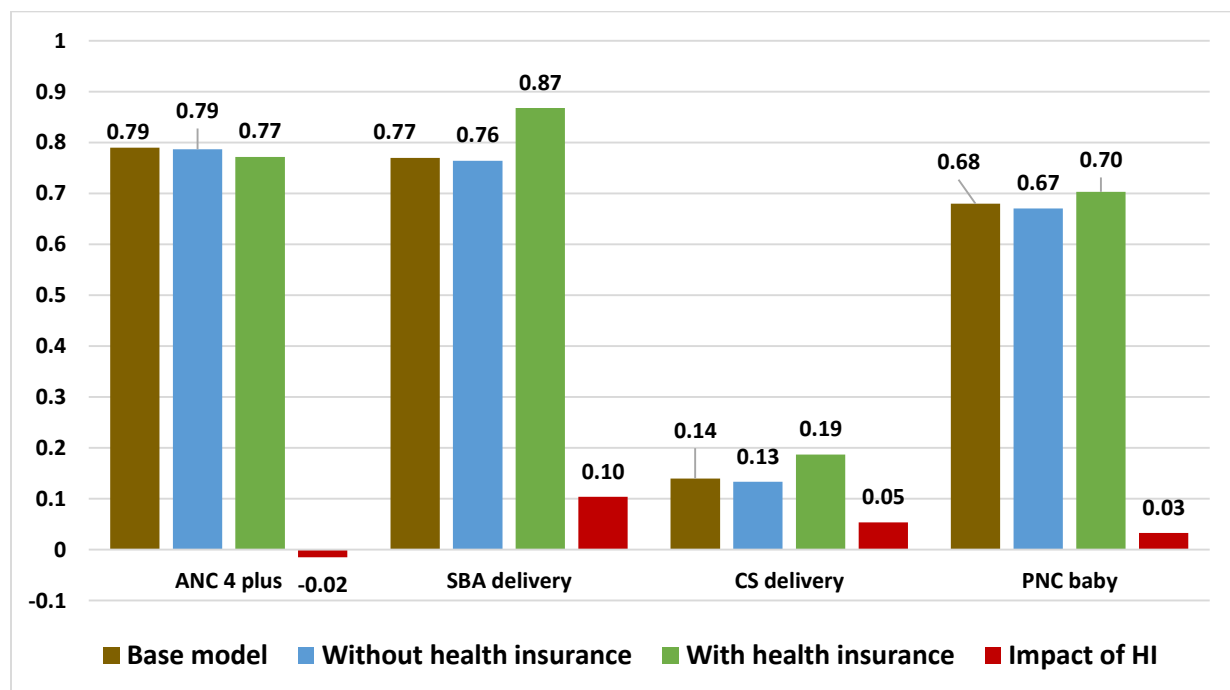


### 3.6. Impact of health insurance on maternal health outcome

Out of four outcome variables examined (ANC 4 visit, SBA delivery, CS delivery and PNC for baby) in this assessment, health insurance coverage is seen to be significantly associated only with SBA delivery and CS delivery in the adjusted model (see Table 4, Table 6, Table 8 and Table 10). To find the impact of health insurance coverage on the four outcomes, we estimated predicted probability of four maternal and newborn health services based on respective final model, with and without health insurance coverage. Figure 3 presents the predicted probabilities of outcome variables in different scenario and related impact of health insurance coverage on four outcomes. As health insurance coverage is not significantly associated with ANC 4 plus visit and PNC for baby, its impact on these services are negligible. Figure 3 also indicates that based on the adjusted model of SBA delivery, predicted probability of SBA delivery is 0.77. Predicted probability of SBA delivery would be 0.76 if all the women included in the sample do not have health insurance coverage and the predicted probability of SBA delivery would be 0.87 if all the women have health insurance coverage. This indicates that predicted probability of SBA delivery is 10-percentage point higher if all the women in sample have health insurance coverage, compared to the situation if all the women in the sample do not have health insurance coverage. Thus, the impact of health insurance coverage on SBA delivery is 10%.

