

DETERMINANTS OF THE UTILIZATION OF MATERNAL HEALTH SERVICES IN MYANMAR



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จุฬาลงกรณ์มหาวิทยาลัย

บทคัดย่อและแฟ้มข้อมูลฉบับเต็มของวิทยานิพนธ์ตั้งแต่ปีการศึกษา 2554 ที่ให้บริการในคลังปัญญาจุฬาฯ (CUIR)  
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ปัจจัยด้านอรรถประโยชน์ของบริการทางด้านสุขภาพมารดาในสาธารณรัฐแห่งสหภาพเมียนมา



วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต

สาขาวิชาเศรษฐศาสตร์สาธารณสุขและการจัดการบริการสุขภาพ

คณะเศรษฐศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

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ลิขสิทธิ์ของจุฬาลงกรณ์มหาวิทยาลัย



เมียด ตู่ สั้น : ปัจจัยด้านอรรถประโยชน์ของบริการทางด้านสุขภาพมารดาในสาธารณรัฐแห่งสหภาพเมียนมา (DETERMINANTS OF THE UTILIZATION OF MATERNAL HEALTH SERVICES IN MYANMAR) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: ผศ. ดร.นพพล วิทยวรพงศ์, 125 หน้า.

การศึกษานี้มีวัตถุประสงค์เพื่อสำรวจปัจจัยที่มีผลต่อการใช้บริการสุขภาพของมารดา อันได้แก่ การฝากครรภ์ของมารดา การคลอดบุตรในสถานพยาบาล และการรับบริการดูแลหลังคลอดบุตรในประเทศเมียนมา โดยมุ่งเน้นการทดสอบปัจจัยนำ (Predisposing Factors) ปัจจัยเอื้อ (Enabling Factors) และปัจจัยด้านความจำเป็น (Perceived Need Factors) การศึกษานี้ใช้ชุดข้อมูลทุติยภูมิจากการสำรวจประชากรและสุขภาพของประเทศเมียนมา (Myanmar Demographic and Health Survey) ในปี พ.ศ. 2558-2559 ในการสำรวจระดับชาตินี้ มีจำนวนของกลุ่มตัวอย่าง 12,500 ครัวเรือน เป็นผู้หญิง 12,885 ราย และชาย 4,737 ราย และภายใต้ชุดข้อมูลนี้ กลุ่มตัวอย่างที่จะถูกนำมาใช้ในการวิเคราะห์ คือ ผู้หญิงที่มีบุตรในช่วง 5 ปีก่อนการสำรวจจำนวนกว่า 3,800 ราย การศึกษานี้ใช้วิธีการวิเคราะห์สมการถดถอยโลจิสติกและการวิเคราะห์สมการถดถอยลอจิสต์ลำดับชั้นในการทดสอบปัจจัยที่เกี่ยวข้องกับการใช้บริการสุขภาพของมารดา

ผลการศึกษา พบว่าในกลุ่มของปัจจัยนำ อายุของมารดา และระดับการศึกษาของมารดา และสามีของมารดามีผลในเชิงบวกต่อการใช้บริการสุขภาพของมารดาทั้งสามประเภทข้างต้น จำนวนบุตรมีผลในเชิงลบ ในกลุ่มของปัจจัยเอื้อ ความมั่งคั่งของครัวเรือนนับว่าเป็นปัจจัยที่มีผลเชิงบวกและมีนัยสำคัญทางสถิติต่อการใช้บริการสุขภาพของมารดา ทั้งสามประเภทข้างต้น การมีที่พำนักในชนบทก็ให้ผลที่สอดคล้องกัน โดยมีผลเชิงลบต่อการฝากครรภ์ของมารดา และการคลอดบุตรในสถานพยาบาล แต่ไม่มีนัยสำคัญทางสถิติต่อการรับบริการดูแลหลังคลอดบุตร และสุดท้าย ในกลุ่มของปัจจัยด้านความจำเป็น พบว่า การมีภาวะครรภ์ที่ซับซ้อน รวมถึงการมีบุตรแฝด มีผลในเชิงบวกต่อการใช้บริการสุขภาพของมารดาทั้งสามประเภทข้างต้น ผลการศึกษานี้ให้เห็นถึงความสัมพันธ์ระหว่างการศึกษาและความอยู่ดีมีสุขทางเศรษฐกิจ กับการใช้บริการสุขภาพของมารดา อันมีนัยยะถึงระดับสุขภาพในประเทศเมียนมา

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This study explored determinants of the utilization of three types of maternal health services in Myanmar: antenatal care (ANC), institutional delivery, and postnatal care (PNC), testing in particular the predisposing factors, enabling factors and perceived need factors. This study used a secondary dataset drawn from the Myanmar Demographic and Health Survey 2015-16 (MDHS). In this nationally representative survey, the number of households that were originally involved was 12,500, among which 12,885 women and 4,737 men were interviewed. The final sample used for analyses in this study consisted of over 3,800 women who had delivered at least one child within 5 years preceding the survey. Factors associated with the utilization of maternal health services were examined with logistic and ordered logit regressions.

The results suggested that, among predisposing factors, age of mothers and levels of education of both mothers and their husbands were generally positively correlated with all three maternal health services. Parity of women was negatively correlated with all the services. Among enabling factors, household wealth had a strong and positive correlation with all three maternal health services. Correspondingly, rural residence had, as expected, a negative correlation with maternal health care utilization. Finally, among perceived need factors, having a complicated (twin or multiple) pregnancy had a significant and positive correlation with the utilization of maternal health services. The results altogether indicated a clear linkage between education and economic well-being, on the one hand, and the utilization of maternal health services (and implicitly better health outcomes), on the other, in Myanmar.

Field of Study: Health Economics and      Student's Signature .....

Health Care Management      Advisor's Signature .....

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## LIST OF ABBREVIATIONS

AMW	Auxiliary Midwife
ANC	Antenatal Care
ASEAN	Association of Southeast Asian Nations
CCT	Conditional Cash Transfer
EA	Enumeration Unit
EmOC	Emergency Obstetric Care
GDP	Gross Domestic Product
MCH	Maternal and Child Health
MDG	Millennium Development Goals
MDHS	Myanmar Demographic and Health Survey
MMR	Maternal Mortality Ratio
OPD	Out-patient Department
OR	Odd Ratios
PHC	Primary Health Center
PNC	Postnatal Care
PSA	Primary Sampling Unit
PSI	Population Service International
RAI	Rural Access Index
RH	Reproductive Health
RHC	Rural Health Center
SARA	Service Availability and Readiness Assessment
SBA	Skilled Birth Attendant
SDG	Sustainable Development Goals
SRH	Sexual and Reproductive Health
SRMNAH	Sexual, Reproductive, Maternal, Neonatal and Adolescent Health
STI	Sexually Transmitted Infections
TFR	Total Fertility Rate
THE	Total Health Expenditure
UNFPA	United Nations Population Fund

UNICEF	United Nations International Children Emergency Fund
USAID	United States Agency for International Development
USDP	Union Solidarity and Development Party
WHO	World Health Organization



## CHAPTER I

### INTRODUCTION

#### 1.1 Motivation and significance

Current momentum of political commitment on universal health coverage is the highest ever than before (*Tracking Universal Health Coverage: 2017 Global Monitoring Report*, 2017). In 2015, at the end of the Millennium Development Goal (MDG) era, leaders from 193 countries set 17 Sustainable Development Goals (SDGs) to be achieved in 2030. SDG 3.8 is set as “Achieve universal health coverage including risk, access to quality essential health care services and access to safe, effective, quality and affordable essential medicines and vaccines for all.” This goal 3.8 has two targets: coverage of essential health services and financial risk protection. In other words, it is expected that every human being has an equitable access to all essential health services without financial hardship, specifically without catastrophic payment or impoverishment.

Maternal health services are deemed “essential” in many countries, including Myanmar (PSI, 2017). It is obvious that antenatal care, post-natal care and delivery services are basic services for pregnant women and each of them has a right to access these services. Low utilization of maternal health services would likely lead to a higher maternal mortality ratio (MMR). MMR has been widely used as a development indicator (“The World Bank | Data,” 2017) and it is continuously included as one of the target indicators of MDGs and SDGs.

Almost all maternal deaths can be prevented. Yet the lifetime risk of maternal death in low-income countries is 1 in 44 and in high-income countries it is much lower at 1 in 3,300 in the MDG age, from 1990 to 2015 (“UNICEF DATA,” 2018). Therefore, to get interventions and treatment in time for maternal health services is very important to save the lives of mothers.

In Myanmar, MMR is relatively high and it is second highest in ASEAN Region (“The World Bank | Data,” 2017), behind only Laos. Myanmar did not achieve its target in 2015 to reduce MMR by three-quarters of the MMR rate in 1990 (*ASEAN Statistical*

*Report on Millennium Development Goals*, 2017). According to the 2016 Thematic Census Report on Maternal Mortality, MMR in Myanmar was 282 per 100,000 live births compared to the rest of Southeast Asia and other developing countries at 140 and 230 respectively (*Thematic Report on Maternal Mortality; Census Report Volume 4C*, 2016).

In Myanmar, maternal health services remain underutilized. While WHO recommends at least four antenatal care (ANC) visits for a pregnancy without complication (WHO, 2002; *WHO recommendations on antenatal care for a positive pregnancy experience*, 2016), the ANC coverage with skilled personnel for one or more ANC visits during last pregnancy in Myanmar in 2015-2016 was 81%, but the coverage with four or more ANC visits was only 59% (*Myanmar Demographic and Health Survey 2015-16*, 2017). For child delivery, in 2015-2016, institutional delivery accounted for 37% only, but delivery with skilled attendants was about 60% with remarkable urban and rural differences (88% and 52%). With regard to post-natal care, only 57% of mothers received post-natal checkup within 24 hours of delivery (*Myanmar Demographic and Health Survey 2015-16*, 2017). These data indicate that the utilization rate of maternal health services is low in Myanmar, and especially low in rural areas.

Studies have been conducted on the utilization of maternal health services in Myanmar. Win (2010) focused on the demand for institutional delivery but covered only one region with a sample of 425 reproductive age married women. Thin Zaw et al (2012) and Sein (2012) investigated maternal health services, but only with youths, in peri-urban area of Mandalay City and in Yangon region respectively. Chamroonsawasdi et al. (2015) studied the utilization of skilled birth attendants during delivery in an urban area of Kalay Township. The most recent study is Thida et al. (2018), conducted in three regions of central Myanmar where MMR was at least 280 deaths per 100,000 live-births.

To date, there still is no countrywide survey and analysis for the utilization of maternal health services in Myanmar yet. Because of the financial constraints and political situations in Myanmar, countrywide surveys happened occasionally. For instance, Myanmar population and census survey could not be conducted for over 30 years—1983 as its latest wave. Luckily, Myanmar Demographic and Health Survey



(MDHS) were conducted in 2015-16 and its full report was issued in 2017. Moreover, no one has conducted a study on the utilization and determinants of maternal health services in Myanmar using MDHS yet.

As it is important to study maternal health services utilization for the whole country in order to arrive at more generalizable conclusions, this paper will cover and analyze potential determinants of the utilization of maternal health services in Myanmar with the recent countrywide dataset.

## 1.2 Research Questions

- What are the determinants of the utilization of maternal health services in Myanmar?
- With regard to maternal health services, what is the extent of access inequality across different regions?

## 1.3 Research Objectives

### 1.3.1 General Objective

To explore the determinants of the utilization of maternal health services in Myanmar.

### 1.3.2 Specific Objectives

- To examine the effects of socio-economic factors on the utilization of ANC (Antenatal Care) services.
- To examine the effects of socio-economic factors on the utilization of institutional delivery services.
- To examine the effects of socio-economic factors on the utilization of PNC (Postnatal Care) services.
- To explore inequalities in accessibility of the above three services across different regions

## 1.4 Hypothesis

The following hypotheses are drawn: -

- Among predisposing factors, age of women, education of woman herself and her husband's, occupation of woman herself and her husband's, and history of abortion are expected to have a positive correlation and parity of women and birth interval less than 24 months are expected to have negative correlation with the utilization of maternal health services.
- Among enabling factors, household wealth is expected to have positive correlation and residence in rural areas is expected to have a negative correlation with the utilization of maternal health services. Different regions as well as its supply side facilities and distance factors will have positive or negative correlation compared with one omitted region.
- Among perceived need factors, the desire to have a child, having twin or multiple pregnancy and the fact that the woman was giving birth to the first child are expected to have a positive correlation with the utilization of maternal health services.

## 1.5 Scope

The study uses secondary data from the Myanmar Demographic and Health Survey (MDHS) conducted in 2015-16, issued in March 2017. This MDHS was based on a stratified two-stage sampling design using the 2014 census frame. Primary sampling unit (PSU) was either enumeration area (EA) of census frame or a ward or village tract in non-state-controlled areas which were not enumerated in the time of census. From these selected households, total 12,500 households, 12,885 women and 4,737 men were interviewed. The survey covers the whole country including 7 States, 7 Regions and 1 Territory.

Unit of analysis in this study is individual level, the woman, but not all the 12,885 women are included. The main inclusion criterium for this study is that women

who had delivered at least one child within 5 years preceding the survey, with a specific focus on the last birth. But data concerning with current pregnancy are excluded for this study. Therefore, out of 12,885 women, over 3,800 women are included in the final sample. In particular, antenatal care, child delivery and postnatal care services are covered. According to the MDHS report, DHS is intended to provide estimates of demographic and reproductive health indicators. Therefore, in this study, although sample size used is one third of the original sample size, it can be inferred to represent the whole country as intended in the DHS.

### 1.6 Possible Benefits

This study will present factors influencing the utilization of maternal health services in different States and Regions of Myanmar with most recent countrywide survey, 2015-2016 Myanmar Demographic and Health Survey. The following possible benefits are expected from this study.

- If the rural residence and distance factor are negatively correlated with the utilization of maternal health services in different regions, government could favor regular mobile outreach services, facility coverage and geographical accessibility in rural areas.
- If the poorer household wealth is found to be barrier to seek maternal health services, demand side financing program could be implemented for short-term health promotion.
- If the younger age is found to have negative correlation with the utilization, SRH education and awareness raising sessions as a part of behavior change program could be implemented.

## CHAPTER II

### BACKGROUND

#### 2.1 General Background of Myanmar

Myanmar is the most northwestern country among eleven countries in South East Asia, and its northernmost part is a continuation of the Himalaya range with the highest mountain, Hkakabo Razi (5,881m) within ASEAN region ("South East Asia," 2017). It is surrounded by Bangladesh and India to the west, China to the north and northeast, Laos PDR to the east, Thailand to the east and southeast, Andaman Sea and Bay of Bengal to the south and the west. The coastline of Andaman Sea and Bay of Bengal is approximately 1,930 kilometers long. Its land size is nearly 676,600 square-kilometers, far wide from north to south about 2,050 kilometers long and much narrower from east to west about 930 kilometers at its widest points. It is situated between 9°32' N and 28°31'N latitudes, and 92°10'E and 101°11' longitudes. Myanmar is the second largest, but the fifth in term of population size, in the region. Its population according to 2014 national census is nearly 51.5 million (*The 2014 Myanmar Population and Housing Census: Census Atlas Myanmar, 2014*).

Myanmar is composed of 7 States, 7 Regions and one territory (it was formerly composed of 14 States and Regions and Naypyidaw Union Territory was separated from Mandalay Region and newly appointed in 2011). These States and Regions are administratively divided into 74 districts, 330 townships, 3,071 Wards and 13,620 Village Tracts, and approximately 65,000 Villages. About 70% of total population resides in rural areas. The geography of Myanmar can be divided into 1) the northern mountains, 2) the western ranges, 3) the eastern plateau, 4) the central basin and lowlands and 5) the coastal plains and delta regions. Some hilly and delta regions are geographically challenging, such that it is very hard for the people to find transportation to get access to healthcare. Ethnic diversity is large in Myanmar. There are 135 ethnic groups and they use over 100 dialects and languages (*The 2014 Myanmar Population and Housing Census: The Main Report, 2015*; "Total List of Districts, Townships, Sub-townships, Towns, Wards, Village-tracts and Villages in Regions and States," 2014).

## 2.2 Myanmar Health Care Provision

The main health care provider in Myanmar is the Department of Medical Services and the Department of Public Health, under the Ministry of Health and Sports which is a combination of former two Ministries: Health and Sport. This change was carried out in 2016 under the present Government with Aung San Suu Kyi as State Counselor. Before this, in 2013, under the Union Solidarity Development Party (USDP) Government, the Ministry of Health was rearranged, and then preventive programs under the Department of Health were united to form the Department of Public Health, and the Medical Care Unit under the same department became Department of Medical Service. Despite these major changes, the system is still evolving. Until now, the public sector remains the main comprehensive health care provider of all health services ranging from primary to tertiary care through its community health centers and different level hospitals as shown in Table 1 ("Ministry of Health and Sports, Myanmar," n.d.; *The Republic of Myanmar Health System Review*, 2014)

Table 1 : Distribution of health care facilities under Ministry of Health (2012)

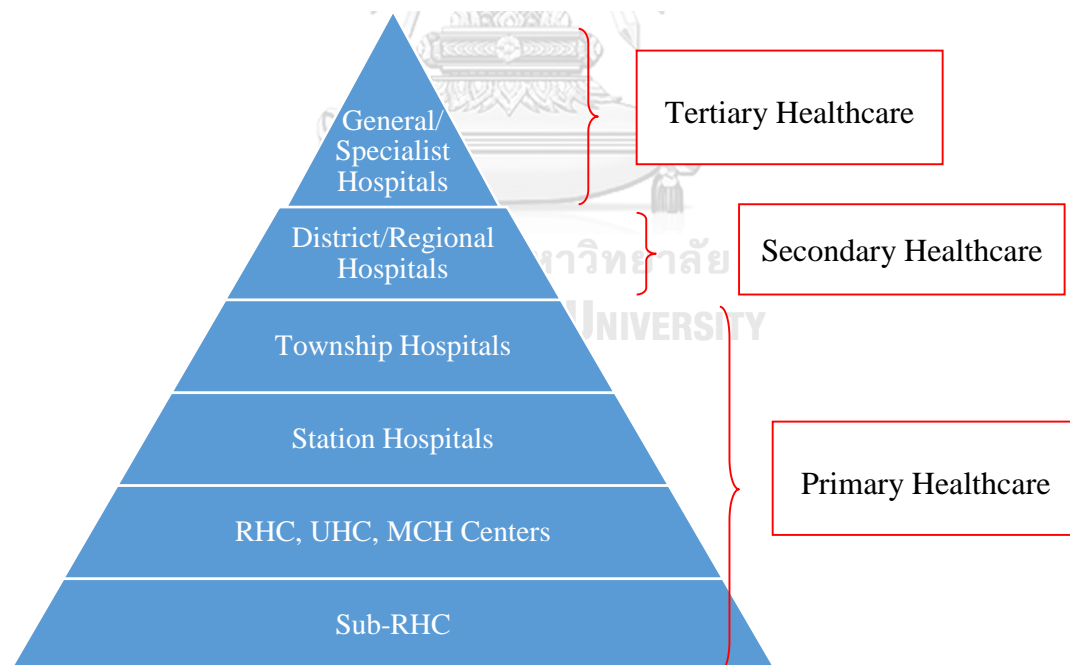
Health facilities	Community Health Centers (Ambulatory care)				Primary care Hospital		Secondary care hospital	Tertiary care hospital
	RHCs	Sub-RHCs	MCH Centers	UHCs	Station Hospital	Township Hospital	District/Regional Hospital	Specialist/Teaching/General Hospital
	1635	7581	87	348	572	255	81	36

RHCs = Rural Health Centers, MCH Centers = Maternal and Child Health Centers, UHCs = Urban Health Centers

Source: (*The Republic of Myanmar Health System Review*, 2014)

Figure 1 exhibits the structure of public health sector hierarchy. The most primary care units in the community in rural area are Rural Health Centers (RHCs) and Sub-RHCs which are mainly responsible not only for preventive activities as well as for minor illness and first aids precautions, but also for maternal and child health (MCH) activities including antenatal care, delivery service, postnatal care and immunization campaign. The same level with RHCs are Urban Health Centers (UHCs), which are mainly responsible for other than MCH activities, and Maternal and Child Health Centers (MCHs) in urban areas. Hospitals in rural area are station hospitals and in urban area are township hospital which are primary level hospital. One level above are district and regional hospitals which provide secondary hospital care. The highest-level hospitals are specialist or teaching or general hospitals, situated in only 5 out of 15 regions.

Figure 1 : Myanmar healthcare service delivery system



RHCs = Rural Health Centers, MCH Centers = Maternal and Child Health Centers, UHCs = Urban Health Centers

Although the public health sector is the main healthcare provider in Myanmar, the private sector is becoming more important in ambulatory care especially in big cities. Private hospitals have been increasing in number within a decade in major cities and many of them can provide intensive and institutional care. But specialized severe cases still rely on public tertiary hospitals. Most of the healthcare providers in private hospitals and ambulatory care settings are also from public hospitals, as there is a dual practice system in Myanmar (*The Republic of Myanmar Health System Review*, 2014).

In the private sector, apart from ‘for-profit’ institutions, there also are ‘not-for-profit’, like Muslim Hospital and Mission Hospitals, and ‘non-profit’ organizations, which include charity and non-government organizations (NGOs). In most rural settings, where 70% of people reside, people often seek healthcare from traditional providers, traditional healers, quacks and drug shops (*The Republic of Myanmar Health System Review*, 2014).

### 2.3 Maternal Health: Selected Indicators

In Myanmar, some gaps of utilization of maternal health services are observed between rural and urban areas as well as among different states and regions, according to the geographic terrain. Maternal Mortality Ratio (MMR) for the whole country is about 282 deaths per 100,000 live births where MMR for rural women is about 310 and MMR for urban women is about 193. The highest MMR is found in Chin State (357) and this State has the lowest rural access index (RAI) in Myanmar (*Myanmar Transport Sector Policy Note: Rural Roads and Access*, 2016). The second and third highest MMR rates are 354 in Irrawaddy and 344 in Magway Regions. These two regions have the largest rural population ratios in Myanmar: 85.9% in Ayeyawady and 85% in Magway (*The 2014 Myanmar Population and Housing Census: Census Atlas Myanmar*, 2014). Rural areas have a more limited access to health care facilities. It is likely due to the distance to health care facilities, lack of transportation, difficult terrain or lack of health facilities (*Thematic Report on Maternal Mortality; Census Report Volume 4C*, 2016).

In addition to MMR, other maternal service outcomes have similar urban-rural differences as seen in Table 2. Home delivery is remarkably different between urban

and rural areas. 30% of pregnant women in urban areas delivered their children at home while 72% of pregnant women in rural areas gave birth at home. The highest home delivery rate is in Chin State again, which accounts for 85% of all deliveries in that State.

Table 2 : Selected maternal health indicators

Sr.	Indicator	Statistics			Sources
		Urban	Rural	Total	
1.	Total Population	30%	70%	51,486,253	(The 2014 Myanmar Population and Housing Census: The Main Report, 2015)
2.	Life expectancy at birth			64.7	
3.	Maternal Mortality Ratio (MMR)	193	310	282	
4.	Antenatal Care Coverage (one or more visits)	94%	77%	81%	
5.	Antenatal Care Coverage (four or more visits)	84%	51%	59%	
6.	Delivery with Skilled Birth Attendant	88%	52%	60%	
7.	Delivery with AMWs	1.8%	7.5%	6%	
8.	Delivery with Traditional Birth Attendants	9%	35%	29%	
9.	Home Delivery	30%	72%	63%	
10.	Delivery at Public Facilities	53%	24%	31%	
11.	Delivery at Private Facilities	17%	3%	6%	
12.	Basic Emergency Obstetric Care (Basic EmOC)	26% of Sub-RHCs and 60% of RHCs can provide basic EmOC services. But they can only give 4 out of 7			



		signal functions of basic EmOCs.			<i>Assessment (SARA), 2015)</i>
13.	Comprehensive EmOC	41% of station hospitals and 78% of township hospitals can provide comprehensive emergency obstetric care (CEmOC).			
14.	Unmet Need for Family Planning	12.8%	17.4%	16.2%	<i>(Myanmar Demographic and Health Survey 2015-16, 2017)</i>
15.	Total Fertility Rate (TFR)			2.5	<i>(The 2014 Myanmar Population and Housing Census: The Main Report, 2015)</i>
16.	Crude birth rate			19.8	
17.	Provider Population Ratio	1.36 Physicians, Nurses, Midwives per 1,000 population			<i>(The Republic of Myanmar Health System Review, 2014)</i>
18.	Abortion Law	Allowed only one condition; to save the life of mother			

Low utilization of maternal health services may depend on demand side as well as supply side factors. As for the demand side, contributing factors may include distance to the health care facilities, lack of transportation or road access, household income, insurance status, health knowledge and education. As mentioned above, 70% of the Myanmar population is residing in rural areas. About 40% of all rural villages do

not have road access and 70% does not have all-season roads, affecting about 20 million people in the country (*Myanmar Transport Sector Policy Note: Rural Roads and Access*, 2016). One of the main barriers for women in accessing maternal health services is the distance and lack of transportation (Pilasant et al., 2016). GDP per capita is 1195 USD ("GDP per capita (current US\$)," 2018) in 2016 and private out-of-pocket (OOP) health expenditure is 73.71% in 2015 (*Myanmar National Health Accounts 2014-15*, 2018). 39% of women in Myanmar have to borrow money and another 13% has to sell or pledge crops or gold in order to receive MCH services (Teerawattananon et al., 2014). The poverty rate of Myanmar in 2015 is 32.1% with urban 14.5% and rural 38.8% (*Myanmar Poverty and Living Conditions Survey: Technical Poverty Estimation Report*, 2017), and 33.5% of 25 years and above women completed primary level as their highest education status (*The 2014 Myanmar Population and Housing Census: The Main Report*, 2015), all of which impact the probability to receive MCH services.

There are also supply-side constraints. For the whole country, the workforce per 1,000 population for health care services is 1.36 health workers (doctors, nurses, midwives) (*The Republic of Myanmar Health System Review*, 2014), which is much lower than the WHO minimum threshold of 2.3 per 1,000 population (*Health Workforce Strategic Plan 2012-2017*, 2012). The abortion law allows terminating the pregnancy for only one condition i.e. to save the mother of life, and the abortion was third leading cause of maternal death according to nation-wide cause specific maternal mortality survey 2004-05 (*Abortion Policies and Reproductive Health around the World*, 2014; *Five-year Strategic Plan for Reproductive Health 2014-18*, 2014). As for emergency obstetric care (EmOC), which is a vital component of maternal care to save lives of mothers in child delivery, Myanmar has poor performance indicators. Basic EmOC services are intended to perform at primary health care centers in rural areas. However, in Myanmar, only 4 out of 7 signal functions of basic EmOC can be performed by community health centers. Among them, only 60% of Rural Health Centers (RHCs) and 26% of Sub-RHCs can perform these 4 out of 7 signal functions. At even these centers, only lower than half can perform all these 4 functions. As for the comprehensive EmOC, which is supposed to be performed at hospitals, only 41% of station hospitals and 76% of township hospitals, which are primary care hospitals, can perform it

(Nation-Wide Service Availability and Readiness Assessment (SARA), 2015). This is very challenging for women in rural areas to receive the basic and comprehensive EmOC.

## 2.4 Maternal Health Workforce in Myanmar

Like general health care provision, the main provider for maternal health services is public sector especially for rural communities. About 31% of women gave birth at public facilities and over 6% delivered at private facilities (*Myanmar Demographic and Health Survey 2015-16*, 2017). The maternal and child health workforce in the public sector is shown in Table 3.

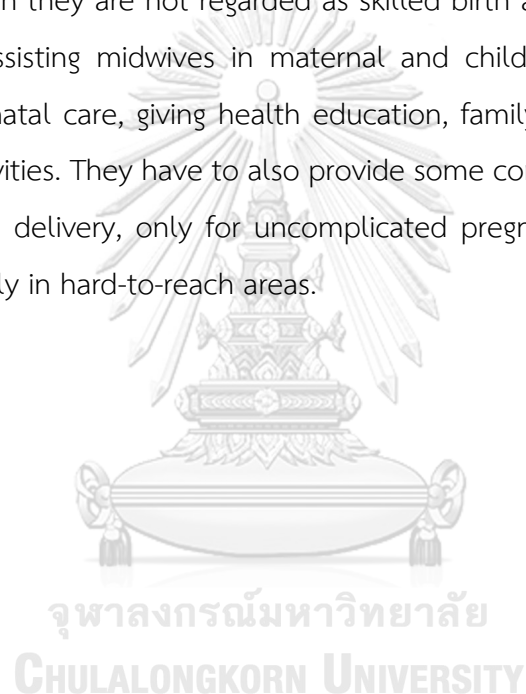
Table 3 : Maternal and Child Health (MCH) workforce (2014)

Sr.	Workforce supply	Number	Percentage	Volunteer
1.	Auxiliary Midwives (AMWs)	21,120	38.16%	Volunteers trained by Ministry of Health
2.	Midwives (MWs)	10,646	19.24%	
3.	Lady Health Visitors (LHVs)	1,706	3.08%	
4.	Nurses	14,575	26.34%	
5.	Physicians (Generalists)	6,902	12.47%	
6.	Obstetricians/ Gynecologists	211	0.38%	
7.	Pediatricians/ Neonatologists	181	0.33%	
	<b>Total</b>	<b>55,341</b>	<b>100.00%</b>	

Source: Myanmar SRMNAH Workforce Assessment (*Myanmar SRMNAH Workforce Assessment*, 2017)

The health workforce in Myanmar is in critical shortage (Wangmo et al., 2016). As mentioned above, there is 1.36 skilled health personnel per 1,000 people which is much lower than the minimum threshold recommended by WHO. Therefore, Ministry of Health has planned to have at least one AMW for one village to perform task shifting of MWs to AMWs (MoH, 2013).

According to Table 3, AMWs are the main type of workforce for maternal and child health services, despite the fact that they are not government employees and they are just volunteer health workers receiving a 6-month training from the Ministry of Health. Although they are not regarded as skilled birth attendants (SBAs), they are responsible for assisting midwives in maternal and child health activities like the provision of antenatal care, giving health education, family planning counseling and child delivery activities. They have to also provide some component of antenatal care services and child delivery, only for uncomplicated pregnancies, in the absence of midwives especially in hard-to-reach areas.



## 2.5 Health Care Financing

Myanmar's financing sources are public expenditure, private expenditure, and external aid. Of these three sources, private expenditure is still the main source. Out-of-pocket expenditure in 2015 was about 73% of total health expenditure (THE). The Ministry of Health and other ministries contributed about 23% and external aid about 3% of THE respectively. Only less than 0.5% came from Social Security Scheme. Some important figures are shown in Table 4 (*Myanmar National Health Accounts 2014-15, 2018*).

Table 4 : Selected national health account indicators in Myanmar 2015

Sr.	Indicators	Value	Source
1.	Per capita GDP in current USD	1,139	("The World Bank   Data," 2017)
2.	Total Health Expenditure as % of GDP	4.7%	(Myanmar National Health Accounts 2014-15, 2018)
3.	Per capita Total Health Expenditure (MMK)	70,148	
4.	Health Expenditure by Ministry of Health	20.84%	
5.	Health Expenditure by other Ministries	2.52%	
6.	Health Expenditure by Social Security Scheme	0.42%	
7.	Health Expenditure by private household out-of-pocket	73.71%	
8.	Health Expenditure by INGOs	2.52%	

There is no national health insurance law yet in Myanmar, but it has been discussed in parliament since 2015. New social security law was issued and became effective in 2012 ("Social Security Law", 2012).

## Chapter III

### LITERATURE REVIEW

#### 3.1 Health Care Utilization

Health care utilization is one form of health behaviors (Shaikh & Hatcher, 2004). It is a result of health-seeking or health-promoting activities at health facilities and involves particular treatment or intervention. It has also been defined as an outcome of the communication between patients and healthcare providers (Donabedian, 1973).

Access to health care and utilization of health care are similar in some aspects. However, unlike utilization, access is not merely a result of interactions between individuals who need health care and receiving the desired effect. Access to health care results from the adjustment between characteristics of health care resources and those of the population. In other words, access represents the opportunity to reach and receive required health services, but utilization is the actual use of the required services (Levesque, Harris, & Russell, 2013).

Access is affected by many factors, including supply side factors and demand side factors as well as the environmental and geographical context. These factors can be broken down into broad dimensions like economical, geographical or social factors, which can make easier measures of specific determinants of access to health care (Levesque et al., 2013). Physical, financial and cultural barriers can be used to measure the extent of accessibility or consequently utilization of health care services.

In assessing determinants of the utilization of medical care services, the Andersen-Newman framework is well known. In this model, access to and use of health care services are based on three factors: predisposing factors, enabling factors and need factors. Predisposing factors are socio-cultural factors before getting the illness that affect medical decision-making. Enabling factors are mainly logistical factors that affect the likelihood to get to the health facilities or to receive health care services. Need factors represent illness, which is the most important factor followed by predisposing factors and then by enabling factors (Andersen & Newman, 2005).

There are several studies on utilization of maternal health services. Some were conducted on all three maternal health services: antenatal care, assisted delivery and postnatal care (Danasekaran, Raja, & Ran, 2017), some on antenatal and delivery services including caesarian section (Mehata et al., 2017), some on only one maternal service (Abebo & Tesfaye, 2018), and some not only on maternal services but also on child health services and/or family planning services (Agunwa, Obi, Ndu, & Omotowo, 2017).

With regard to Myanmar, on utilization of maternal health services have been conducted in some selected areas in Myanmar. Two of them exclusively were conducted on youth in peri-urban areas of Yangon and Mandalay, which are the most populated cities in Myanmar. One was conducted in Yangon region on maternal health services (Sein, 2012) and another was on reproductive health services (Thin Zaw, Liabsuetrakul, Htay, & McNeil, 2012). There is also a publication in 2015 that focused exclusively on the utilization of skilled assisted delivery in the urban area of Kalay Township (Chamroonsawasdi, Soe, Charupoonphol, & Srisorrachatr, 2015) and a publication in 2018 that was conducted on community-based maternal health services in three regions in central Myanmar (Thida, Liabsuetrakul, & McNeil, 2018). This study considers the entire country, based on a nationally representative sample, and addresses three maternal health services. The generalizability of results and the scope of the research topic constitute this study's main contributions.

### **3.2 Predisposing factors for Maternal Health Care Utilization**

According to Andersen-Newman model, socio-demographic factors are considered as predisposing factors which can influence on the decision making to seek health care rather than to facilitate receiving health services. Addressing socio-demographic factors for the utilization of maternal health services are very common among existing studies on this topic. Socio-demographic variables that have been included in the empirical analyses include age, parity or birth order, education, occupation or employment, women's autonomy, religion, social class (caste) and ethnicity, and attitudes toward health care providers.

### 3.2.1 Age

Age has been tested in almost all studies on the utilization of maternal health services. Generally, similar to the utilization of general health services, maternal health service utilization may have the same pattern with age, i.e., older woman (of reproductive ages) are more likely to have a higher utilization rate for maternal health services.

In a systematic review, on the utilization of maternal health services among adolescent mothers of 32 different low and middle-income countries (LMICs), Banke-Thomas et al. (2017) stated that adolescent mothers had an inadequate access to ANC and skilled assisted delivery compared with older age group women with the same socio-demographic background (Banke-Thomas, Banke-Thomas, & Ame, 2017). Similar results were found out with studies that considered reproductive aged women. Maternal age was positively correlated with institutional delivery in Bangladesh (Yaya, Bishwajit, & Ekholuenetale, 2017); with ANC services in Nigeria (Adewuyi et al., 2018); with institutional delivery and PNC services in Pakistan (Agha & Carton, 2011); and with skilled attendant delivery in Indonesia (Osaki, Kosen, Indriasih, Pritasari, & Hattori, 2015). However there also were some studies in which maternal age was not associated with 3 times ANC visits in Pakistan (Agha & Carton, 2011) and not with ANC and institutional delivery in Vietnam (Malqvist, Lincetto, Du, Burgess, & Hoa, 2013).

Therefore, in general it can be concluded that maternal age is positively correlated with the utilization of maternal health services especially with institutional delivery.

### 3.2.2 Parity

Like maternal age, parity or birth order of the pregnancy has been tested in many studies. Generally, women with higher parity especially with no previous complications will be less likely to seek maternal health services compared to women who are primigravida or with fewer children.

In Banke-Thomas et al. (2017)'s systematic review, it was found that higher parity had a strong and consistently negative effect on all skilled attendant delivery



services and on some ANC and PNC services among adolescent mothers in 32 lower and middle-income countries. The same result where parity was negatively correlated with timing of ANC visit was discussed in a study using DHS data of six African countries (Dimbuene et al., 2017). Similar results appeared with all three maternal health services in Pakistan (Agha & Carton, 2011) and with skilled attendant delivery services in Indonesia (Osaki et al., 2015).

Therefore, it is expected that higher parity is negatively affected with the utilization of all three types of maternal health services across different studies and regions.

### 3.2.3 Education

Education status of women has been assessed in almost all studies about maternal health service utilization, and that of their husbands has also been tested in some studies. In general, education level and health utilization as well as health status are positively correlated.

Mehata et al (2017) stated in their study that woman's education was the strongest and significant predictors for the utilization of maternal health services in Nepal among the studied variables. Positive correlation results were also found with regard to institutional delivery in Nepal (Freidoony et al., 2017); with all maternal health services in Pakistan (Agha & Carton, 2011); with ANC and institutional delivery services in Vietnam (Malqvist et al., 2013); with skilled attendant delivery in Indonesia (Osaki et al., 2015); with institutional delivery services in Nigeria (Agunwa et al., 2017); and with ANC and institutional delivery services, but not with PNC services, in India (C & Kharde, 2017).

There were mixed findings in assessing the education level of both mother and her husband with maternal health service utilization in the literature. Both maternal and paternal education were positively correlated with ANC services in Nigeria (Adewuyi et al., 2018); and with PNC services in Ethiopia (Abebo & Tesfaye, 2018). In a study in Nepal where the husband had lower education and the woman had higher education, she was 9 times more likely to use skilled delivery services (Bhandari, Kutty,

Sarma, & Dangal, 2017). However, a study in Bangladesh showed that education attainment of husband had a higher predictive value for institutional delivery than that of woman (Yaya et al., 2017). In Freidoony et al. (2017), husband's education was not statistically significant with institutional delivery in Nepal.

In the Dimbuene et al. (2017), in Ghana, the effect of women's education was significantly associated with 'frequency of ANC visits', but this was found only in middle and high socio-economic groups, not in poor groups. The authors concluded that over-generalization of education effects on maternal health services might become misleading.

#### 3.2.4 Occupation

In the literature, some studies about maternal health care utilization have treated occupation as an enabling factor while others have considered it as a predisposing factor. However, it was classified as a predisposing factor in Andersen-Newman model, reflecting social characteristics rather than the family income (Andersen & Newman, 2005). Generally, better types of occupation like professional work or even skilled labor have a positive correlation with the utilization of health services.

Danasekaran et al. (2017) considered maternal, but not on paternal, occupation, and discussed in their study that type of maternal occupation was positively correlated with ANC services among fisherman population in India. Both mother's and father's occupation were also associated with ANC services in rural, but not in urban, Nigeria (Adewuyi et al., 2018); with institutional delivery in Nigeria (Agunwa et al., 2017); and with PNC services in Ethiopia (Abebo & Tesfaye, 2018). In some studies, husband's occupation was more significant than that of woman. In Nepal, it was found that, although husbands of respondents' occupation in agricultural sector were less likely to lead to institutional delivery than other types including manual workers in Nepal, woman's occupation was not statistically associated with institutional delivery (Freidoony et al., 2017). In Banke-Thomas et al. (2017)'s study of systematic review, employment status of adolescent mothers was statistically significant in correlation

with utilization of maternal health services among 4 out of 12 studies, and that of husband was significant in 1 out of 12 studies.

Therefore, this evidence of weak association in literature needs further studies, and Myanmar needs them more as there is no countrywide study on the impact of occupation on the utilization of maternal health services.

### **3.2.5 Birth Intervals**

Literature on how birth intervals affect maternal health utilization is scarce in the literature. WHO recommends a minimum of 24 months to conceive next pregnancy after a live birth for neonatal and maternal health ("Report of a WHO Technical Consultation on Birth Spacing," 2005). Moreover, women with infants may have a lower utilization of ANC as well as delivery services. Adewuyi et al. (2008) studied underutilization of ANC services as a comparative study between rural and urban women in Nigeria. In their study, they found that women whose birth interval less than 24 months were significantly associated with underutilization of ANC services in rural Nigeria, but not in urban (Adewuyi et al., 2018). This limited finding needs to be explored more.

### **3.2.6 History of abortion in previous pregnancies**

Andersen-Newman (2005) put past illness in the predisposing factor group as people experiencing past illness might be more likely to seek health services. Previous abortion history can be considered the same situation with past illness and can be included as a predisposing factor (although Freidoony et al. (2017) put it as perceived need factor).