The figure 3 further indicates that based on the adjusted model of CS delivery, predicted probability of CS delivery is 0.14. Predicted probability of CS delivery would be 0.13 if all the women in the sample do not have health insurance coverage and predicted probability of CS delivery would be 0.19 if all the women in the sample have health insurance coverage. Thus, predicted probability of CS delivery is 5-percentage point higher if all the women in sample have health insurance coverage compared to situation is all the women in the sample do not have health insurance coverage. This further suggests that the impact of health insurance coverage on CS delivery is 5%.

**Figure 3 Predicted probability of maternal health care, base model, with health insurance coverage and without health insurance coverage in 2019 NMICS, (N=1950)**



#### 4. Discussion

Adequate ANC, delivery by SBA, and timely PNC are components of continuum of care, which is essential for maternal and newborn survival. To attain the SDG of reducing maternal newborn mortality GoN aims to increase ANC 4 plus visit, SBA delivery and PNC as per protocol to 90% each [37]. Yet in Nepal, use of these maternal and newborn health care remain far below the desired level. Reducing maternal and newborn mortality through adequate quality maternal health services requires further efforts to implement focused interventions targeting towards improvement in social determinants of maternal health services [38]. This assessment examined predisposing, enabling and need factors among women surveyed in 2019 NMICS to examine their relationship to each of these component of maternal care. In addition, the assessment estimated the impact of health insurance coverage on these services.

Among the predisposing, enabling and need factors in the framework used in this assessment, variables at all three levels are associated with use of maternal and newborn health care in Nepal. Among the predisposing factors, education is found to be a strong positive predictor of ANC 4 visit, SBA delivery and PNC for baby. The association between education and use of maternal health services may be the result from the fact that formal schooling exposes women to information about RH and pregnancy care. Education may also enhances women's confidence in taking independent choices. Knowledge about information of pregnancy and delivery care and awareness on place of service help them to uptake maternal health services [35]. Khatri and Karkee (2018) [38] also suggest that education level of women have synergistic impact on improving their status within household and communities. As a result, educated women are more aware of their health, more informed about where to go, and exercise gender autonomy inside and outside household. Autonomous women can thus travel comfortably outside household to seek care, able to demand service and able to make decision to use modern health care [38-39]. Some other studies on determinants of maternal health services conducted in the context of Sub-saharan Africa, Bangladesh, Indonesia and India have highlighted the importance of education as key predictors of maternal health care [15-18].

Our assessment also showed that the level of education is not significantly associated with CS delivery in the adjusted model. Reason of the unexpected result is not clear, however, this may be related to the fact that more educated women may be aware of the adverse effect of CS delivery and less likely to use elective CS. Similar finding was reported in a study conducted in China, which suggests that there was a significant reduction in the number of elective CS in pregnant women who are more educated and attend prenatal education courses [44].

Women's age is well known factor influencing pregnancy and delivery care. We found that age is significant predictor for CS delivery and PNC for baby only but not associated with ANC 4 plus visit and SBA delivery. Younger women having their first baby may be less likely to seek medical care due to fear of new experience [45]. This may be due to women's tendency to seek medical care only after experiencing pregnancy complications requiring medical intervention. Women in older age may be more likely to experience pregnancy complication and are managed the problem with the help of CS delivery [46].

Janjati, Dalit and Muslim women were found to be significantly less likely to seem ANC 4 plus visit, SBA and CS delivery compared to Brahmin/Kshetri/Thakuri in Nepal. This might be related to cultural values, which determine position within social hierarchy, keep minority groups excluded in society, and prevent them from seeking maternal health care [47]. Status of women in society determine access and ability for women wot exercise their right in terms of using pregnancy and delivery care [45]. The

disadvantaged group such as Dalit, Muslim and Terai Madhesi women have poor health seeking practice in Nepal due also to low awareness. They also experience high out of pocket expenditure for health care [38].