In general, women with history of spontaneous abortion may have more utilization in succeeding pregnancies. But it was induced abortion, it may not be related with the maternal health service utilization in later pregnancies. Freidoony et al. (2017) studied utilization of institutional delivery in Nepal and found no significant association between previous abortion history and utilization of maternal health services.

### 3.2.7 Woman's Autonomy

The effect of autonomy of woman on the utilization of maternal health services has been found in the literature, but in relatively few studies. Bhandari et al. (2017) stated in their study that woman's education was more important than woman's autonomy for utilization of skilled delivery services in Nepal. Similarly, Freidoony et al. (2017), woman's autonomy was not associated with institutional delivery in Nepal. However, Ahga & Carton (2011) found that, in Pakistan, women with high autonomy index had higher predictive value for at least 3 times ANC visits and institutional delivery, but not with PNC service compared with lowest autonomy index group.

### 3.2.8 Religion, Social Class (Caste) and Ethnicity

The effect of being a particular religion or social class or ethnicity on the utilization of maternal health services as the social and cultural determinants are found in the literature.

In Banke-Thomas et al. (2017)'s systematic review, particular socio-ethnic groups and religions had a significant correlation with the utilization of maternal health services among adolescent mothers in 32 countries with higher association found in socio-ethnic groups. Similarly, Hoa ethnic group had higher utilization of ANC and delivery services compared with non-Hoa ethnic group in Vietnam (Malqvist et al., 2013); Muslim women were less likely to use ANC services than Christian women in urban Nigeria (Adewuyi et al., 2018); Muslim woman had statistically negative correlation with timing of ANC services (Dimbuene et al., 2017); but in contrast, Muslim woman had significant correlation and they had higher odd ratios on utilization of 4 completed ANC services and Caesarean sections compared with Newars ethnic group in Nepal (Mehata et al., 2017). But in Freidoony et al. (2017), social caste was statistically not associated with institutional delivery in Nepal.

Therefore, evidence stated that even woman with same religions in different parts of the world had different utilization. Myanmar also has 135 ethnic groups and it is needed to know the effect of the ethnicity on the utilization of maternal health services. Unfortunately, there is no ethnic and religion data in the MDHS 2015-16. But

out of 15 states and regions, each of 7 states has its main ethnic group as its major population. Therefore, each state and region can be tested against one region

### **3.2.9 Attitude towards Health Care Providers**

Attitudes of people were categorized under the belief part of predisposing factors in Andersen-Newman model. There was not much about the impact of the perceived attitudes of health care providers on the utilization of maternal health services. In the study Chamorroonsawasdi et al. (2015), they conducted on this matter in Myanmar, and concluded that women with good attitude towards skilled birth attendants (SBAs) was more likely to use skilled assisted delivery than those with bad attitude towards SBA in Kalay Township.

### **3.3 Enabling factors for Maternal Health Care Utilization**

Enabling factors are those which can facilitate the receipt of health care services (Andersen & Newman, 2005). These are factors related to logistical points of view. In the literature, the commonly tested factors were household wealth or household income (representing financial barriers to health care), geographical location (representing geographical barriers to health care), and awareness of information and health knowledge (representing cultural/knowledge barriers to health care).

#### **3.3.1 Economic status**

The effect of household wealth or monthly income on the utilization of maternal health services has been explored in the literature, as it captures the impact of financial barriers.

In general, the impact of income/ economic status/ wealth on the utilization of maternal health services is positive and statistically significant. Banke-Thomas et al. (2017), in their systematic review, found that wealth was a positively and statistically correlated with the utilization of maternal health services among adolescent mothers. The same conclusion was reached with regard to ANC services in India (Danasekaran

et al., 2017); ANC visits, institutional delivery and Caesarean section in Nepal (Mehata et al., 2017); institutional delivery in Bangladesh (Yaya et al., 2017); ANC visits in Nigeria (Adewuyi et al., 2018); ANC visits and institutional delivery in Vietnam (Malqvist et al., 2013); skilled attendant delivery in Indonesia (Osaki et al., 2015); postnatal care (PNC) utilization in Ethiopia (Abebo & Tesfaye, 2018) and all maternal health services in Pakistan (Agha & Carton, 2011). Agunwa et al. (2017) also found a similar conclusion based on a cross-sectional survey on Nigerian rural women, concluding that income was significantly associated with child OPD service but surprisingly not with maternal health services.

The evidence is more mixed among studies based on Myanmar. Thin Zaw (2012), using a sample collected in peri-urban areas of Mandalay City in 2011, found that, although there was no geographical inaccessibility in the areas, there was some financial inaccessibility. About 13% and 17% of youth mothers (with relatively limited income) had never used ANC and skilled assisted delivery respectively (Thin Zaw et al., 2012). This indicated that income was an important determinant of the utilization of maternal care services. On the contrary, considering female youths in Kyimyindaing Township, Sein (2012) found that family income was not significantly associated with institutional delivery in this township (Sein, 2012). Overall, the mixed evidence suggests that there is room to more closely investigate the impact of economic status on maternal care use.



### 3.3.2 Geographical location

Geographical inaccessibility is one of the main barriers in utilization of health services and so are in maternal health services. The effect of rural or urban residence has been assessed in the literature.

People living in rural areas have a long distance to health facilities and/or lack of transportation, difficult terrain and even no health facility around their area. Therefore, in general, residing in rural area has a negative and significant effect on the utilization of maternal health services. In systematic review of Banke-Thomas et al. (2017), the urban residence area was significantly and positively correlated with

utilization of maternal health services especially with ANC services among adolescent mothers.

Similar results were found with institutional delivery in Bangladesh (Yaya et al., 2017); and with skilled attendant delivery in Indonesia (Osaki et al., 2015). But contradictory results were observed in Nepal that Mehata et al. (2017) stated that urban residence was positively correlated with institutional delivery, but Freidoony et al. (2017) stated that residence had no significant result for institutional delivery. Agha & Carton (2011) studied the impact of distance to health facility, and they stated that distance was significantly correlated with at least 3 times ANC visits, but not with institutional delivery and PNC services in Pakistan.

Contrary to the Banke-Thomas et al., Sein (2017) showed in her study in Myanmar that urban-rural difference was not significantly correlated with the utilization of ANC services although there were 6 out of 7 women, who never received ANC with skilled personnel, were residing in rural areas. But urban-rural difference was statistically correlated with the institutional delivery and the utilization of postnatal care. Therefore, more evidences are needed to be clearer for these contradicted and incomplete findings.

### **3.3.3 Awareness of Information and Health Knowledge**

In the Andersen-Newman model, they counted health knowledge as personal belief under predisposing factors, but they considered availability or awareness of information as an enabling factor. In the literature also, awareness of information and health knowledge were used as enabling factors for maternal health service utilization.

Banke-Thomas et al. (2018) studied the effect of awareness of health information, as media exposure, and the conclusion was that they were statistically and positively correlated with maternal health service utilization. Agha & Carton (2011) found that mass media exposure was positively correlated with at least 3 times ANC visits and institutional delivery, but not with PNC service in Pakistan. Abebo et al. (2018) accounted for specific knowledge on PNC services and studied its effect on utilization of PNC services, and concluded that it was statistically and positively correlated in

Ethiopia. Similarly, Chamroonsawasdi et al. (2015) made a conclusion that there was statistically and positively correlation between higher MCH knowledge and skilled assisted delivery in Kalay township in Myanmar.

In conclusion, regarding with awareness or mass media exposure, most of the studies have shown positive effects on maternal health service utilization.

### **3.4 Perceived Need Factors for Maternal Health Care Utilization**

Need factors are defined as immediate causes that motivate the utilization of health care services. Not only perceived illness level but also clinical evaluation is considered under need factors (Andersen & Newman, 2005). Although being an important factor for maternal health care utilization, it has been seldomly addressed, even for institutional delivery (Karkee, Lee, & Khanal, 2014).

In the literature, studies that include need factors are as shown in Table 5. ANC visit status and frequency of ANC visits have been mainly used as an explanatory variable for institutional delivery. Although past illness is categorized as a predisposing factor in Andersen-Newman model, Freidoony et al. (2017) used previous maternal complication as a need factor. Similarly, perceived quality and health knowledge were put under predisposing, and information availability under enabling factors in Andersen-Newman model, but they were found under need factors in Gabrysch & Campbell. (2009). It shows that the operational definitions between these three factors of the Andersen-Newman model in the literature are not always clear cut. Although many studies which used Andersen model analyzed small set of variables, the categorization of these factors varied a lot in the literature (Babitsch, Gohl, & Lengerke, 2012). Therefore, literature is still evolving, despites many papers based on the Andersen-Newman framework.

Most of the studies in the literature tested need factors mainly for institutional delivery or place of delivery.



Table 5 : Perceived need factors used in the literature

Sr.	Author, year	Title	Perceived need factors	Dependent variables
1	(Kebede, Hassen, Nigussie, & Teklehaymanot, 2016)	Factors associated with institutional delivery service utilization in Ethiopia (Systematic review and meta-analysis)	<ul style="list-style-type: none"> <li>- ANC visit</li> <li>- Frequency of ANC</li> <li>- Problems during pregnancy</li> <li>- Planned pregnancy</li> </ul>	Institutional delivery
2	(Karkee et al., 2014)	Need factors for utilization of institutional delivery services in Nepal (Systematic review)	<ul style="list-style-type: none"> <li>- ANC visits</li> <li>- Birth preparedness</li> <li>- Planned pregnancy</li> </ul>	Institutional delivery
3	(Freidoony et al., 2017)	Predisposing, enabling, and need factors associated with utilization of institutional delivery services in far-western Nepal	<ul style="list-style-type: none"> <li>- ANC visits</li> <li>- Pregnancy complication</li> </ul>	Institutional delivery
4	(Adewuyi et al., 2018)	Prevalence and factors associated with underutilization of antenatal care services in Nigeria	Planned pregnancy	Underuse ANC
5	(Gabrysch & Campbell, 2009)	Still too far to walk: Literature review of the determinants	<ul style="list-style-type: none"> <li>- Information availability</li> <li>- Health knowledge</li> <li>- ANC visit</li> </ul>	Institutional delivery

		of delivery service use (Systematic review)	<ul style="list-style-type: none"> <li>- Previous institutional delivery</li> <li>- Perceived quality</li> <li>- Planned pregnancy</li> <li>- First birth</li> </ul>	
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### 3.4.1 Planned Pregnancy (Wanted Pregnancy)

Few studies have considered planned or wanted pregnancy as a factor affecting maternal health care utilization (Karkee et al., 2014). In general, if the woman has conceived wanted pregnancy, she may have higher utilization. Inversely, if the pregnancy is unwanted, she may have a lower utilization rate.

In Kebede et al. (2016)'s systematic review and meta-analysis on utilization of institutional delivery services in Ethiopia, they stated that women who had planned pregnancy were more likely to use institutional delivery (Kebede et al., 2016).

Different results were found in Nigeria and Nepal. Adewuyi et al. (2018) studied desire for pregnancy as the only need factor in their study, and they stated that the presence of unwanted pregnancy was not significant in its association with ANC services both in urban and rural Nigeria. Karkee et al. (2013) studied wanted pregnancy in their study in Nepal, but they could not find that it was associated with institutional delivery.

In Gabrysch and Campbell (2009)'s systematic review, the presence of unplanned pregnancy was associated with home delivery in Kenya, but not associated with home delivery in Bolivia, Philippines and not with institutional delivery in Thailand.

Concerning with planned pregnancy or wanted pregnancy, findings are mixed.

### 3.4.2 Pregnancy with the First Child

Although many studies put the parity, including the effect of first birth, under predisposing factors, Gabrysch and Campbell (2009) put it under perceived need factors in their systematic review. They stated in their review that giving birth to the

first child was more difficult, and health personnel might encourage women to conduct first birth at facilities (Gabrysch & Campbell, 2009).

There were some studies that considered particularly on the first birth rather than on all parity. Freidoony et al. (2017) stated in their study that women who delivered their first child were more likely to use institutional delivery services than those who delivered their fourth or above child in Nepal. Similarly, Danasekaran et al. (2017) stated that women were more likely to take antenatal care services during the birth of their first child in India.

### **3.4.3 Twin or Multiple Pregnancy**

In the literature, the effects of twin or multiple pregnancy on the utilization of maternal health services was rarely found. Adewuyi et al. (2017) put this factor under predisposing factors for underutilization of maternal health services. But the Andersen-Newman model stated that if the condition makes higher chance of health service utilization, it could be thought of as a need factor (Andersen & Newman, 2005). Multiple pregnancy has higher risk of postpartum complications with normal vaginal delivery and it is an indication for hospital delivery. Therefore, it should be under need factors. Adewuyi et al. (2018) stated in their study that women with singleton fetus were less likely to use ANC services in rural, but not in urban, Nigeria.

According to the above literature review, predisposing factors, enabling factors and need factors were statistically correlated with the utilization of maternal health services. Among predisposing factors, having lower education level might be the most important barrier for utilization of health services followed by types of occupation, higher parity, adolescent pregnancy and lower autonomy of woman. Above them, economic status might be more important and stronger barrier especially in situations without financial risk protection. And geographical accessibility also was possible strong barrier for utilization of health services.

### 3.5 Literature on Maternal Health Care Utilization in Myanmar

In Myanmar, there is a limited number of studies that specifically investigate the utilization of reproductive and maternal health services, the utilization of skilled assisted delivery, and the disparity between services received and services expected for ANC and institutional delivery services. Barriers to maternal health care are observed in these studies.

Thin Zaw et al. (2012) studied 444 youths, aged 15-24, from suburban areas of Mandalay city, Myanmar. The targeted youths were from resource-limited, informal and poor socio-economic communities. They were interviewed with a structured questionnaire from May to September 2011. The objective was to gather information regarding accessibility, utilization and unmet needs for reproductive health services among youths. It involved descriptive statistics, univariate analyses, and multivariate logistic regression. The outcomes assessed in this study were sexual and reproductive health (SRH) information services including health education awareness sessions in every occasion they encountered, family planning, maternal care and STI/HIV testing. Explanatory variables were socio-demographic variables including gender, knowledge of RH services and types of providers, perceived norm of peer exposure to RH services, and exposure to any mass media on SRH. For accessibility, they measured geographical accessibility (less than 30 minutes' walk to health facilities or less than one mile away from health facilities) and financial accessibility (transportation cost – less than 0.63 USD, treatment cost – less than 1.9 USD, and perceived affordability). Since Mandalay was a former capital city and health facilities were well-established, there was no geographical inaccessibility (94% within 30 minutes' walk away and 80% within one mile away). But financial inaccessibility was observed (only 5% - services were free, 20% - less than 1.29 USD, 75% - more than 1.29 USD) (69% thought they couldn't afford it). Overall, about 13% and 17% of youth mothers had never used ANC and skilled assisted delivery respectively. Positive and statistically significant associations were found with regard to education and knowledge of RH services and providers (Thin Zaw et al., 2012).

Sein (2012) conducted a similar study on the utilization of maternal health services among 196 female youths (15-24 years) who had delivered at least one child in Kyimyindaing Township. This township consisted of 11 rural villages as well as an urban area that is Yangon City. Maternal health services in this township were provided by one tertiary hospital, one maternity home, one rural health center (RHC) and one sub-RHC. Data were collected from 10 Wards and 2 villages from January to May 2009. Descriptive analysis and binary logistic regression analysis were used. Maternal health outcomes assessed included ANC visits, institutional delivery and PNC. Explanatory variables were age, age at marriage, residence, mother's and husband's education, family income and ANC frequency. Results suggested that 96.4% of mothers used ANC service. A non-negligible number of women in the sample did not receive ANC and the reasons they mentioned were financial difficulty, perceived lack of need, and ignorance. With chi-square tests, ANC was not significantly associated with any socio-demographic variables. For delivery services, 78.6% of urban women delivered at government hospital and 63.4% of rural women delivered at home. 78.9% of women who delivered at home were delivered with traditional birth attendants (TBAs). Reasons for delivering at home were financial difficulty, social support and negative attitude of health staff, suggesting that cultural barriers to care existed. In a bivariate analysis, urban-rural difference, education of both parent and ANC frequency were significantly associated with institutional delivery and utilization of postnatal care. But family income was not significantly associated with institutional delivery in this township.

Chamroonsawasdi et al. (2015) considered one maternal health service: skilled assisted delivery in urban area of Kalay Township. Stratified random sampling method was used and 7 out of 19 Wards were selected. 200 women aged 18-49 who delivered a child within a year were recruited in March 2012. Descriptive analysis, chi-square tests and multiple logistic regression method were used. Delivery with skilled birth attendant (SBA) was the dependent variable. Results showed that 76% of urban women in this township used SBA in delivery, 20% were with TBAs and 4% with AMWs. Women with higher MCH knowledge, who had good attitude towards SBA and who had good accessibility to ANC services were 2.7 times, 7.8 times, and 1.5 times more likely to use delivery with SBA respectively.

Finally, Thida et al. (2018) conducted a study in three regions: Mandalay, Magway and Bago. These regions had an MMR over 280 per 100,000 live births (but not the worst in Myanmar) and the main causes of maternal death eclampsia/pre-eclampsia and post-partum hemorrhage. The study assessed the disparity between actual utilization and the expectation of community-based maternal health services among 1743 women who had given birth within 6 months prior the survey. Data were collected from 39 Wards and 230 villages from May to September 2016. Ten essential services during ANC and five essential services during delivery were analyzed. Based on multinomial logistic analyses, explanatory variables included personal characteristics, obstetric information of women and accessibility to ANC and delivery services. They stratified the level of agreement between services received and services expected into 5 categories: poor, fair, moderate, substantial and perfect. There was a very low percent of women who received all ten essential ANC services (12% only). Out of 10 ANC services, 7 were classified as “moderate to almost perfect” and 3 had a “fair” agreement, which were hemoglobin test, urine test, and iron supplementation. Women who had ANC without skilled personnel, and who had less than four ANC visits were significantly associated with those fair agreements. Other significant factors were residence, education, monthly income, parity, history of pregnancy complications, type of and distance to the nearest health facility and out-of-pocket costs during ANC.

These four studies in Myanmar covered both youths and women in reproductive ages. Only one of the studies covered all maternal health services. None assessed on types of health care providers and associated factors. In terms of the geographical coverage of the sample, three of the studies covered one township each and the other covered three regions.

This study will use the most recent national survey dataset and will cover the whole country. This will assess not only on complete ANC visits (at least four times), skilled assisted delivery and PNC, but also on types of health care providers for these services. Moreover, this study will assess coverage inequalities between urban and rural areas for the whole country as well as across each state and region.

## CHAPTER IV

### RESEARCH METHODOLOGY

#### 4.1 Conceptual Framework

According to the Andersen-Newman model, health care utilization depends on predisposing factors, enabling factors and need factors. Predisposing factors are socio-demographic and cultural factors that impact the probability of receiving health care. Enabling factors are financial and geographical factors that impact of the probability/difficulty of reaching to the health facilities. Need factors are particular conditions or health problems, which result in the utilization of particular health services for those conditions (Andersen & Newman, 2005).

Based on the Andersen-Newman model, a conceptual framework is developed. In this study, predisposing factors are represented by socio-demographic factors, which is analyzed according to the variables that are available in the Myanmar-DHS dataset. These variables include age, parity or birth order, birth interval, history of abortion, education status and occupation of woman, and education status and occupation of her husband. The list of explanatory variables here is consistent with the existing literature. Enabling factors are represented by family income or household wealth quintiles and geographic accessibility factors such as urban and rural residence and geographic regions. Moreover, distance and other supply side factors underlying enabling factors, including coverage of primary health centers (PHCs), coverage of available beds, coverage of sexual and reproductive health (SRH) workforce are analyzed. Although need factors for pregnant mothers for utilization of maternal health services are more or less similar and they are essential for all pregnant women, women with high risk and unplanned pregnancies are likely to need more maternal health services. Therefore, in this study, whether the pregnancy was planned, whether the woman who had twin or multiple pregnancy, and whether the birth in the sample was her first child, are included as representing need factors.

Therefore, predisposing factors, enabling factors and need factors are tested against three maternal health services, namely ANC, institutional delivery, and PNC.

This can be represented as:

$U = f$  (age, parity, birth interval, abortion history, woman's education, woman's occupation, husband's education, husband's occupation, household wealth quintile, rural/urban of residence, region/state of residence, planned pregnancy, twin/multiple pregnancy, first birth), where  $U = Utilization\ of\ maternal\ health\ services$ .