Among the enabling factors included in this assessment, household wealth is found to be most consistent and strong predictor for all four maternal and newborn health services in Nepal. Showing result of women in richer household more likely to seek maternal health care than poorer household. This finding is consistent with previous studies found in African and South East Asian countries [21-23, 38-39]. Poor households may be constrained in paying for health service fee, transport to facilities and health related resources that incur additional expenses [38]. Routine maternal care is free in Nepal under some circumstances. However, associated indirect cost such as day lost from work, food and accommodation can still be high and unaffordable, resulting in non-use of maternal health services. Furthermore, Economic status of household is directly linked to out of pocket expenditure to access maternal health care in Nepal [38-39].

We found that the rural-urban difference in maternal health care was significant only for SBA delivery in Nepal. Rural women have significantly lower odds of SBA delivery than urban women. This may be partly due to the distance to facility as barrier to SBA delivery and related lack of transportation facilities in rural areas. Individual level attributes contribute little variation in health seeking behavior in such situation. This may also be due to the fact that the better health care service are concentrated in urban areas [1]. Consistent to this finding, place of residence as an enabling factor has been found to be a predictor of maternal health service use in studies in Sierra Leon, Nigeria, Mali [23], and Pakistan [31]. We also found that there has been a significant provincial difference in maternal health care in Nepal. While Madhesh Province seemed to be disadvantaged, and Sudurpaschim Province seemed to be better off in terms of ANC 4 plus visit and SBA delivery, Lumbini Province is found to be disadvantaged and Province 1 as better off in terms of CS delivery and PNC for baby compared to Bagmati.

We also introduced health insurance coverage as enabling factor for maternal health care. Probably this is the first study to examine association of health insurance ownership with maternal health care in Nepal. Overall, 5% of the women reported having health insurance coverage in 2019 in Nepal. After controlling for socio-demographic factors, we found that health insurance coverage was associated only with SBA and CS delivery in Nepal. This finding is consistent with the previous studies conducted in India [42], Ghana [48], and Kenya [49] but contradicts with studies conducted in Jordan [41]. Contradictory to the finding of positive association of health insurance coverage with ANC in Jordan [41], our assessment showed lack of significant association of health insurance coverage with ANC 4 plus visit and PNC for baby in Nepal. The reason is not clearly understood, however, one possible explanation for this could be due to the fact that basic maternity care is free in Nepal. Generally, health insurance policy is focused for marginalized families who are economically vulnerable [40].

The health insurance coverage reduces the rate of out of pocket payment associated with the use of maternal health services. As the ANC and PNC service are free and expanded up to the community level, such service may be easily accessible and may demand less out of pocket expenditure. While the SBA and CS delivery service is relatively expensive, inaccessible and concentrated in urban places, thereby likely to demand more out of pocket expenditure, which is covered by health insurance. Therefore, women with health insurance are more likely to receive SBA and CS delivery. Given the fact that out of pocket payment to finance health care could also be catastrophic to poor household, government initiated health insurance scheme aiming to protect poor household from financial risk due to hospitalization and covers secondary inpatient care provided at hospital and medical college [42]. As health insurance is in

early stage of expansion and geographical coverage is still relatively low, this may also be the reason why its impact on ANC and PNC is not yet visible in Nepal.

With regard to need factors, parity is consistently negatively associated with ANC 4 plus visit, SBA delivery, and CS delivery in Nepal, but not with PNC for baby. That means the utilization of ANC, SBA and CS delivery decreased with the increase in parity. The reason could be while women having their first child might feel insecure, in contrast during higher order birth, women might feel comfortable due to her previous experience of delivery or other constraints that affect health service utilization [40]. Alternatively, higher parity comes with more familiarity with the birthing process, therefore women could be more likely to refrain the service [41]. It is also argued that among women with high parity, available resources need to be divided among competing needs and thus women are less likely to seek health services unless the pregnancy pose greater risk requiring hospital care [50].

Our assessment also showed that fertility risk, a composite measure generated from two or more parity, age less than 20, and age more than 34 as significant positive determinant for ANC 4 plus visit and SBA delivery in Nepal. This is because; advanced maternal age is a risk factor for gestational diabetes, hypertension and other medical conditions [46]. Similarly, higher birth order or parity increased the risk for maternal death [51]. Therefore, ANC 4 plus visit and SBA delivery are likely to be more prevalent for grand multiparous (3+ child) women. Short birth interval, higher birth order, adolescent child bearing, delayed child bearing etc. increase risk of multiple complications during pregnancy, which in turn lead to higher risk pregnancy outcome and high rate of obstetric service [43].