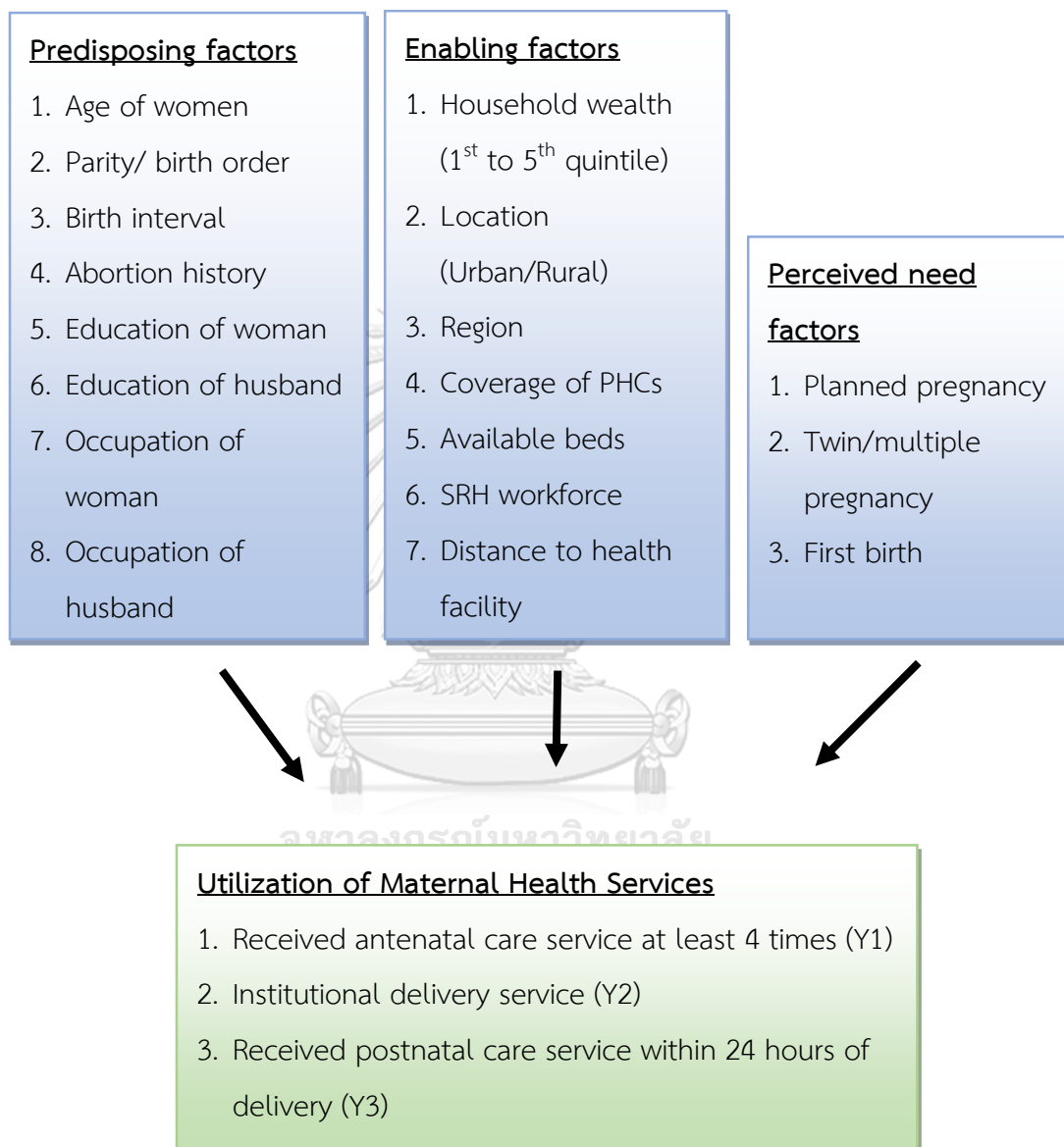
The above model is the main model used in this study. But one of the predisposing factors, "birth interval" is examined as sub-sample analysis separately with all three groups other than "first birth". These models are discussed in the data analysis section of this chapter in details.





The conceptual framework can be represented diagrammatically as follows: -

Figure 2 : Conceptual framework



## 4.2 Survey Data

A secondary dataset from cross sectional Myanmar Demographic Health Survey (MDHS) 2015-16 is used for this research. MDHS was the very first of its survey type in Myanmar and it was conducted by Ministry of Health and Sports with the support from United States Agency for International Development (USAID). MDHS data covered from December 2015 to July 2016.

Besides the MDHS data, data for supply side and distance factors are taken from the Ministry of Health reports which covered the period from 2010 to 2012.

### 4.2.1 Sampling Method of MDHS

This MDHS was based on a stratified two-stage sampling design using the 2014 census (sampling) frame. Primary sampling unit (PSU) was either enumeration area (EA) of census frame or a ward or village tract in non-state-controlled areas which were not enumerated in the time of census. Besides the non-state-controlled areas, it covered internally displaced population also. As the first stage, total 442 clusters (EAs or Wards/Village tracts), involving 123 urban and 319 rural, were selected from the sampling frame. Then 30 households were selected from each cluster with systematic sampling, and total 13,260 households were selected.

From these selected households, total 12,500 households, 12,885 women and 4,737 men were interviewed. Interviews were conducted with 3 sets of questionnaires which were household questionnaire, women's questionnaire and men's questionnaire. In the household questionnaire, basic information of all household members and visitors who stayed one night before the survey, household dwelling characteristics including iodine content testing of salt, weight, height and mid-arm-circumstance measuring and anemia test results were included. In the women's questionnaire, background characteristics, birth history and maternal and child health issues, adult mortality, knowledge, sexuality and family planning, attitudes and behavior related to other health issues including HIV/AIDS and sexually transmitted infections, and domestic violence were covered. Contents of men's questionnaire

were similar with those of women's questionnaire except that maternal, child health and domestic violence issues were not included.

Out of these three sets of questionnaires, women's questionnaire was focused in this study as the explained variables and its determinant factors except wealth index were assessed in women's questionnaire. For the wealth quintile index, several questions about housing and its properties were assessed in household questionnaire, and the wealth index was already calculated in the given dataset.

#### 4.2.2 Sample Selection

For this study, to analyze the maternal health service utilization, the main inclusion criterion whether giving birth at least one child within five years preceding the survey is considered and accounted only for the last child's data. But data concerning with current pregnancy are not considered and excluded from this study. Therefore, out of 12,885 women, over 3,800 women were involved in the data analysis. Unit of analysis in this study was individual level.

The distribution of respondents before and after the sample selection process can be seen in Table 6. With original sample size i.e., 12,885 women, Tanintharyi Region has the lowest distribution (5.56%) and Yangon has the highest (8.27%). After the sample selection, with the selected sample size of 3,833 women, Mon State has the lowest distribution (5.32%) and Chin State has the highest (8.17%). The range of sample distribution is similar after the sample selection, and, therefore, it can represent the whole country as intended in the original survey selection.

Table 6: Sample distribution before and after the sample selection

Sr.	State/Region	n = 12,885	n = 3,833
1	Naypyidaw	5.87	5.40
2	Kachin	6.24	6.89
3	Kayah	5.88	7.17
4	Kayin	5.83	6.99
5	Chin	5.82	8.17
6	Sagaing	8.06	7.59
7	Tanintharyi	5.56	6.60
8	Bago	7.29	6.42
9	Magway	7.35	6.18
10	Mandalay	7.47	6.21
11	Mon	6.12	5.32
12	Rakhine	7.07	7.28
13	Yangon	8.27	5.69
14	Shan	6.04	6.94
15	Ayeyarwady	7.13	7.15

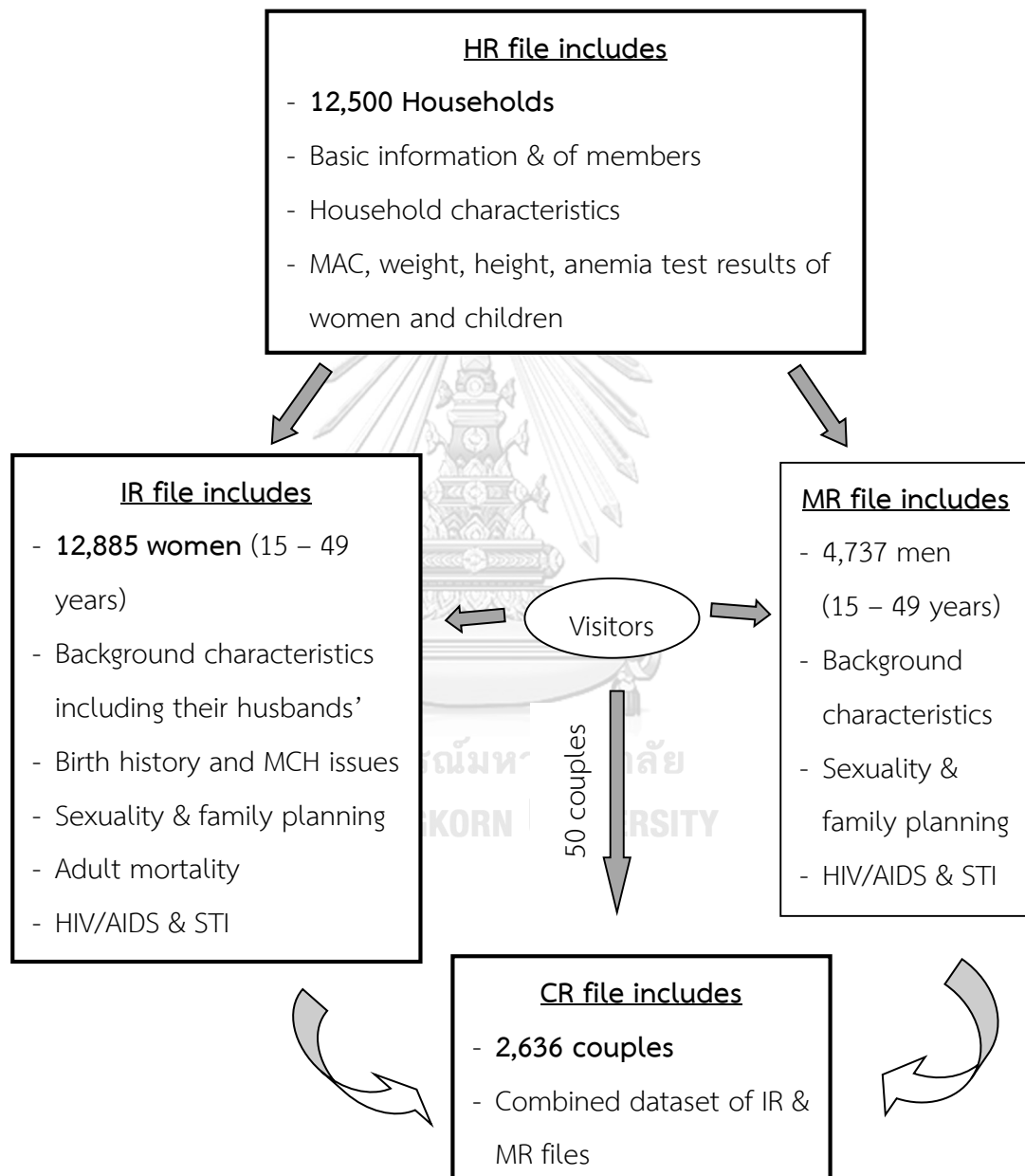
#### 4.2.3 Data Cleaning Process

From the MDHS, 3 datasets, namely women (IR), couple (CR) and household (HR) files, were used. As shown in the following flowchart, household file included total 12,500 observations, and women file had 12,885 observations from these households including visitors who had stayed there last night. In couple files, 2,623 couples, including 50 visitor couples, of women themselves from women file and their husbands were involved.

Each dataset was cleaned and recoded separately, and then household file was merged into women file with one-to-many function. Then couple file was merged with the already combined women-household file with one-to-one function. The final combined dataset was individual level and had 12,885 observations. Out of this 12,885,

over 3,800 observations, which were women who had delivered at least one child within 5 years preceding the survey, were used to be analyzed.

Figure 3 : MDHS data files relating with the study



Besides the MDHS dataset, to get more complete pictures of determinants on the maternal health service utilization, supply side factors as well as distance information were added to the merged data file. Supply side factors added were coverage of primary health centers (PHCs), available beds, and sexual and reproductive health (SRH) workforce.

Number of PHCs and available beds were retrieved from a report “Myanmar Health System Review” (*The Republic of Myanmar Health System Review*, 2014). These PHCs and available beds data reflected 2011–12 situation in Myanmar health system. Available beds per 1,000 population had already been calculated in it. But number of PHCs was recalculated with 2014 census population to get PHC coverage per 1,000 population. Data for another two variables, SRH workforce and distance to health facility, were taken from “Myanmar SRMNAH (Sexual, Reproductive, Maternal, Neonatal and Adolescent Health) Workforce Assessment” conducted by Ministry of Health and Sport (MoHS) and UNFPA. SRH workforce was recalculated, too, with census data to get coverage per 10,000 population. The coverage with per 1,000 population was too small to handle and that’s why it was converted to per 10,000 population. This reflected the situation in 2014, and in this workforce assessment, as discussed in chapter 2, the major providers for MCH services were auxiliary midwives (AMWs) which accounted for about one third of total workforce. But these AMWs were not regarded as skilled birth attendants (SBAs) as well as not the government staff. They were just government certified volunteers. Distance information i.e., percent of population residing beyond 1.23 miles away from a nearest health facility was directly retrieved from that report and it reflected the situation in 2010.

### 4.3 Variable Description

There are three dependent variables in this study: -

- antenatal care service received at least 4 times with the last pregnancy;
- institutional delivery services; and
- postnatal care received within 24 hours of the last birth.

In other words, the outcomes of interest here cover utilization of all three types of maternal health services that are relevant for a given pregnancy. Operational definitions of the dependent variables are shown in Table 7.

*Table 7 : Variable description (Dependent Variables)*

Sr.	Variables	Explanation
1.	Received ANC services at least 4 times with the last child's pregnancy ( $Y_1$ )	0 = No ANC at all with the last child's pregnancy within 5 years preceding the survey 1 = had received ANC 1 to 3 times with her last child within 5 years preceding the survey 2 = had received at least four times of ANC during the last child's pregnancy within 5 years preceding the survey
2.	Institutional delivery service ( $Y_2$ )	0 = Respondent's home or other's home 1 = Public and private health facilities other than respondent's home or other's home
3	Received PNC service within 24 hours of delivery	0 = No PNC at all with the last child's delivery within 5 years preceding the survey 1 = had received PNC within 24 hours of her last child delivery 5 years preceding the survey 2 = had received PNC beyond 24 hours of her last child delivery 5 years preceding the survey

Independent variables used in the study are age and parity of woman, birth interval between the last two births, history of abortion, education level of woman and her husband, type of occupation of woman and her husband as predisposing factors; household wealth, residence of place whether urban or rural, and geographic locality, population coverage of primary health centers (PHCs), available beds and sexual and reproductive health (SRH) workforce, and percent of population more than 1.23 miles away from the nearest health facility as enabling factors; and planned pregnancy, twin or multiple pregnancy and first birth as perceived need factors.

Operational definitions of the independent variables and expected signs are shown in Table 8. These expected signs are drawn based on the reviewed literature.

Regarding with predisposing factors, age of women, history of abortion, education of both women and husbands, better work type of both women and husbands will have positive correlation, and parity of women, birth interval less than 24 months will have negative association with the utilization of all maternal health services. With the age of women as continuous variable, although some elder multiparous women may have lower utilization rate, the sign of correlation is expected to be positive as younger women, having less self-confidence and less decision-making power, are thought to have lower utilization rate for maternal health services. Multiparous women are used to be familiar with pregnancy caring and child delivering processes, and they are less likely to seek maternal health services. Similarly, women who has delivered a baby within 24 months are quite busy with the little child and she is less likely to seek maternal health care. Being literally similar with past illness, history of abortion may have positive correlation if the abortion is spontaneous one. More educated women and husbands will have higher utilization rate, and there might be some relation with planned pregnancy and managerial or clerical work type.

Among enabling factors, household wealth most likely will have positive correlation while rural residence will have negative correlation for longer distance to health facilities, lack of transport or difficult terrains. Out of 14 states and regions, some will have positive correlation and some will have negative correlation according to their rural population size, means of transportation, difficult terrains, different social norms among different ethnicity. Similarly, population coverage of PHCs, available beds, SRH workforce and distance to health facilities will have negative or positive correlation closely related with regions as the available data is categorized based on regionality.

All perceived need factors; planned pregnancy, twin or multiple pregnancy and first birth will have positive correlation with all three maternal health services especially with institutional delivery as planned pregnancy is related with their values and the latter two conditions have more risks to have maternal complications compared with single pregnancy.



Table 8 : Variable description (Independent Variables)

Sr.	Variables	Explanation	Expected sign	
			Reason	Sign
<b>Predisposing factors</b>				
1.	Age of women	15 – 49 years (continuous)	(Adewuyi, et al., 2018; Agha & Carton, 2011; Yaya et al., 2017; Osaki et al., 2015)	+
2.	Parity of women	1 – 12 children	(Dimbuene, et al., 2017; Agha & Carton, 2011; Osaki et al, 2015)	-
3.	Birth interval	0 = > 24 months; 1 = ≤ 24 months	(Adewuyi et al., 2018)	-
4.	Abortion history	0 = No 1 = Yes	-One study examining the effect of history of abortion on the utilization of institutional delivery is reviewed, and it shows no significant result (Freidoony et al., 2017). -But in this study, it is expected to have positive correlation if the abortion(s) happened is spontaneous abortion, and is expected to have negative signs if it is induced one(s).	+/-
5.	<u>Education (woman)</u> Completed primary school	No education as base case 1 = woman who completed primary school; 0 = otherwise	(Mehata, et al., 2017; Freidoony, et al., 2017; Agha & Carton, 2011; Malqvist et al, 2013; Osaki et al., 2015; Agunwa et al, , 2017; C & Kharde, 2017; Adewuyi, et al., 2018; Abebo & Tesfaye, 2018)	+
	Completed secondary school	1 = woman who completed secondary school; 0 = otherwise		
	Higher than secondary education	1 = woman who has higher education level; 0 = otherwise		

6.	<u>Education (husband)</u>	No education as base case	(Adewuyi, et al., 2018; Abebo & Tesfaye, 2018; Yaya et al., 2017)	+
	Completed primary school	1 = woman who has completed primary school; 0 = otherwise		
	Completed secondary school	1 = woman who has completed secondary school; 0 = otherwise		
	Higher than secondary education	1 = woman who has higher education level 0 = otherwise		
7.	<u>Occupation (woman)</u>	No occupation and manual workers as base case	-In the literature, occupation of both woman and her husband are not much significantly associated with the utilization of maternal health services like education does. -In most studies with significant findings, they used working status, but not with work type (Adewuyi et al., 2018; Agunwa et al., 2017; Abebo & Tesfaye, 2018). -In few studies in which work type is used to examine the effect of occupation, husbands in agricultural sector are negatively correlated with	+
	Professional/technical/managerial and clerical	1 = woman whose occupation is professional/technical/managerial and clerical; 0 = otherwise		
	Sales/services and domestic	1 = woman whose occupation is sales/services and domestics; 0 = otherwise		
	Agricultural sector	1 = woman whose occupation is in agricultural sector; 0 = otherwise		+/-

8.	<u>Occupation (husband)</u>	No occupation and manual workers as base case 1 = husband whose occupation is professional/technical/managerial and clerical; 0 = otherwise	institutional delivery (Freidoony et al., 2017). -In this study, women and husbands with better work type like managerial or clerical and sales or domestics are expected to have better utilization of maternal health services are compared with no occupation and manual workers.	+
	Sales/services and domestic	1 = husband whose occupation is sales/services and domestics; 0 = otherwise	-Work type of agricultural work is expected to have positive or negative sign although one evidence of negative correlation is observed in the literature because agricultural works may have seasonal variations.	+/-
	Agricultural sector	1 = husband whose occupation is in agricultural sector; 0 = otherwise		+/-
<b>Enabling factors</b>				
9.	Household wealth	Poorest as base case	(Danasekaran et al., 2017; Mehata, et al., 2017; Yaya et al., 2017; Adewuyi, et al., 2018; Malqvist et al., 2013; Osaki et al., 2015; Abebo & Tesfaye, 2018; Agha & Carton, 2011)	+
	Poorer	1 = she belongs to 1 <sup>st</sup> quintile 0 = otherwise		
	Middle	1 = she belongs to 2 <sup>nd</sup> quintile 0 = otherwise		
	Richer	1 = she belongs to 3 <sup>rd</sup> quintile 0 = otherwise		
	Richest	1 = she belongs to 4 <sup>th</sup> quintile 0 = otherwise		

10.	Location (Urban/Rural)	1 = residing in rural area 0 = residing in urban area	(Mehata, et al., 2017; Yaya et al., 2017; Osaki et al., 2015; Agha & Carton, 2011)	-
11.	Region	Naypyidaw Region as base case 1 = woman lives in Kachin State 0 = otherwise	<ul style="list-style-type: none"> <li>- Myanmar has different terrains; hilly regions (Western, Northern and Eastern regions), coastal regions, delta region and central plain region comprising different states and regions.</li> <li>- Over 130 ethnic groups are dwelling in Myanmar and they have different belief and cultures.</li> <li>- But (relative to other tribes) major 7 ethnic groups, other than Burmese, are divided into 7 States with some degree of mix dwelling.</li> <li>- Therefore, some regions are expected to have positive signs and some are expected to have negatives.</li> </ul>	+/-
	Kachin State	1 = woman lives in Kachin State 0 = otherwise		
	Shan State	1 = woman lives in Shan State 0 = otherwise		
	Chin State	1 = woman lives in Chin State 0 = otherwise		
	Rakhine State	1 = woman lives in Rakhine State 0 = otherwise		
	Kayah State	1 = woman lives in Kayah State 0 = otherwise		
	Karen State	1 = woman lives in Karen State 0 = otherwise		
	Mon State	1 = woman lives in Mon State 0 = otherwise		
	Sagaing Region	1 = woman lives in Sagaing Region 0 = otherwise		
	Mandalay Region	1 = woman lives in Mandalay Region 0 = otherwise		
	Magway Region	1 = woman lives in Magway Region 0 = otherwise		
	Bago Region	1 = woman lives in Bago Region		

		0 = otherwise		
	Irrawaddy Region	1 = woman lives in Irrawaddy Region 0 = otherwise		
	Yangon Region	1 = woman lives in Yangon Region 0 = otherwise		
	Tanintharyi Region	1 = woman lives in Tanintharyi Region 0 = otherwise		
12.	Coverage of PHCs	Same as region (Naypyidaw – base case)	Same as region	+/-
13.	Coverage of available beds	Same as region (Naypyidaw – base case)	Same as region	+/-
14.	Coverage of SRH workforce	Same as region (Naypyidaw – base case)	Same as region	+/-
15.	Distance to health facility	Same as region (Naypyidaw – base case)	Same as region	+/-
<b>Perceived need factors</b>				
16.	Planned pregnancy	1 = yes (then); 0 = no (later, no more)	(Kebede et al., 2016)	+
17.	Twin/multiple pregnancy	1 = twin/multiple pregnancy 0 = single pregnancy	(Adewuyi et al., 2018)	+
18.	First birth	1 = first child delivery 0 = other than first child	(Freidoony et al., 2017; Danasekaran et al., 2017)	+

#### 4.4 Data Analysis

Dependent variables in this study are categorical variables with binary and ordered outcomes. Therefore, data are conducted regression and analyzed with Logit and Ordered Logit models as in the following table.

Table 9 : Regression models

Sr.	Dependent Variables	Model
1.	Taking ANC service at least 4 times with the last child's pregnancy ( $Y_1$ )	Ordered logit regression
2.	Institutional delivery service ( $Y_2$ )	Logit regression
3.	Received PNC within 24 hours( $Y_3$ )	Ordered logit regression

#### *Ordered Logit Regression Model*

Ordered logit regression model will be used for the first dependent variable,  $Y_1$ : "Receiving ANC service at least 4 times with the last child's pregnancy", and the third dependent variable,  $Y_3$ : "Receiving PNC service within 24 hours of delivery".

As defined earlier, the dependent variable  $Y_1$  is ordered as follow:

0 = receiving no ANC at all; 1 = receiving 1 – 3 ANCs; 2 = receiving  $\geq$  4 ANCs.

The dependent variable  $Y_3$  is ordered as follow:

0 = receiving no PNC at all; 1 = receiving PNC beyond 24 hours of delivery; 2 = receiving PNC within 24 hours of delivery.

Using the ordered logit model, the probabilities of having each of the above outcomes are represented as:

$$P(Y=0) = \Phi (C_1 - (\beta_1 \text{Age} + \beta_2 \text{Parity} + \beta_3 \text{Abort} + \beta_4 W' \text{Edu} + \beta_5 H' \text{Edu} + \beta_6 W' \text{Occ} + \beta_7 H' \text{Occ} + \beta_8 \text{Wealth} + \beta_9 \text{Urb/Ru} + \beta_{10} \text{Region} + \beta_{11} \text{want} + \beta_{12} \text{twin} + \beta_{13} \text{FirstBth}))$$

$$P(Y=1) = \Phi (C_2 - (\beta_1 \text{Age} + \beta_2 \text{Parity} + \beta_3 \text{Abort} + \beta_4 W' \text{Edu} + \beta_5 H' \text{Edu} + \beta_6 W' \text{Occ} + \beta_7 H' \text{Occ} + \beta_8 \text{Wealth} + \beta_9 \text{Urb/Ru} + \beta_{10} \text{Region} + \beta_{11} \text{want} + \beta_{12} \text{twin} + \beta_{13} \text{FirstBth})) - \Phi (C_1 - (\beta_1 \text{Age} + \beta_2 \text{Parity} + \beta_3 \text{Abort} + \beta_4 W' \text{Edu} + \beta_5 H' \text{Edu} + \beta_6 W' \text{Occ} + \beta_7 H' \text{Occ} + \beta_8 \text{Wealth} + \beta_9 \text{Urb/Ru} + \beta_{10} \text{Region} + \beta_{11} \text{want} + \beta_{12} \text{twin} + \beta_{13} \text{FirstBth}))$$

$$P(Y=2) = 1 - \Phi (C_3 - (\beta_1 \text{Age} + \beta_2 \text{Parity} + \beta_3 \text{Abort} + \beta_4 W' \text{Edu} + \beta_5 H' \text{Edu} + \beta_6 W' \text{Occ} + \beta_7 H' \text{Occ} + \beta_8 \text{Wealth} + \beta_9 \text{Urb/Ru} + \beta_{10} \text{Region} + \beta_{11} \text{want} + \beta_{12} \text{twin} + \beta_{13} \text{FirstBth}))$$

The  $\Phi$  sign represents the logistic probability density function and the C values represent the cut-offs. The above model can be captured through a latent variable model that is represented as:

$$Y^* = \beta_0 + \beta_1 \text{Age} + \beta_2 \text{Parity} + \beta_3 \text{Abort} + \beta_4 W' \text{Edu} + \beta_5 H' \text{Edu} + \beta_6 W' \text{Occ} + \beta_7 H' \text{Occ} + \beta_8 \text{Wealth} + \beta_9 \text{Urb/Ru} + \beta_{10} \text{Region} + \beta_{11} \text{want} + \beta_{12} \text{twin} + \beta_{13} \text{FirstBth} + \varepsilon, \text{ where } \beta_0 \text{ is constant}$$

### *Logit Regression Model*

Logit regression model will be used for the second dependent variable,  $Y_2$ : “Institutional delivery”. The latent-variable model for this regression equation is represented as follow:

$$Y^* = x_i\beta + \epsilon_i = \beta_0 + \beta_1\text{Age} + \beta_2\text{Parity} + \beta_3\text{Abort} + \beta_4\text{W'Edu} + \beta_5\text{H'Edu} + \beta_6\text{W'Occ} + \beta_7\text{H'Occ} + \beta_8\text{Wealth} + \beta_9\text{Urb/Ru} + \beta_{10}\text{Region} + \beta_{11}\text{want} + \beta_{12}\text{twin} + \beta_{13}\text{FirstBth} + \epsilon,$$

where  $Y^*$  is the latent probability of institutional delivery,  $\beta_0$  is constant,

$$Y_i = 0 \text{ if } Y^* \leq 0;$$

$$Y_i = 1 \text{ if } Y^* > 0.$$

And the probabilities of the two possible outcomes are defined as: -

$$P(Y=1) = e^{x\beta}/(1+e^{x\beta})$$

$$P(Y=0) = 1/(1+e^{x\beta}).$$

In all the above models for each of the probability outcomes, some explanatory variables are not included. They are birth interval (bthitv), coverage of primary health centers (PHCs), coverage of available beds (beds), coverage of SRH workforce (wforce) and distance (dist) factors.

Birth interval does not include the same observations with “first birth” and it contains only women with at least two children, but “first birth” contains all the observed women. Therefore, to examine the effect of birth interval on the utilization of maternal health services, sub-sample logistic regression is run together with all the variables other than “first birth”.

For coverage of PHCs, available beds, workforce and distance factors, these data are categorized at the regional level. And it has multicollinearity with the “region” variable. Therefore, these variables are run in regression one after another in place of region with the full sample.

But, the results of full sample regression, without coverage of PHCs, available beds, workforce and distance variables, is discussed in the chapter 5. The sub-sample analysis for birth interval, and descriptive statistics and regression results of PHCs, available beds, workforce and distance factors are described in the appendix A to D.



For the interpretation of regression results, the direction of change is observed with the sign of the coefficients, and the magnitude of changes is predicted according to marginal effects and odds ratios.

### ***Odd Ratios (OR)***

Odd ratios used in this study is the ratio of the relative odds of the occurrence of the utilization of one of the maternal health services for the given explanatory variable.

Odds is the occurrence of a particular outcome compared to its non-occurrence. It can be represented as:

$$\Omega(x_i) = \frac{Pr(Y=1 | x_i)}{Pr(Y=0 | x_i)} ; \text{ for binary outcome of } Y_2 \text{ and}$$

$$\Omega(x_i) = \frac{Pr(Y=2 | x_i)}{Pr(Y=0|x_i) + Pr(Y=1|x_i)} ; \text{ for categorical ordered outcome of } Y1 \text{ and } Y3.$$

Odd ratios can be represented as:

$$\frac{\Omega(x_i, x_{ij+1})}{\Omega(x_i, x_{ij})} = e^{(\beta_j)}.$$

Therefore, odd ratio is the exponential of the correspondent coefficient, and its value is between 0 and positive  $\infty$ . If the odd ratio is lower than 1, it has a negative correlation with the tested outcome; if it is higher than 1, it has a positive correlation with the tested outcome; and if it is equal to 1, it has no difference outcome with the change of interested explanatory variable.

### *Marginal Effects (ME)*

Marginal effect used in this study is the change of the probability of the utilization of one of the maternal health services with the change of the particular explanatory variable. It can be represented for dummy explanatory variable as:

$$\begin{aligned} \Delta\text{Pr} &= \text{Pr}(Y = 1 \mid x = 1) - \text{Pr}(Y = 1 \mid x = 0) \\ &= \frac{e^{\beta+z\delta}}{1+e^{\beta+z\delta}} - \frac{e^{z\delta}}{1+e^{z\delta}} \text{ where } z \text{ is a matrix of other control variables.} \end{aligned}$$

For continuous explanatory variable, marginal effect becomes elasticity and it can be represented as:

$$\frac{\Delta\text{Pr}(Y=1)}{\text{Pr}(Y=1)} / \frac{\Delta x_i}{x_i}$$

The value of marginal effect varies from  $-\infty$  to  $+\infty$ , and the signs indicates the direction of the change of probability of the particular outcome.

## CHAPTER V

### RESULTS AND DISCUSSION

#### 5.1 Descriptive Statistics of Dependent Variables

Three dependent variables are used in this study to examine the utilization of maternal health services related with the last delivered pregnancy within 5 years; number of ANC visits ( $Y_1$ ), institutional delivery ( $Y_2$ ) and PNC received ( $Y_3$ ). As discussed in chapter 4,  $Y_1$  is sub-categorized into (1) no ANC visit, (2) 1 – 3 visits and (3) at least 4 visits;  $Y_2$  was into dummy variable; and  $Y_3$  was into (1) no PNC received, (2) PNC received within 24 hours and (3) beyond 24 hours.

Table 10 describes distribution of dependent variables. There are 3,833 observations for the ANC visits, and of which 13.62% of respondents did not seek ANC services at all for their last birth while 28.41% taken ANC service one to three times and the rest majority, 57.97%, utilized four or more ANC visits. For the institutional delivery, 3,856 observations are involved, and only 37.97% of them delivered at health facilities while the rest 62.03% delivered at their home or relatives' or friends' homes. 3,820 women are involved in examining for PNC received. The majority of them, 54.16% received PNC within 24 hours of delivery, followed by no PNC, 27.09%, and then PNC beyond 24 hours of delivery, 18.74%.

Table 10 : Descriptive statistics for Dependent Variables

Dependent Var.	Category	Freq.	Percentage
ANC visit ( $Y_1$ ) (n = 3,833)	0 = No ANC	522	13.62
	1 = ANC 1-3 times	1,089	28.41
	2 = ANC $\geq$ 4 times	2,222	57.97
Ins. Delivery ( $Y_2$ ) (n = 3,856)	0 = home delivery	2,392	62.03
	1 = institutional delivery	1,464	37.97
PNC received ( $Y_3$ ) (n = 3,820)	0 = No PNC	1,035	27.09
	1 = PNC > 24 hours	716	18.74
	2 = PNC $\leq$ 24 hours	2,069	54.16

## 5.2 Descriptive statistics of explanatory variables

Explanatory variables used in this study are grouped into predisposing factors, enabling factors and perceived need factors as discussed in chapter 4.

Table 11 describes the descriptive statistics of predisposing factors. There were 15 – 49 years aged 3,833 women respondents who had delivered their last child within five years preceding the survey involved in this study and the mean age of them was 31 years. They had minimum of 1 child up to 12 children as maximum with the mean number of 2.8 children as their parity status. Among them, 15.83% of women had birth interval of equal or less than 24 months with their last two children. And 13.67% of them had history of abortion with at least one previous pregnancy. Education level of both woman and her husband is categorized into 4 groups—no education, primary passed, secondary passed and higher than secondary. The majority of respondents, nearly 43.96%, were primary passed followed by secondary passed (32.09%), no education (16.18%) and higher than secondary (7.77%) as the least. Similarly, their husbands, with 3,757 total observation, had the same order, but primary passed and secondary passed were almost the same, 39.05% and 38.57% respectively, followed by no education (16.24%) and higher than secondary level (6.15%). Occupation of women and husbands are categorized separately into four groups; no occupation and manual worker, professional/managerial and clerical, sales/services and domestics, and agricultural sector. Majority of both women and their husbands were manual worker or with no work having 62.76% and 57.79% respectively. The second largest portion of women were equally distributed in agricultural sector and sales/services and domestic sector while the second largest group of their husbands were in agricultural sector with 26.83% distribution. Women in the least group were in the best type of work, managerial and clerical, (5.75%). The least group of husbands was sales/services and domestic group (6.61%), but it was more or the same with managerial and clerical group (8.77%).

Table 11 : Descriptive statistics for Explanatory Variables (Predisposing Factors)

Variables	Mean	S.D.
Age of woman (15 – 49)	31.00	6.783
Parity of woman (1 – 12)	2.80	1.992
<u>Birth interval (last birth)</u>		
> 24 months (omitted)		
≤ 24 months	0.158	0.365
<u>History of abortion</u>		
No (omitted)		
Yes	0.137	0.344
<u>Education (woman)</u>		
No education (omitted)		
Primary passed	0.440	0.496
Secondary passed	0.321	0.447
Higher than secondary	0.078	0.268
<u>Education (husband)</u>		
No education (omitted)		
Primary passed	0.391	0.488
Secondary passed	0.386	0.487
Higher than secondary	0.062	0.240
<u>Occupation (woman)</u>		
Not working & manual workers (omitted)		
Managerial & clerical	0.056	0.233
Sales & services, domestic	0.156	0.363
Agricultural sector	0.159	0.366
<u>Occupation (husband)</u>		
Not working & manual workers (omitted)		
Managerial & clerical	0.088	0.283
Sales & services, domestic	0.066	0.248
Agricultural sector	0.268	0.443

Table 12: Descriptive statistics for Explanatory Variables (Enabling Factors)

Variables	Mean	S.D.
<u>Household wealth quintile</u>		
Poorest (omitted)		
Poorer	0.222	0.416
Middle	0.183	0.387
Richer	0.176	0.381
Richest	0.137	0.344
<u>Region</u>		
Naypyidaw (omitted)		
Kachin	0.069	0.253
Kayah	0.072	0.258
Kayin	0.070	0.255
Chin	0.082	0.274
Sagaing	0.076	0.265
Tanintharyi	0.066	0.248
Bago	0.064	0.245
Magway	0.062	0.241
Mandalay	0.062	0.241
Mon	0.053	0.225
Rakhine	0.073	0.260
Yangon	0.057	0.232
Shan	0.069	0.254
Ayeyawady	0.072	0.258
<u>Residence</u>		
Urban (omitted)		
Rural	0.772	0.419

Enabling factors tested were described in Table 12. Household wealth is divided into poorest, poorer, middle, richer and richest quintile. Majority of them were poorest with the distribution of 28.12% followed by poorer (22.28%), middle (18.29%), richer (17.61%) and the least, richest (13.7%). Regarding with their residence of place, 77.22% were residing in rural while only 22.78% were in urban area. Among 15 States or Regions

in Myanmar, their distribution was from 5.4% as minimum in Naypyidaw and 8.17% as maximum in Chin State. Their detailed distribution can be seen in Table 12. Please see the appendix – A for the descriptive statistics of other enabling factors (supply side factors and distance factor).

Table 13 describes the distribution of perceived need factors. Among 3,833 women who had delivered their last child within five years preceding the survey, less than 1% (0.97%) delivered twin or multiple pregnancy while 31.78% gave birth their first delivery. Most of the child delivered were the child they wanted at that time of pregnancy (90.97% of women).

*Table 13 : Descriptive statistics for Explanatory Variables (Perceived Need Factors)*

Variables	Mean	S.D.
<u>Planned pregnancy</u>		
No (later/no more) (omitted)		
Yes (then)	0.908	0.289
<u>Twin or multiple pregnancy</u>		
No (omitted)		
Yes	0.010	0.098
<u>The child born was her first born</u>		
No (omitted)		
Yes	0.318	0.466

### 5.3 Results of Regression Analysis

The results of binary logit regression for utilization of institutional delivery services and that of ordered logit regression for ANC and PNC services utilization will be discussed in this section.

Before running logistic regressions, simple regression analysis for univariate and multivariate are tested. Table 14 shows the results of univariate regression analyses for each explanatory variable. History of abortion is not significant even at 10% level with ANC and institutional delivery, but significant at 10% with PNC. Planned pregnancy is not significant with ANC and PNC. All are variables are significant at 5% level.

Table 14: Results of univariate simple regression analysis

X variables	Prob > F (at 5% sig level)		
	ANC	Institutional Del.	PNC
<b>Predisposing factors</b>			
Age	√	√	√
Parity	√	√	√
Abortion history	Not sig	Not sig	10%
Education (women)	√	√	√
Education (husbands)	√	√	√
Occupation (women)	√	√	√
Occupation (husbands)	√	√	√
<b>Enabling factors</b>			
Household wealth	√	√	√
Residence (Rural)	√	√	√
Regions	√	√	√
<b>Perceived need factors</b>			
Planned pregnancy	Not sig	√	Not sig
Twin pregnancy	√	√	10%
First birth	√	√	√



For the multivariate regression for each of the dependent variables, Prob > F value is 0.0000. And R-squared values are 0.2500 for ANC, 0.2946 for institutional delivery and 0.2102 for PNC. Therefore, the models show a good fit for the data.

### **5.3.1 Utilization of Antenatal Care Services (Ordered logit model)**

#### **5.3.1.1 Results in odd-ratio for ANC services**

Table 14 shows the results in odd-ratio of ordered logit for ANC services, and the detailed regression output table is shown in appendix – B.

Among the predisposing factors, age and parity of women, all education levels of both women and husbands are statistically significant at 1% significant level; sales and domestic work type of women are at 5% significant level. Among these significant variables, husbands' higher education level has the highest predictive value. It stated that if the husband of a woman has higher education level, she is about 3.4 times more likely to receive minimum of four ANC services compared with no education group. Then predictive values in odd-ratio in decreasing order are higher education level of women (3.002484 compared with no educated women group), secondary education level of women (2.320118 compared with no educated woman group) and husbands (2.09373 compared with no educated husband group), primary education level of women (1.673218 compared with no educated woman group) and husbands (1.440527 compared with no educated husband group), sales and domestic work type of women (1.318471 compared with women with no work or manual workers), and age of the women (1.048386 with the increase of one year of woman's age). The odd-ratio for the parity of women is 0.7954765. Therefore, among predisposing variables, women with higher parity only is less likely to use minimum of four ANC visits whenever the woman has one more child delivered. History of abortion with previous pregnancies, and all work types of both women and husbands, except sales and domestic work type of women, are not statistically associated with ANC service utilization.