Evidence show that previous experience of maternal health service positively influence the subsequent maternal health care [1, 52]. We also found that independent of the other factors, use of ANC is a direct determinant of SBA delivery, CS delivery and PNC for baby. Similarly, institutional delivery is direct determinant of PNC for baby in Nepal. The finding is in line with previous studies conducted in Kenya [1], Cambodia [28], Srilanka [31], and India [32]. Receiving high quality ANC visit make women better informed about pregnancy and more likely to recognize importance of SBA, thereby more likely to seek SBA delivery, CS delivery and PNC for baby [30]. Similarly, women receiving institutional delivery may be well informed about how to make mother and baby safe as a result more likely to receive PNC for baby [31].

We estimated difference in maternal health service utilization between the health insurance covered and not covered women with the help of predicted probability. Health insurance coverage was associated with improvement in the utilization of SBA delivery and CS delivery but it was not much associated with ANC 4 plus visit and PNC for baby. Impact of health insurance coverage was higher for SBA delivery than for CS delivery. Health insurance coverage was associated with increased SBA by 10% and increased CS delivery by 5%. Our finding is consistent with previous study conducted in Indonesia [53], which indicates that expansion of health insurance coverage was associated with reduction in socio-demographic inequality in access to maternal health services. Our finding of lack of association of health insurance with ANC 4 plus visit and PNC for baby might be due to the limited stage of expansion of health insurance. However, further in-depth analysis is needed to examine the impact of health insurance in detail in Nepal.

#### **4.1. Study limitation**

This assessment is based on a cross-sectional survey, our results therefore cannot establish causality but it shows association between the variables in the analysis. Additionally, the analysis is limited to the variables available in the NMICS 2019 data set. The NMICS 2019 is nationally representative survey;

therefore, the socio-demographic characteristics measured are nationally representative. However, the conceptual framework used in this assessment is based on the socio-demographic characteristics available in the data set. Therefore, findings of the variables used in conceptual framework may result in omitted variable bias [1]. The predisposing, enabling and need factors operationalize the Andersen behavior model are based on identified variables available in NMICS 2019. Therefore application of the model to our setting may be weak, because, most of the predisposing, enabling and need factors are proxy measures and we could not find the direct measures of clinical diagnosis or perceived susceptibility or seriousness of illness as postulated in the Andersen model. The need factor is represented by external criteria of need such as fertility risk [1].

Finally, we could not explore in detail socio-cultural practices, and belief that may act as a barrier to care seeking but that lie outside of this model. For example, we are unable to explore the role that fear of mistreatment, women's empowerment, men's involvement or other community contextual norms may play in limiting use of facility delivery. Socio-cultural barriers to care may best be assessed through qualitative or mixed methods of inequality, as they are not easily captured in structured, pre-coded questions such as NMICS [1].

This study used NMICS 2019 data to examine utilization of maternal health service. In this survey, the questions were asked to women with a live birth in two years before the survey, which might introduce recall bias. Unmeasured predisposing, enabling and need based factors not included in the analysis might affect coverage of ANC 4 visit, SBA delivery, CS delivery, and PNC for baby.

The response pertaining to the individual components of ANC 4 plus visit were self-reported and therefore subject to recall bias. Our results may also be biased to some extent because several known covariates of maternal health care were not collected in the survey. For example, location and distance to health facilities are known barriers to service utilization, similarly, lack of human resources and retention of trained staff are major identified barriers to improve maternal health, which is not included in analysis.

Medical and health facility related factors that might influence maternal health care were not associated, as such information were not collected in survey. This study used secondary data; therefore, we could not include other factors such as maternal complication that could affect use of maternal health care.