Table 15 : Results in odd-ratio of ordered logit regression (ANC)

X variables	OR	S.E.
<b>Predisposing factors</b>		
Age	1.048386***	.00766
Parity	.7954765***	.0216899
Abort history	.9673095	.0998495
Education (w)	No education - omitted	
Primary	1.673218***	.1746012
Secondary	2.320118***	.2895387
Higher	3.002484***	.8013774
Education (h)	No education - omitted	
Primary	1.440527***	.1490494
Secondary	2.09373***	.2437698
Higher	3.368091***	1.02202
Occupation (w)	No work and manual worker - omitted	
Managerial+clerk	1.170626	.2610134
Sales+Domestic	1.318471**	.151087
Agri sector	.9139473	.1014096
Occupation (h)	No work and manual worker - omitted	
Managerial+clerk	1.207368	.2063678
Sales+Domestic	.9577491	.1690289
Agri sector	1.002744	.0954718
<b>Enabling factors</b>		
Household wealth	Poorest - omitted	
Poorer	1.443645***	.1383409
Middle	1.541277***	.1678247
Richer	1.865411***	.2344818
Richest	2.921663***	.5580314
Residence (Rural)	.6202901***	.0736049
Region	Naypyidaw – omitted	
Kachin	1.495789*	.312313
Kayah	2.413616***	.511379
Kayin	1.18689	.2402821

Chin	.7474619	.1478664
Sagaing	.972564	.1926907
Tanintharyi	1.570319**	.3214956
Bago	1.239607	.2524826
Magway	1.225822	.2527132
Mandalay	1.290248	.2774161
Mon	2.007644***	.4411479
Rakhine	.883214	.1745596
Yangon	2.674669***	.6740615
Shan	.9776293	.1991712
Ayeyarwady	1.650459**	.3256115
<b>Perceived need factors</b>		
Planned pregnancy	.8310966	.1006431
Twin/multiple preg	2.588824**	1.026466
First birth	1.079962	.1097106
Prob > chi2 = 0.0000		Pseudo R2 = 0.1511

\* =  $P \leq 0.1$ ; \*\* =  $P \leq 0.05$ ; \*\*\* =  $P \leq 0.01$

Among the enabling factors, all four household wealth quintiles, residing in rural area, and living in Kayah, Mon and Yangon regions are statistically associated at 1% significant level; living in Taninthayi and Ayeyarwady regions are at 5% significant level; and living in Kachin State is at 10% significant level. Among them, the highest wealth quintile has highest predictive value i.e., if the woman is from richest quintile household, she is nearly 3 times more likely to use minimum of four times ANC services compared with the poorest group. Odd-ratio then followed by are women living in Yangon (2.674669 compared with Naypyidaw), women living in Kayah (2.413616 compared with Naypyidaw) and Mon (2.007644 compared with Naypyidaw), the fourth wealth quintile (1.865411 compared with the poorest group), women living in Ayeyarwady (1.650459 compared with Naypyidaw), the third wealth quintile (1.541277 compared with the poorest group), women living in Kachin (1.495789 compared with Naypyidaw) and second wealth quintiles (1.443645 compared with the poorest group). Women residing in rural area are nearly 1.4 times less likely to get at least four times

ANC services compared with those from urban area (OR - 0.6202901). Planned pregnancy, first birth and 8 out of 14 regions are not statistically correlated with ANC service utilization. Regression results for supply-side factors (coverage of primary health centers, coverage of available beds and coverage of SRH workforce) and distance factor are more or less the same with those of regions as these data are categorized at regional level. The detailed results for these factors are shown in the appendix – B.

For perceived need factors, only one of three factors, twin or multiple pregnancy is statistically correlated with ANC services at 5% significant level. If the woman has twin or multiple pregnancy, she is 2.6 times more likely to use at least four ANC services compared with those who has single pregnancy. Planned pregnancy and first child are not significantly correlated with ANC services.

Among all factors, the higher education level of husband has the highest predictive value (3.368091 compared with no education husband group) for utilization of ANC services.

### ***5.3.1.2 Results in marginal effect for ANC services***

In addition to the odds ratios, marginal effects for each of the possible outcomes are also shown. Table 15 shows changes in the probabilities of  $Y=0,1$  and  $2$  with respect to changes in each of the explanatory variables. In here, the results only when  $Y=2$  will be discussed. The results are largely consistent with the odds ratios. As in odd-ratio, higher level of husbands' education has the strongest predictive value i.e., if the husband of a woman has higher level of education, the probability of having 4 or more ANC visits will be increased by 22.7% compared with no educated group. Whenever the woman becomes one more higher parity status, the utilization of at least 4 times ANC visits will be reduced by about 4%.

As expected in hypothesis, among predisposing factors, age of women and all levels of education of both women and husbands are positively correlated, and parity of women is negatively correlated with the utilization of at least four times ANC visits. But, though managerial or clerical work type is expected to have positive correlation, it is correlated only with that of husbands, but not with that of women. And abortion

history has no significant positive correlation with ANC services as expected. Among enabling factors, all wealth quintiles have positive correlation compared with poorest group while rural residence has negative correlation with ANC utilization as expected. But there is no region which is statistically and negatively correlated with ANC utilization compared with Naypyidaw region. Among perceived need factors, only twin or multiple pregnancy has significant positive correlation as expected.

Table 16 : Results in marginal effect of ordered logit model (ANC)

X (with ANC)	Pr (Y <sub>i</sub> = 0) (S.E.)	Pr (Y <sub>i</sub> = 1) (S.E.)	Pr (Y <sub>i</sub> = 2) (S.E.)
<b>Predisposing factors</b>			
Age	-.0047701*** (.0007409)	-.0040643*** (.0006328)	.0088345*** (.0013456)
Parity	.0230989*** (.0027436)	.0196811*** (.002418)	-.04278*** (.0049856)
Abort history	.0033553 (.0104219)	.0028588 (.0088767)	-.0062141 (.0192976)
Education (w)	No education – omitted		
Primary	-.0519642*** (.0104775)	-.0442753*** (.0091363)	.0962395*** (.0193823)
Secondary	-.0849619*** (.0126502)	-.0723905*** (.0108059)	.1573524*** (.0229331)
Higher	-.1109892*** (.0270973)	-.0945667*** (.0229312)	.2055559*** (.0496132)
Education (h)	No education - omitted		
Primary	-.0368479*** (.010422)	-.0313957*** (.0089689)	.0682436*** (.0192731)
Secondary	-.0745972*** (.0118066)	-.0635594*** (.0100417)	.1381566*** (.0214159)
Higher	-.122589*** (.0307847)	-.1044501*** (.0260789)	.2270392*** (.0564179)
Occupation (w)	No work + manual worker - omitted		
Managerial+clerk	-.0159036 (.0225083)	-.0135504 (.0191781)	.0294541 (.0416762)

Sales+Domestic	-.0279101** (.011598)	-.0237804** (.0098245)	.0516905** (.0213614)
Agri sector	.0090838 (.0111987)	.0077397 (.0095486)	-.0168235 (.0207407)
Occupation (h)	No work + manual worker - omitted		
Managerial+clerk	-.0190234 (.017255)	-.0162086 (.0147094)	.035232 (.0319454)
Sales+Domestic	.004358 (.0178165)	.0037132 (.0151805)	-.0080711 (.032996)
Agri sector	-.0002766 (.0096116)	-.0002357 (.0081894)	.0005123 (.0178009)
<b>Enabling factors</b>			
Household wealth	Poorest - omitted		
Poorer	-.0370662*** (.0096655)	-.0315817*** (.0082854)	.0686478*** (.0178219)
Middle	-.0436724*** (.0109996)	-.0372104*** (.0093785)	.0808828*** (.0202203)
Richer	-.0629409*** (.0127559)	-.0536278*** (.0107605)	.1165687*** (.0232318)
Richest	-.1082345*** (.0195049)	-.0922196*** (.016312)	.2004541*** (.0352645)
Residence (Rural)	.0482108*** (.0120582)	.0410773*** (.0101563)	-.0892881*** (.0220383)
Region	Naypyidaw – omitted		
Kachin	-.0406482* (.0211082)	-.0346337* (.0179369)	.0752818* (.038974)
Kayah	-.0889503*** (.0215167)	-.0757887*** (.018137)	.164739*** (.0393175)
Kayin	-.0172965 (.0204513)	-.0147372 (.0173967)	.0320337 (.0378347)
Chin	.0293839 (.0199588)	.0250361 (.0170422)	-.05442 (.0369618)
Sagaing	.0028084 (.0199997)	.0023928 (.0170429)	-.0052012 (.0370423)

Tanintharyi	-.0455569** (.0207149)	-.0388161** (.0175757)	.084373** (.0381994)
Bago	-.0216837 (.020581)	-.0184752 (.0175)	.0401589 (.0380602)
Magway	-.0205547 (.0208268)	-.0175134 (.017718)	.0380681 (.0385264)
Mandalay	-.0257257 (.0217244)	-.0219192 (.0184741)	.0476448 (.0401708)
Mon	-.0703588*** (.0222728)	-.0599481*** (.01883)	.1303069*** (.0409002)
Rakhine	.0125368 (.0199365)	.0106818 (.0170247)	-.0232186 (.036954)
Yangon	-.0993178*** (.0256249)	-.0846223*** (.0215196)	.1839401*** (.0467927)
Shan	.002284 (.0205653)	.001946 (.017525)	-.00423 (.0380901)
Ayeyarwady	-.0505816** (.01997)	-.0430973** (.0169285)	.093679** (.0367819)
<b>Perceived need factors</b>			
Planned pregnancy	.0186768 (.0122223)	.0159133 (.0104299)	-.0345901 (.0226263)
Twin/multiple preg.	-.0960246** (.0400939)	-.0818164** (.0340737)	.177841** (.0739585)
First birth	-.0077657 (.010264)	-.0066166 (.0087262)	.0143823 (.0189849)
Prob > chi2 = 0.0000		Pseudo R2 = 0.1352	

\* =  $P \leq 0.1$ ; \*\* =  $P \leq 0.05$ ; \*\*\* =  $P \leq 0.01$

### 5.3.2 Utilization of Institutional Delivery (Logit model)

#### 5.3.2.1 Results in odd-ratio for Institutional Delivery

Table 17 : Results in odd-ratio of ordered logit model (Institutional Delivery)

X variables	OR	S.E.
<b>Predisposing factors</b>		
Age	1.072695***	.00896
Parity	.7921822***	.0295084
Abort history	1.181677	.1425238
Education (w)	No education - omitted	
Primary	1.403162**	.2065643
Secondary	2.19538***	.3520147
Higher	2.566056***	.6381611
Education (h)	No education - omitted	
Primary	1.297089*	.1830558
Secondary	1.432639**	.2133507
Higher	2.421776***	.6440478
Occupation (w)	No work and manual worker - omitted	
Managerial+clerk	.9597771	.2040104
Sales+Domestic	.8684103	.1012851
Agri sector	.8125141	.1153907
Occupation (h)	No work and manual worker - omitted	
Managerial+clerk	1.361399*	.2314865
Sales+Domestic	1.334812*	.2296571
Agri sector	.8389002	.095805
<b>Enabling factors</b>		
Household wealth	Poorest - omitted	
Poorer	1.226406	.1534804
Middle	1.557882***	.2042789
Richer	1.901641***	.2662695
Richest	3.698059***	.6787377
Residence (Rural)	.4923093***	.0553746
Region	Naypyidaw – omitted	



Kachin	.6487875*	.1486089
Kayah	.6269155**	.1452192
Kayin	1.472082*	.3358374
Chin	.3330314***	.0833791
Sagaing	.7468537	.1677919
Tanintharyi	1.343085	.3038922
Bago	.8345121	.1906352
Magway	.8814614	.2040212
Mandalay	.9422853	.218119
Mon	.7891418	.1922889
Rakhine	.5660032**	.1380617
Yangon	1.218277	.3011043
Shan	.7829012	.1878025
Ayeyarwady	.9238841	.2059009
<b>Perceived need factors</b>		
Planned pregnancy	.8732926	.1248978
Twin/multiple preg.	8.470139***	3.495203
First birth	2.595752***	.3011873
Prob > chi2 = 0.0000		Pseudo R2 = 0.2496

\* =  $P \leq 0.1$ ; \*\* =  $P \leq 0.05$ ; \*\*\* =  $P \leq 0.01$

Table 16 shows the result of logistic regression for institutional delivery and detailed table is under appendix – C. Among the predisposing factors, age and parity of women, secondary and higher level of women’s education and higher level of husbands’ education are statistically correlated with institutional delivery at 1% significant level; primary education level of women, and secondary education level of husbands are at 5% significant level; and primary education level of husbands, husbands’ work types of managerial or clerical and sales or domestic are at 10% significant level. Among these significant variables, higher education group of woman has highest odd-ratio of 2.566056 compared with no educated woman group followed by husbands’ higher education (2.421776 compared with no educated husband group), women’s secondary education (2.19538 compared with no educated woman group),

husbands' secondary education (1.487626 compared with no educated husband group), women's primary education (1.432639 compared with no educated woman group), husbands' work types of managerial or clerical (1.361399 compared with husbands with no work or manual workers) and sales and domestic works (1.334812 compared with husbands with no work or manual workers) and women's age (1.072695 with the increased of one year age). Parity of women has predictive value of 0.7921822 and it shows that if the woman has one more child, she is about 1.2 times less likely to use institutional delivery services. History of abortion, all work types of women and husbands working under agricultural sector are not statistically correlated with the utilization of institutional delivery services.

Among enabling factors, the top three quintile of wealth status, residing in rural and women from Chin State are statistically correlated with institutional delivery at 1% significant level; while women from Kayah and Rakhine States are at 5% significant level; and women from Kachin and Kayin are at 10% significant level. Among them, the highest wealth quintile has the highest odds of 3.698059 compared with the poorest group, which is higher than both of ANC and PNC, to deliver at health facility. It is followed by second and third upper quintile wealth group with odd-ratio of 1.901641 and 1.557882 compared with the poorest group, and women from Kayin State (1.472082 compared with Naypyidaw). Women residing in rural area are over 1.5 times less likely to use institutional delivery compared with women in urban area. And women from Chin (OR - 0.3330314), Rakhine (OR - 0.5660032), Kayah (OR - 0.6269155) and Kachin (OR - 0.6487875) are less likely to use institutional delivery services compared with Naypyidaw region. Like in regression for ANC, distance factor and supply side factors are run logit regression separately without region variable, but together with all other variables and detailed results can be seen in appendix – C.

Among perceived need factors, both twin or multiple pregnancy and delivering her first child are statistically correlated with institutional delivery at 1% significant level while planned pregnancy is not statistically correlated with. If the woman has twin or multiple pregnancy, she is 8.5 times higher than woman with single pregnancy and if it is her first child to deliver, she is 2.6 times more likely to deliver at health facility than woman who are not nulliparous.

It can be seen that, for institutional delivery, perceived need factors have higher predictive value than predisposing and enabling factors even than the household wealth status.

### ***5.3.2.2 Results in marginal effect for Institutional Delivery***

Table 17 shows the probability of  $Y=1$  for binary logit model with respect to changes in each of the explanatory variables. The results are largely consistent with the odds ratios. As in odd-ratio, twin or multiple pregnancy has the strongest predictive value i.e., if the woman has twin or multiple pregnancy, the probability of giving birth at health facility will be increased by 35% compared with women with single pregnancy. The most negative predictive value is found in women living in Chin State. Living in Chin State decreases the probability of giving birth at a health facility by 18%.

As expected in hypothesis, among predisposing factors, age of women and all levels of education of both women and husbands are positively correlated, and parity of women is negatively correlated with the utilization institutional delivery services. But, though managerial or clerical work type is expected to have positive correlation, it is correlated only with that of husbands, but not with that of women. And abortion history has no significant positive correlation with institutional delivery as expected. Among enabling factors, all wealth quintiles have positive correlation compared with poorest group while rural residence has negative correlation with institutional delivery as expected. For the region, too, some have positive correlation and some have negative correlation compared with Naypyidaw Region. Among perceived need factors, twin or multiple pregnancy and first birth have significant positive correlation as expected.

Table 18 : Results in marginal effect of binary logit model (Institutional Delivery)

X (with Ins. del)	Pr ( $Y_i = 1$ )	S.E.
<b>Predisposing factors</b>		
Age	.0115368***	.0013311
Parity	-.0382998***	.0060337
Abort history	.0274444	.0198155
Education (w)	No education – omitted	
Primary	.0556877**	.0241624
Secondary	.1292786***	.0260892
Higher	.1549278***	.0406332
Education (h)	No education - omitted	
Primary	.0427647*	.0231728
Secondary	.0591056**	.0244244
Higher	.145414***	.0435408
Occupation (w)	No work + manual worker - omitted	
Managerial+clerk	-.0067494	.0349444
Sales+Domestic	-.0231957	.0191646
Agri sector	-.0341335	.0233308
Occupation (h)	No work + manual worker - omitted	
Managerial+clerk	.0507202*	.027917
Sales+Domestic	.0474778*	.0282477
Agri sector	-.0288795	.0187562
<b>Enabling factors</b>		
Household wealth	Poorest - omitted	
Poorer	.0335526	.0205563
Middle	.072884***	.0214491
Richer	.1056642***	.0227851
Richest	.2150067***	.0294402
Residence (Rural)	-.1165034***	.018143
Region	Naypyidaw – omitted	

Kachin	-.0711287*	.0376049
Kayah	-.0767666**	.0380226
Kayin	.0635708*	.0374503
Chin	-.1807634***	.0408657
Sagaing	-.0479867	.0369123
Tanintharyi	.0484937	.0371659
Bago	-.0297417	.0375485
Magway	-.0207433	.0380492
Mandalay	-.0097733	.0380559
Mon	-.038932	.0400475
Rakhine	-.0935705**	.0400325
Yangon	.0324592	.0406191
Shan	-.0402373	.0394211
Ayeyarwady	-.0130155	.0366385
<b>Perceived need factors</b>		
Planned pregnancy	-.022274	.0235036
Twin/multiple preg.	.3512533***	.0669645
First birth	.1568195***	.0184371
Prob > chi2 = 0.0000		Pseudo R2 = 0.2092

\* =  $P \leq 0.1$ ; \*\* =  $P \leq 0.05$ ; \*\*\* =  $P \leq 0.01$

### 5.3.3 Utilization of Postnatal Care Services (Ordered logit model)

#### 5.3.3.1 Results in odd-ratio for Postnatal Care Services

Table 19 : Results in odd-ratio of ordered logit model (PNC)

X variables	OR	S.E.
<b>Predisposing factors</b>		
Age	1.03545***	.0072345
Parity	.8826894***	.0238455
Abort history	.959546	.095673
Education (w)	No education - omitted	
Primary	1.325328***	.1423513
Secondary	1.762557***	.2225244
Higher	2.257622***	.4883503
Education (h)	No education - omitted	
Primary	1.269937**	.1353827
Secondary	1.356439***	.160264
Higher	1.329665	.2972409
Occupation (w)	No work and manual worker - omitted	
Managerial+clerk	.940419	.1717668
Sales+Domestic	1.211097*	.1274071
Agri sector	1.136325	.1261232
Occupation (h)	No work and manual worker - omitted	
Managerial+clerk	1.289802*	.1913746
Sales+Domestic	1.27372	.2030035
Agri sector	.8639679	.0804289
<b>Enabling factors</b>		
Household wealth	Poorest - omitted	
Poorer	1.345643***	.1311394
Middle	1.622861***	.178068
Richer	1.776613***	.2173294
Richest	2.150433***	.3562924
Residence (Rural)	.9291932	.0976537
Region	Naypyidaw – omitted	

Kachin	.3285508***	.0660256
Kayah	.8335417	.1736926
Kayin	1.112014	.2364799
Chin	.106515***	.0221305
Sagaing	.5664825***	.1110649
Tanintharyi	1.895011***	.4201503
Bago	.599125**	.1209364
Magway	1.16069	.2547858
Mandalay	.6056224**	.1273981
Mon	1.719033**	.4110094
Rakhine	.5026694***	.1010397
Yangon	.6656449*	.148021
Shan	.5331429***	.111225
Ayeyarwady	.6996454*	.1412205
<b>Perceived need factors</b>		
Planned pregnancy	.9146714	.1078045
Twin/multiple preg.	2.324555**	.8721871
First birth	1.341341***	.130184
Prob > chi2 = 0.0000		Pseudo R2 = 0.1154

\* =  $P \leq 0.1$ ; \*\* =  $P \leq 0.05$ ; \*\*\* =  $P \leq 0.01$

Table 18 shows the results in odd-ratio of ordered logit regression for PNC services, and detailed regression result can be seen in appendix – D. Among the predisposing variables, age and parity of women, all level of women’s education, and secondary education level of husbands are correlated with PNC service utilization at 1% significant level; primary education level of husbands is at 5% significant level; and sales or domestic work type of women and managerial or clerical work type of husbands are at 10% significant level. Among them, higher education level of women has highest odd-ratio of 2.257622 compared with no educated woman group, followed by secondary education level of women (1.762557 compared with no educated woman group) and that of husbands (1.356439 compared with no educated husband group), primary education level of women (1.325328 compared with no educated

woman group), managerial or clerical work type of husbands (1.289802 compared with husbands with no work or manual workers), primary education level of husbands (1.269937 compared with no educated husband group), sales or domestic work type of women (1.211097 compared with women with no work or manual workers), and age of women (1.03545 with the increased of one year age). Women with one more child are about 1.1 times less likely to use PNC services within 24 hours of delivery.

Among enabling factors, all the household wealth quintiles are statistically correlated with PNC service utilization within 24 hours of delivery at 1% significant level; and 11 out of 14 regions are correlated varying from 1% to 10% significant level. Among them, the highest wealth quintile has the highest odd-ratio of 2.150433 compared with the poorest group, followed by Tanintharyi Region (1.895011 compared with Naypyidaw), the fourth wealth quintile (1.776613 compared with Naypyidaw), Mon State (1.719033 compared with Naypyidaw), and the third (1.622861 compared with the poorest group) and second (1.345643 compared with the poorest group) wealth quintiles. Other statistically correlated regions are less likely to get PNC services within 24 hours of delivery compared with Naypyidaw Region. Although rural residence is statistically correlated with ANC and institutional delivery services, it is not statistically correlated with PNC services. The same with the above two dependent variable testing, distance and supply side factors are run separately without region, but together with all the other variables, and the detailed results of this regression can be seen in appendix – D.

Regarding with perceived need factors, first birth is statistically correlated with PNC services at 1% significant level; twin or multiple pregnancy is at 5% significant level while planned pregnancy has no statistic correlation. If the woman has gave birth twin or multiple pregnancy, she is about 2.3 times more likely to get PNC services within 24 hours of delivery compared with woman with single pregnancy, while if she has given birth her first child, she is 1.3 times more likely to get PNC services within 24 hours of delivery compared than multiparous woman.

Among all the explanatory variables, twin or multiple pregnancy has the highest predictive value for PNC services utilization within 24 hours of delivery.



### *5.3.3.2 Results in marginal effect for Postnatal Care Services*

Table 19 shows changes in the probabilities of  $Y=0,1$  and  $2$  with respect to changes in each of the explanatory variables. The results when  $Y = 2$  will be discussed here. The results are largely consistent with the odds ratios. As in odd-ratio, twin or multiple pregnancy has the strongest predictive value i.e., if the woman has given birth twin or multiple pregnancy, the probability of receiving PNC within 24 hours of delivery will be increased by about 17% compared with women with single pregnancy. The most negative predictive value is found in women living in Chin State. Living in Chin State decreases the probability of receiving PNC within 24 hours of delivery by over 45% compared with those living in Naypyidaw Region.

As expected in hypothesis, among predisposing factors, age of women and all levels of education of both women and husbands except higher education level of husbands, are positively correlated, and parity of women is negatively correlated with the utilization of PNC services. But, though managerial or clerical work type is expected to have positive correlation, it is correlated only with that of husbands, but not with that of women. And abortion history has no significant positive correlation with PNC services as expected. Among enabling factors, all wealth quintiles have positive correlation compared with poorest group. But rural residence has no statistically significant correlation with PNC utilization as expected. For the region, too, some have positive correlation and some have negative correlation compared with Naypyidaw Region. Among perceived need factors, twin or multiple pregnancy and first birth have significant positive correlation as expected.

Table 20 : Results in marginal effect of ordered logit model (Postnatal Care)

X (with PNC)	Pr (Y <sub>i</sub> = 0) (S.E.)	Pr (Y <sub>i</sub> = 1) (S.E.)	Pr (Y <sub>i</sub> = 2) (S.E.)
<b>Predisposing factors</b>			
Age	-.0056674*** (.0011303)	-.0014261*** (.0002921)	.0070935*** (.0014085)
Parity	.0203005*** (.0043649)	.0051081*** (.0011406)	-.0254087*** (.0054599)
Abort history	.0067182 (.0162211)	.0016905 (.0040804)	-.0084087 (.0203002)
Education (w)	No education – omitted		
Primary	-.0458227*** (.0174213)	-.0115302*** (.004453)	.0573529*** (.0218158)
Secondary	-.092206*** (.0204334)	-.0232014*** (.0052681)	.1154074*** (.0254988)
Higher	-.1324788*** (.0351568)	-.0333351*** (.008881)	.1658139*** (.0437925)
Education (h)	No education - omitted		
Primary	-.0388771** (.0173157)	-.0097825** (.0043853)	.0486595** (.0216582)
Secondary	-.0495976*** (.0191917)	-.01248*** (.0048572)	.0620776*** (.0239861)
Higher	-.0463542 (.036357)	-.0116639 (.009161)	.0580182 (.045489)
Occupation (w)	No work + manual worker - omitted		
Managerial+clerk	.0099939 (.0297156)	.0025147 (.0074753)	-.0125086 (.0371892)
Sales+Domestic	-.031159* (.0171151)	-.0078404* (.0043018)	.0389994* (.0213891)
Agri sector	-.0207914 (.0180586)	-.0052316 (.0045373)	.026023 (.0225842)
Occupation (h)	No work + manual worker - omitted		
Managerial+clerk	-.0414022* (.0241216)	-.0104179* (.0061011)	.0518201* (.0301879)

Sales+Domestic	-.039361 (.0259258)	-.0099042 (.0065219)	.0492652 (.0324183)
Agri sector	.0237882 (.0151315)	.0059857 (.0038276)	-.0297739 (.0189408)
<b>Enabling factors</b>			
Household wealth	Poorest - omitted		
Poorer	-.0482975*** (.0158093)	-.0121529*** (.0040308)	.0604504*** (.019768)
Middle	-.078772*** (.0177599)	-.0198211*** (.0045755)	.0985931*** (.0221652)
Richer	-.0934983*** (.0197986)	-.0235266*** (.0050787)	.1170248*** (.0246613)
Richest	-.1245653*** (.0268901)	-.0313438*** (.0068006)	.1559091*** (.0334068)
Residence (Rural)	.0119476 (.0170972)	.0030063 (.0043037)	-.0149539 (.0213968)
Region	Naypyidaw – omitted		
Kachin	.1810822*** (.0324107)	.045565*** (.0084239)	-.2266472*** (.0403421)
Kayah	.0296209 (.0338862)	.0074534 (.0085394)	-.0370742 (.0424129)
Kayin	-.0172731 (.0345977)	-.0043463 (.008708)	.0216194 (.0433015)
Chin	.364335*** (.0321756)	.0916761*** (.0103177)	-.456011*** (.040771)
Sagaing	.0924571*** (.0317938)	.0232646*** (.0080953)	-.1157217*** (.0397577)
Tanintharyi	-.1039943*** (.0361028)	-.0261676*** (.0090356)	.1301619*** (.0449911)
Bago	.0833427** (.0327601)	.0209712** (.0083121)	-.1043138** (.0409684)
Magway	-.0242429 (.0357174)	-.0061001 (.0089797)	.030343 (.0446891)
Mandalay	.0815878**	.0205296**	-.1021175**

	(.0341653)	(.0086506)	(.0427205)
Mon	-.0881382** (.0389025)	-.0221779** (.0097621)	.1103161** (.0485665)
Rakhine	.1119005*** (.0325425)	.0281571*** (.008358)	-.1400576*** (.0407134)
Yangon	.0662139* (.0361364)	.0166611* (.0091358)	-.082875* (.0452128)
Shan	.1023252*** (.033847)	.0257477*** (.0085851)	-.1280729*** (.0422806)
Ayeyarwady	.0581092* (.0328116)	.0146218* (.0082683)	-.072731* (.0410294)
<b>Perceived need factors</b>			
Planned pregnancy	-.0145102 (.0191724)	.0036511 (.0048286)	-.0181614 (.0239956)
Twin/multiple preg.	-.137232** (.0610125)	-.0345311** (.0153832)	.1717631** (.0762442)
First birth	-.0477765*** (.0157786)	-.0120218*** (.0039688)	.0597984*** (.0196763)
Prob > chi2 = 0.0000		Pseudo R2 = 0.1145	

\* =  $P \leq 0.1$ ; \*\* =  $P \leq 0.05$ ; \*\*\* =  $P \leq 0.01$

Results of logit regressions for the utilization of maternal health services can be summarized as follows.

As expected in hypothesis, among predisposing factors, age of women and all levels of education of both women and husbands are positively correlated with all three maternal services, exception with higher education level of husbands which do not have statistically significant correlation with PNC services. Parity of women is negatively correlated with the utilization all three maternal services. But, although managerial or clerical work type is expected to have positive correlation in both women and husbands, it is correlated only with that of husbands in all three services, but not with that of women. And abortion history has no significant correlation with all maternal health services. Among enabling factors, all wealth quintiles have positive

correlation with all three maternal health services compared with poorest group while rural residence has negative correlation with ANC utilization and institutional delivery as expected, but it become insignificant with PNC services. For the region, some regions have positive correlation and some have negative correlation with all three services compared with Naypyidaw Region. Among perceived need factors, twin or multiple pregnancy has significant positive correlation with all three services, but first birth has only positive correlation with institutional delivery and PNC, but not with ANC services. Planned pregnancy is not statistically significance in all three services.



## CHAPTER VI

### CONCLUSION AND RECOMMENDATION

#### 6.1 Conclusion

This study analyzed the determinants of the utilization of maternal health services in Myanmar using the most recent national survey, Myanmar Demographic and Health Survey 2015-16. Maternal health services examined in this study are antenatal care, institutional delivery and postnatal care services. The explanatory variables tested are divided into 3 groups; predisposing factors, enabling factors and perceived need factors according to Andersen-Newman model.

##### 6.1.1 Significant Findings and Expected Signs

Table 20 shows the summarized results for significant findings and the expected signs or correlation expected in hypothesis. Exception with history of abortion, occupation type of agriculture of both women and husbands, and planned pregnancy, all other variables are statistically correlated with the utilization of maternal health services with the expected signs. Parity of women, birth interval and rural residence have a negative correlation and all other significant findings have a positive correlation with the maternal health services utilization as shown in the following table.

Table 21: Significant findings and expected signs

Variables	Expected signs	ANC	Institutional Delivery	PNC
Age (15 – 49)	+	+	+	+
Parity (1 – 12)	-	-	-	-
Birth Interval ( $\leq$ 24 months)	-	-	-	-
Abortion history	+	Not Sig	Not Sig	Not Sig
Education (Woman)	+	+	+	+
Education (Husband)	+	+	+	+
W's occ Manag&Clerical	+	Not Sig	Not Sig	Not Sig
Sales&Domestics	+	+	Not Sig	+
Agri sector	+/-	Not Sig	Not Sig	Not Sig
H's occ Manag&Clerical	+	Not Sig	+	+
Sales&Domestics	+	Not Sig	+	Not Sig
Agri sector	+/-	Not Sig	Not Sig	Not Sig
Household wealth	+	+	+	+
Residence (rural)	-	-	-	Not Sig
Planned pregnancy	+	Not Sig	Not Sig	Not Sig
Twin/multiple pregnancy	+	+	+	+
First child	+	Not Sig	+	+

### 6.1.2 Utilization of ANC Services

This study found that husbands' higher education level has the highest and positive predictive value for utilization of ANC services even stronger than that of women's education, which is the second strongest among all factors. But concerning with primary and secondary education level, women's have higher odd-ratio than that of husbands. Therefore, for ANC service utilization, there is not much difference between education status of women and husbands significantly. This finding of significant correlation between maternal education and the utilization of ANC services is consistent with studies in Pakistan (Agha & Carton, 2011); in Vietnam (Malqvist et al., 2013); in India (C & Kharde, 2017); and both maternal and paternal educations with ANC in Nigeria (Adewuyi et al., 2018) in which husband's education is more stronger than that of maternal education for underuse of ANC services.

The third highest odd-ratio is the highest household wealth and all other household wealth quintiles are positively associated with the utilization of ANC services. It is consistent with studies concerning with ANC services in India (Danasekaran et al., 2017); in Nepal (Mehata et al., 2017); in Nigeria (Adewuyi et al., 2018); in Vietnam (Malqvist et al., 2013); in Pakistan (Agha & Carton, 2011); and in Myanmar (Thin Zaw et al., 2012).

Only sales or domestic work type of woman is positively associated with ANC services compared with no work or manual work type, but husband's work type is not statistically associated with ANC. Like this weak association, only 4 out of 11 studies found significant correlation with women's occupation while only 1 out of 11 studies found correlation with husbands' occupation in the systematic review of Banke-Thomas et al. (2017).

Age of women is positively associated with ANC services and it is consistent with studies in Nigeria (Adewuyi et al., 2018); and in Banke-Thomas et al. (2017)'s systematic review, 9 out of 11 studies has significant results with maternal age. The parity of women is negatively associated with the utilization of ANC services and it is consistent with studies in six African countries (Dimbuene et al., 2017); and in Pakistan (Agha & Carton, 2011).



Rural residence is negatively associated with the ANC services and consistent findings is observed in studies in Nepal (Mehata et al., 2017) and in Pakistan (Agha & Carton, 2011). Out of 14 regions, Kachin, Kayah, Mon, Yangon, Tanintharyi and Ayeyarwady regions have positive correlation to ANC utilization compared with Naypyidaw Region. Among them, Kachin, Kayah and Mon ethnic groups are major population in their respective states.

Twin or multiple pregnancy is positively associated with the utilization of ANC services, but it is rarely explored in the literature. This result is consistent with those in rural Nigeria in which women with single pregnancy are more likely to have underuse of ANC services (Adewuyi et al., 2018).

History of abortion with previous pregnancies is found not associated with ANC services. In the literature, there is no evidence between history of abortion and the utilization of ANC services. Also, planned pregnancy or wanted pregnancy are not associated with ANC services and it is consistent with the study in Nigeria (Adewuyi et al., 2018). Similarly, first birth is not associated with ANC services and it is consistent with the study in India (Danasekaran et al., 2017).

Among three factors of Andersen-Newman model, concerning with the utilization of ANC services, predisposing factors (education status of women and husbands) has strongest predictive value followed by enabling factors (household wealth index), then by perceived need factors (twin or multiple pregnancy).

### **6.1.3 Utilization of Institutional Delivery**

Unlike ANC services, having twin or multiple pregnancy has the highest predictive value for institutional delivery. But in the literature, twin or multiple pregnancy is mainly examined for the clinical outcomes, but not for the utilization of institutional delivery services.

The second strongest odd-ratation is found with the highest wealth quintile having positive correlation with institutional delivery, and second and third wealth quintile also are statistically associated with it. It is consistent with studies in Nepal

(Mehata et al., 2017); in Bangladesh(Yaya et al., 2017); in Vietnam (Malqvist et al., 2013); in Indonesia (Osaki et al., 2015); and in Pakistan (Agha & Carton, 2011).

The third strongest predictive value is found with first birth and it has positive correlation with institutional delivery, it is consistent with a study in Nepal (Freidoony et al., 2017).

Women's higher education has the third, husbands' higher education has the fourth and women's secondary education has the fifth strongest value for institutional delivery. And all education status of women and husbands are positively correlated with institutional delivery. Many consistent findings with women education are found in Nepal (Mehata et al., 2017); in Pakistan(Agha & Carton, 2011); in Vietnam (Malqvist et al., 2013); in Indonesia (Osaki et al., 2015); in Nigeria (Agunwa et al., 2017); and in India (C & Kharde, 2017). With husbands' education in Bangladesh, it is positively correlated with institutional delivery, even better odds than that of women(Yaya et al., 2017).

Women living in rural area also have strong negative predictive value for institutional delivery. Consistent findings with institutional delivery are found in Bangladesh (Yaya et al., 2017); in Indonesia (Osaki et al., 2015); and in Nepal (Mehata et al., 2017).

Husbands' occupation is positively correlated with institutional delivery, but not with that of women. It is consistent with the finding in Nigeria in which husbands' occupation is positively correlated with institutional delivery (Agunwa et al., 2017). Insignificant finding relating with women's occupation with institutional delivery is found in Nepal (Freidoony et al., 2017).

Woman's age is positively associated with institutional delivery, and it is consistent with Yaya et al. (2017) in Bangladesh; with Agha & Carton (2011) in Pakistan; and with Osaki et al. (2015) in Indonesia. Woman's parity is negatively associated with institutional delivery and it is consistent with Agha & Carton (2011) in Pakistan and Osaki et al. (2015) in Indonesia. Birth interval less than 24 months also have negative predictive value for institutional delivery, but it is rarely found the results testing the birth interval effect on institutional delivery and no similar results is found in literature.

Women from Chin, Rakhine, Kachin and Kayah states have strong negative correlation and Kayin State has positive correlation for institutional delivery compared with Naypyidaw Region. All these five regions are occupied with the respective major ethnics and many other minor ones.

History of abortion and planned pregnancy are not statistically associated with institutional delivery. In the literature also, history of abortion has no significant effect on institutional delivery in Nepal (Freidoony et al., 2017), and no positive correlation is observed in literature. Similarly, for planned pregnancy, consistent results with this study is found in Nepal (Karkee et al., 2014).

Among three factors of Andersen-Newman model, concerning with the utilization of institutional delivery services, perceived need factors (twin or multiple pregnancy) has strongest predictive value followed by enabling factors (household wealth index), then by predisposing factors (education of woman and husband).

#### **6.1.4 Utilization of PNC services**

The strongest predictive value for the utilization of PNC services in this study found is twin or multiple pregnancy. As discussed in section 6.1.2, in the literature, twin or multiple pregnancy is tested for clinical outcomes with different types of delivery, and no similar evidence is found in the literature.

The second highest predictive value is the higher education level of woman, and other education levels of woman and lower two levels of husband's education are positively correlated with PNC services while higher education of level of husband has no significant association. This positive correlation findings with woman is consistent with Mehata et al. (2017) in Nepal; and with Agha & Carton (2011) in Pakistan. Positive correlation of both woman and husband's education is similar with Abebo & Tesfaye (2018) in Ethiopia; and Yaya et al. (2017) in Bangladesh. The findings of stronger correlation with woman's education than that of husband is consistent with Bhandari et al. (2017) in Nepal.

All four wealth quintiles have positive relation for PNC services compared with poorest group and the highest wealth quintile has the third highest odds among all

explanatory variables. This finding is consistent with studies in Ethiopia(Abebo & Tesfaye, 2018); and in Pakistan(Agha & Carton, 2011).

Another strong significant factor is first birth of woman and it has positive correlation with PNC service utilization. But no similar evidence is found in the literature for PNC services.

Managerial or clerical work type of husband and sales or domestic work type of woman are positively correlated with PNC service utilization compared with no work or manual workers. This result of positive correlation between PNC and occupation of both woman and husband are not common in the literature and it is consistent with studies in Ethiopia(Abebo & Tesfaye, 2018). But in Banke-Thomas (2017) systematic review, 2 out of 8 studies has similar evidence with maternal occupation, and no evidence for correlation with husband's occupation. Age of woman is positively associated with PNC service utilization, and similar evidence is found in Pakistan(Agha & Carton, 2011).

Out of 14 regions, 9 regions have negative correlation while Tanintharyi Region and Mon State have positive correlation with PNC services compared with Naypyidaw Region. Although rural residence is statistically correlated with ANC and institutional delivery services, it is not statistically correlated with PNC services. It is consistent with a study in Pakistan (Agha & Carton, 2011). Planned pregnancy has no statistic correlation with PNC service utilization. In the literature, the examining the effect of planned pregnancy on PNC services is rarely found, and instead, it is found to have tested against institutional delivery. No evidence of positive correlation between planned pregnancy and PNC service utilization is found in the literature.

Among three factors of Andersen-Newman model, concerning with the utilization of PNC services, perceived need factors (twin or multiple pregnancy) has strongest predictive value followed by predisposing factors (education of woman and husband), then by enabling factors (household wealth index).

### 6.1.5 Regional Disparities

Among all the 15 state and regions, the highest predictive values are observed in Yangon for ANC, Kayin for institutional delivery and Tanintharyi for PNC. For the lowest or negative correlation, Chin is the lowest for all three maternal health services, but not statistically significant for ANC services. Not surprisingly, this Chin State has the highest MMR in Myanmar, and Tanintharyi region, which has higher utilization rate compared with Naypyidaw in all three maternal health services, has the lowest MMR (*Thematic Report on Maternal Mortality; Census Report Volume 4C, 2016*). And Yangon, having the highest ANC utilization compared with Naypyidaw, has the third lowest MMR and Kyin, having the highest institutional delivery rate compared with Naypyidaw, has MMR lower than the national figure of 282 per 100,000 per population.