#### **4.3. Conclusion and recommendation**

We examined possible pathways through which the common factors determined by modified Andersen behavior model linked with four maternal and newborn health outcome. Education is the strongest predisposing factor affecting three out of four outcome variables (ANC 4 visit, SBA delivery and PNC for baby). Similarly, ethnicity is independently associated with three out of four outcome variables (ANC 4 visit, SBA delivery and CS delivery) and age as predisposing factor is independently associated only with CS delivery and PNC for baby. The important enabling factors predicting outcome variables are household wealth, place of residence and health insurance coverage. Parity, fertility risk and prior maternal health service in continuum of care are independent need factors. It is important to note that ANC during pregnancy is an important determinant for SBA as well as CS delivery and both ANC during pregnancy and facility delivery are independent predictor for PNC for baby. Thus, investing around the above factors is likely to have a positive impact on improving maternal health care in Nepal.

Education, wealth and health insurance coverage are important intervention area where government of Nepal should pay more attention. Women with at least basic level of education are more likely to utilize ANC 4 plus visit, SBA delivery and PNC for baby. Therefore, GoN should implement education and health promotion interventions intensively, particularly in the areas where literacy rate is low. Here female education should be a priority and GoN/Ministry of Education (MoE) should address barriers to education faced by women. There is also an urgent need for health education to create awareness about benefit of seeking adequate ANC, SBA delivery and timely PNC service for women and child in these areas.

Household wealth is strongest predictor, as it is independently associated with all four maternal health outcomes. Therefore, GoN should develop a cost effective intervention to improve financial status of women to advance their maternal health need among poor and disadvantaged communities.

Implementation of women empowerment program such as, income generation activities and social security scheme are some potential interventions, which help women to fight against poverty and are likely to have direct impact on maternal health services. Conditional cash transfer scheme for ANC and institutional delivery is being implemented in Nepal since 2005. However, some barriers, such as not getting the incentive on time and the incentive amount being too little to help poor women are prevalent. MoHP has to remove such barrier by strictly implementing the program as per guideline. Such as providing the incentive at the time of discharge and providing the service with no additional cost of any form. Creating awareness about the provision of maternity incentive scheme among the poor and disadvantaged community will encourage the poor and vulnerable group to utilize the maternal health service.

Having health insurance has been found as an important enabling resource, which has positive association with SBA and CS delivery in Nepal. This scheme is organized with the principle of risk pooling and regular payments of small premium. It aims to prevent catastrophic health expenditure, particularly among the under-served and poorest of the poor. However by 2019 only about 11% of the population in 50 districts are covered with health insurance in Nepal. Comprehensive health insurance program to cover the poor can help to reduce cost as barrier to maternal health services. Health insurance program should therefore be expanded to all the districts and communities to increase the population covered with health insurance.

Dalit, Muslim and Janjatis are less likely to utilize ANC 4 plus visit, SBA delivery and CS delivery compared to Brahmin/Kshetri/Thakuri. Increasing access to quality maternal health services to these ethnic groups by removing cultural, racial and ethnic barrier is very important. Health care providers should deliver respectful maternity care to these disadvantaged groups. Social mobilization and community awareness to change the existing discriminating social and cultural norms towards Dalit and Muslim and empowering Dalit and Muslim women through education and income generating activities will help to improve their autonomy to utilize maternal health care.

Women living in rural area and Madhesh Province are relatively disadvantaged towards utilization of maternal health service in Nepal. Supply of quality maternal health services to the rural and inaccessible area and creating demand for service among women in these areas could be the potential interventions. Strengthening existing maternal health program with supply of infrastructure, logistic and trained service provider as per minimum service standards, and strengthening health system with relocating hospitals, birthing centers and maternity waiting homes at strategic location are some effective supply side interventions. Creating community awareness about birth preparedness through mothers groups

and community health volunteers are the potential demand side interventions to improve maternal health service.

Multiparous women are less likely to utilize maternal health services such as ANC 4 plus visit, SBA and CS delivery. Thus to improve utilization of these services program interventions should also pay more attention to older and multiparous women.

In conclusion, the finding call for attentions to practical demand and supply side interventions targeted at enhancing ANC, delivery and postpartum care through continuous advocacy ensuring the availability of quality service with trained health worker, community mobilization for improving health seeking behavior and women's empowerment particularly in rural, backward and under privileged community in Nepal.

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