Therefore, regression results of this study reflect the degree of MMR across the country. This different pattern of the utilization of maternal health services might be resulted from the predisposing factors of personal behavior and beliefs; enabling factors of financial barrier, geographical barrier, cultural barrier and social norms, distance to health facilities and supply side factors; and some need factors in some situations, which occurs as a result of low literacy and poverty rate, and lack of access to information, like having unwanted pregnancy.

## 6.2 Recommendations

Based on the findings from this study, the following recommendations are proposed to improve the utilization of maternal health services in order to reduce maternal mortality in Myanmar.

- Since rural residence and distance factor are strongly and negatively correlated especially with the utilization of ANC and institutional delivery, there should be, at least, more primary health centers (PHCs) in rural areas. According to 2012 data, the highest coverage of PHCs is in Chin State, but this State has the highest MMR at the same time. It indicates that PHCs are still needed especially in hard to reach areas. Moreover, as a whole country, 20 million people are affected by lack of all-season-roads (*Myanmar Transport Sector Policy Note: Rural Roads and Access, 2016*) showing the definite needs of transportation and health facility coverage. Besides, concerning with SRH workforce in Myanmar, not only being under the WHO recommended minimum threshold but also one third of the workforce is Auxiliary Midwives (AMWs) who are not skilled-birth attendants (SBAs) and just volunteer workers. Therefore, there should be proper policy for AMWs to become SBAs, to get reasonable incentive and to make sure they are under proper and effective monitoring system. In brief, there should be more PHCs and more SBAs in rural Myanmar.
- Since household wealth is a very strong estimator for utilization of all three maternal health services in this study, and the above recommendation cannot be a quick-win, demand side financing programs should be implemented to overcome this financial barrier. In the literature, demand side financing has positive effect and could make the targeted services to be more utilized by intended populations and so as the health outcome better (Witvorapong & Foshanji, 2016). Although, in Myanmar, MCH Voucher Scheme and Conditional Cash Transfer (CCT) are conducted in some selected underserved areas with

external development aid funds, it should be extended and practiced especially in high MMR regions for the short-term health promotion.

- As age has positive effect on utilization of ANC and institutional delivery services, it seems good. But younger women especially under 18 years of age need special attention for maternal health service utilization as they have higher risk of pregnancy complications. Therefore, to get the proper knowledge, sexual and reproductive health issues should be integrated into the middle and high school curriculum. Moreover, in the community, health awareness sessions particularly on MCH issues should be conducted regularly targeting not only to youths but also to their guardians in separate groups.
- Parity has negative effect on ANC and institutional delivery service utilization, and woman with many children are less likely to use these services. But multigravida especially older than 35 years are in need of maternal health services as they also have higher risk of maternal complications. Therefore, awareness raising sessions on risk pregnancies should be emphasized to conduct regularly in the community as well as via mass media transmission like FM radio channels.
- Some regions like Chin State needs special care for utilization as well as reducing maternal mortality.

### 6.3 Limitations

- Limitations in this study are mainly on the data used. Although original sample size of DHS for women 12885, this study takes just over 3,800 women from that sample. But the sample distribution before and after the sample selection process among the state and regions is not much different.
- Another limitation is the possibility of recall bias as data collection of MDHS is retrospective method to women who have to answer the facts happened in past up to 5 years prior the survey date.
- The subjectiveness of some question may affect its causal effect on explained variables, for instance, the response rate for answering “yes (then)” for the wanted pregnancy is over 90% although unmet need for family planning in Myanmar is 16.2 (*Myanmar Demographic and Health Survey 2015-16, 2017*)
- There may have some endogeneity issue as an important variable, awareness of specific information and knowledge, which has strong evidence of positive correlation with maternal health services in the literature, is not covered in the MHDS dataset.
- Similarly, ethnicity or religion and woman’s autonomy are not covered in the original dataset. But administrative regions in Myanmar already divided the 7 major ethnic groups into 7 States, with some degree of mix-dwelling throughout the country. Therefore, this limitation is solved to some extent in this study by examining each State and Region with controlled group, Naypyidaw. A single question is not enough to measure woman’s autonomy, and therefore, this variable is omitted in this study. But the strong proxy indicator for woman’s autonomy, education, is kept involved.
- To reduce omitted variable bias and to be more completeness of the model, some supply side factors; population coverage of PHCs, available beds, and SRH workforce, as well as distance factors are added to the dataset. But these



data are generalized according to each State and Region, and therefore, the accuracy of the result might be weaker.



## REFERENCES

- The 2014 Myanmar Population and Housing Census: Census Atlas Myanmar.* (2014).
- The 2014 Myanmar Population and Housing Census: The Main Report.* (2015).
- Abebo, T. A., & Tesfaye, D. J. (2018). Postnatal care utilization and associated factors among women of reproductive age Group in Halaba Kulito Town, Southern Ethiopia. *Archives of Public Health, 76*(9).
- Abortion Policies and Reproductive Health around the World.* (2014). Retrieved from
- Adewuyi, E. O., Auta, A., Khanal, V., Bamidele, O. D., Akuoko, C. P., Adefemi, K., . . . Zhao, Y. (2018). Prevalence and factors associated with underutilization of antenatal care services in Nigeria: A comparative study of rural and urban residences based on the 2013 Nigeria demographic and health survey. *PLOS One, 1* - 21.
- Agha, S., & Carton, T. W. (2011). Determinants of institutional delivery in rural Jhang, Pakistan. *International Journal for Equity in Health, 1* - 12.
- Agunwa, C. C., Obi, I. E., Ndu, A. C., & Omotowo, I. B. (2017). Determinants of patterns of maternal and child health service utilization in a rural community in south eastern Nigeria. *BMC Health Service Research, 17*(715), 8.
- Andersen, R., & Newman, J. F. (2005). Societal and Individual Determinants of Medical Care Utilization in the United States. *The Milbank Quarterly, 83*(4).
- ASEAN Statistical Report on Millennium Development Goals.* (2017).
- Babitsch, B., Gohl, D., & Lengerke, T. v. (2012). Re-revisiting Andersen's Behavioral Model of Health Services Use: a systematic review of studies from 1998–2011. *GMS Psycho Social Medicine, 1* - 15.
- Banke-Thomas, O. E., Banke-Thomas, A. O., & Ame, C. A. (2017). Factors influencing utilisation of maternal health services by adolescent mothers in Low-and middle-income countries: a systematic review. *BMC Pregnancy and Child Health, 17*(65).

- Bhandari, T. R., Kutty, V. R., Sarma, P. S., & Dangal, G. (2017). Safe delivery care practices in western Nepal: Does women's autonomy influence the utilization of skilled care at birth? *PLOS*, 12(8).
- C, R. K., & Kharde, A. L. (2017). Utilization of MCH services in tribal area of Akole: A client perspective. *Global Journal of Medicine and Public Health*, 6(5).
- Chamroonsawasdi, K., Soe, M., Charupoonphol, P., & Srisorrachatr, S. (2015). Rate of Utilization of Skilled Birth Attendant and the Influencing Factors in an Urban Myanmar Population. *Asia Pacific Journal of Public Health*, 27(5), 1-11.
- Danasekaran, R., Raja, P., & Ran, K. (2017). Utilization of Antenatal HealthCare Services among Fishermen Population in Kanchipuram District, Tamil Nadu: A Cross-sectional Study. *Indian Journal of Community Medicine*, 42(3), 159-162.
- Dimbuene, Z. T., Amo-Adjei, J., Amugsi, D., Mumah, J., Izuğbara, C. O., & Beguy, D. (2017). Women's Education and Utilization of Maternal Health Services in Africa: A Multi-country and Socio Economic Status Analysis. *Journal of Biosocial Science*, 6, 1-24.
- Donabedian, A. (1973). Aspects of Medical Care Administration: Specifying Requirements for Health Care.
- Five-year Strategic Plan for Reproductive Health 2014-18*. (2014).
- Freidoony, L., Ranabhat, C. L., Kim, C.-B., Kim, C.-S., Ahn, D.-W., & Doh, Y. A. (2017). Predisposing, enabling, and need factors associated with utilization of institutional delivery services: A community-based cross-sectional study in far-western Nepal. *Women and Health*, 51-71.
- Gabrysch, S., & Campbell, O. M. (2009). Still too far to walk: Literature review of the determinants of delivery service use. *BMC Pregnancy and Child Birth*, 1 - 18.
- GDP per capita (current US\$). (2018). *The World Bank | Data*. Retrieved from <https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=MM&view=chart>
- Health Workforce Strategic Plan 2012-2017*. (2012).
- Karkee, R., Lee, A. H., & Khanal, V. (2014). Need factors for utilisation of institutional delivery services in Nepal: an analysis from Nepal Demographic and Health Survey, 2011 *BMJ Open*.

- Kebede, A., Hassen, K., Nigussie, A., & Teklehaymanot. (2016). Factors associated with institutional delivery service utilization in Ethiopia. *International Journal of Women's Health*, 463-475.
- Levesque, J.-F., Harris, M. F., & Russell, G. (2013). Patient-centred access to health care: conceptualising access at the interface of health systems and populations. *BioMed Central*, 12(18).
- Malqvist, M., Lincetto, O., Du, N. H., Burgess, C., & Hoa, D. T. P. (2013). Maternal health care utilization in Viet Nam: increasing ethnic inequity. *Bull World Health Organ*, 254 - 261.
- Mehata, S., Paudel, Y. R., Dariang, M., Aryal, K. K., Lal, B. K., Khanal, M. N., & Thomas, D. (2017). Trends and Inequalities in Use of Maternal Health Care Services in Nepal: Strategy in the Search for Improvements. *BioMed Research International*, 2017, 11 pages.
- Ministry of Health and Sports, Myanmar. (n.d.). Retrieved from <http://www.mohs.gov.mm/>
- MoH. (2013). *Microplan for Auxiliary Midwives (2013-16)*.
- Myanmar Demographic and Health Survey 2015-16. (2017).
- Myanmar National Health Accounts 2014-15. (2018).
- Myanmar Poverty and Living Conditions Survey: Technical Poverty Estimation Report. (2017).
- Myanmar SRMNAH Workforce Assessment. (2017).
- Myanmar Transport Sector Policy Note: Rural Roads and Access. (2016).
- Nation-Wide Service Availibility and Readiness Assessment (SARA). (2015).
- Osaki, K., Kosen, S., Indriasih, E., Pritasari, K., & Hattori, T. (2015). Factors affecting the utilisation of maternal, newborn, and child health services in Indonesia: the role of the Maternal and Child Health Handbook. *Public Health*, 582 - 586.
- Pilasant, S., Kulpeng, W., Werayingyong, P., Tritasavit, N., Yamabhai, I., Teerawattananon, Y., . . . Tantivess, S. (2016). Maternal and child health voucher scheme in Myanmar: a review of early stage implementation. *BMC Health Service Research*, 16(600).
- PSI. (2017). *Myanmar Strategic Purchasing Brief Series No.1*.

- Report of a WHO Technical Consultation on Birth Spacing. (2005). *WHO*. Retrieved from  
[http://apps.who.int/iris/bitstream/handle/10665/69855/WHO\\_RHR\\_07.1\\_eng.pdf;jsessionid=CBD548096C3F2C3D86E75AE5EF9B3864?sequence=1](http://apps.who.int/iris/bitstream/handle/10665/69855/WHO_RHR_07.1_eng.pdf;jsessionid=CBD548096C3F2C3D86E75AE5EF9B3864?sequence=1)
- The Republic of Myanmar Health System Review*. (2014).
- Sein, K. K. (2012). Maternal Health Care Utilization Among Ever Married Youths in Kyimyindaing Township, Myanmar. *Maternal Child Health, 16*(5), 1021 - 1030.
- Shaikh, B. T., & Hatcher, J. (2004). Health seeking behaviour and health service utilization in Pakistan: challenging the policy makers. *Journal of Public Health (Oxford), 27*(1), 49-54.
- Social Security Law (2012). *Myanmar Law Library*. Retrieved from  
<http://www.myanmar-law-library.org/law-library/laws-and-regulations/laws/myanmar-laws-1988-until-now/union-solidarity-and-development-party-laws-2012-2016/myanmar-laws-2012/pyidaungsu-hluttaw-law-no-15-2012-social-security-law-burmese-and-english.html>
- South East Asia. (2017). *Encyclopedia Britannica*. Retrieved from  
<https://www.britannica.com/place/Southeast-Asia#ref510035>
- Teerawattananon, Y., Tantivess, S., Werayingyong, P., Kingkaew, P., Tin, N., Aye, S. S., & Myint, P. (2014). Evidence-informed policy formulation: the case of the voucher scheme for maternal and child health in Myanmar. *WHO South East Asia Journal of Public Health, 3*(3), 285-288.
- Thematic Report on Maternal Mortality; Census Report Volume 4C*. (2016).
- Thida, T., Liabsuetrakul, T., & McNeil, E. (2018). Disparity in utilization and expectation of community-based maternal health care services among women in Myanmar: a cross-sectional study. *Journal of Public Health (Oxford), 10*(1093), 1 - 9.
- Thin Zaw, P. P., Liabsuetrakul, T., Htay, T., & McNeil, E. (2012). Equity of access to reproductive health services among youths in resource-limited suburban communities of Mandalay City, Myanmar. *BMC Health Service Research, 12*(458).

- Total List of Districts, Townships, Sub-townships, Towns, Wards, Village-tracts and Villages in Regions and States. (2014). *General Administration Department*. Retrieved from <http://www.gad.gov.mm/en/content/total-list-districts-townships-sub-townships-towns-wards-village-tracts-and-villages-regions>
- Tracking Universal Health Coverage: 2017 Global Monitoring Report*. (2017). UNICEF DATA. (2018). Retrieved from <https://data.unicef.org/topic/maternal-health/maternal-mortality/#>
- Wangmo, S., Suphanchaimat, R., Htun, W. M. M., Aung, T. T., Khitdee, C., Patcharanarumol, W., . . . Tangcharoensathien, V. (2016). Auxiliary midwives in hard-to-reach rural areas of Myanmar: filling MCH gaps. *BMC Public Health*, 16(914).
- WHO. (2002). *Antenatal Care Randomized Trial: Manual for the Implementation of the New Model*.  
*WHO recommendations on antenatal care for a positive pregnancy experience*. (2016).
- Witvorapong, N., & Foshanji, A. I. (2016). The impact of a conditional cash transfer program on the utilization of non-targeted services: Evidence from Afghanistan. *Social Science & Medicine*, 87 - 95.
- The World Bank | Data. (2017). *Data.worldbank.org*. Retrieved from <https://data.worldbank.org/products/wdi>
- Yaya, S., Bishwajit, G., & Ekholuenetale, M. (2017). Factors associated with the utilization of institutional delivery services in Bangladesh. *PLOS One*, 1-12.



APPENDIX

จุฬาลงกรณ์มหาวิทยาลัย  
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## APPENDIX – A

### Descriptive Statistics Results for Supply-side and Distance Factors

Table A-2 and A-3 describe data retrieved from two different reports on coverage of primary health centers (PHCs), available beds and SRH workforce, and percent of population residing beyond 1.23 miles away from the nearest health facility. These data were originally categorized at state and regional level. Therefore, the distributions of them were mostly the same with the distribution respondents across the regions. PHC coverage was lowest in Yangon Region having 0.8 center per 10,000 population which accounts for 5.4% of the respondent women. Although PHC coverage was the least, being highest populated and having 70% of urban dwelling (*The 2014 Myanmar Population and Housing Census: The Main Report, 2015*), Yangon may have highest utilization rate for health services from private and public hospitals. The highest PHC coverage, 7.3 PHCs per 10,000 population, was observed in Chin State accounted for 8.17% of respondents. Tanintharyi Region and Mon State had the same coverage of 1.8 PHC per 10,000 population (11.92% of respondents), and also Bago and Ayeyarwady Regions had the same coverage of 2.1 PHC per 10,000 population (13.57% of respondents). For available beds and SRH workforce coverage, maximum was observed in Kayah State having 2.02 beds and 3.86 providers per 1,000 population. Minimum distributions were 0.55 bed and 0.69 provider per 1,000 population in Rakhine States. Minimum distribution of population percent beyond 1.23 miles away from the nearest health facility was observed in Kayah State (0%) and that of maximum was in Sagaing Region (38%). This distance data was taken for 2010, and at that time Naypyidaw territory was not separated from Mandalay Region. Therefore, distribution in Naypyidaw was taken the same as that of Mandalay Region.



Table A-1: Descriptive Statistics for Coverage of PHCs and Available Beds

Region	Variables	Mean	S.D.
	<u>Primary health centers per 10,000 population</u>		
Naypyidaw (omitted)			
Kachin	2.0	0.069	0.253
Kayah	5.4	0.072	0.258
Kayin	2.5	0.070	0.255
Chin	7.3	0.082	0.274
Sagaing	2.2	0.076	0.265
Tanintharyi & Mon	1.8	0.119	0.324
Bago & Ayeyawady	2.1	0.136	0.342
Magway	2.7	0.062	0.241
Mandalay	1.4	0.062	0.241
Rakhine	1.9	0.073	0.260
Yangon	0.8	0.057	0.232
Shan	1.7	0.069	0.254
	<u>Available beds per 1,000 population</u>		
Naypyidaw (omitted)			
Kachin	1.57	0.069	0.253
Kayah	2.02	0.072	0.258
Kayin	0.73	0.070	0.255
Chin	1.90	0.082	0.274
Sagaing	0.63	0.076	0.265
Tanintharyi	0.90	0.066	0.248
Bago	0.72	0.064	0.245
Magway	0.64	0.062	0.241
Mandalay	1.03	0.062	0.241
Mon	0.59	0.053	0.225
Rakhine	0.55	0.073	0.260
Yangon	1.82	0.057	0.232
Shan	1.23	0.069	0.254
Ayeyawady	0.57	0.072	0.258

Table A-2: Descriptive Statistics for Coverage of SRH Workforce and Distance Factors

Region	Variables	Mean	S.D.
	<u>SRH workforce per 1,000 population</u>		
Naypyidaw (omitted)			
Kachin	1.31	0.069	0.253
Kayah	3.86	0.072	0.258
Kayin & Shan	1.05	0.139	0.346
Chin	3.47	0.082	0.274
Sagaing	1.25	0.076	0.265
Tanintharyi	1.18	0.066	0.248
Bago	1.02	0.064	0.245
Magway	1.70	0.062	0.241
Mandalay	0.72	0.062	0.241
Mon	0.81	0.053	0.225
Rakhine	0.69	0.073	0.260
Yangon	0.90	0.057	0.232
Ayeyawady	1.07	0.072	0.258
	<u>% population &gt; 1.23 miles from a health facility</u>		
Naypyidaw (omitted)			
Kachin	4%	0.069	0.253
Kayah	0%	0.072	0.258
Kayin & Shan	22%	0.139	0.346
Chin	32%	0.082	0.274
Sagaing	38%	0.076	0.265
Tanintharyi	21%	0.066	0.248
Bago	20%	0.064	0.245
Magway	29%	0.062	0.241
Mandalay	19%	0.062	0.241
Mon	1%	0.053	0.225
Rakhine	25%	0.073	0.260
Yangon	6%	0.057	0.232
Ayeyawady	14%	0.072	0.258

## APPENDIX – B

## Detailed Regression Results for Antenatal Care

Table B-1: Results in OR for ANC (Full sample)

Ordered logistic regression	Number of obs	=	3721
	LR chi2(37)	=	1059.19
	Prob > chi2	=	0.0000
Log likelihood = -2975.8218	Pseudo R2	=	0.1511

X (with Ins. deli.)	OR	Std. Err.	z	P >  z	[95% Conf. Interval]	
Age	1.048386	.00766	6.47	0.000	1.03348	1.063508
Parity	.7954765	.0216899	-8.39	0.000	.7540811	.8391443
Abort history	.9673095	.0998495	-0.32	0.747	.7901346	1.184213
Education (w)	No education - omitted					
Primary	1.673218	.1746012	4.93	0.000	1.363732	2.052938
Secondary	2.320118	.2895387	6.74	0.000	1.816706	2.963027
Higher	3.002484	.8013774	4.12	0.000	1.779471	5.066062
Education (h)	No education - omitted					
Primary	1.440527	.1490494	3.53	0.000	1.176112	1.764388
Secondary	2.09373	.2437698	6.35	0.000	1.666543	2.630418
Higher	3.368091	1.02202	4.00	0.000	1.858205	6.104838
Occupation (w)	No work and manual worker - omitted					
Managerial+clerk	1.170626	.2610134	0.71	0.480	.7561823	1.812215
Sales+Domestic	1.318471	.151087	2.41	0.016	1.053244	1.650486
Agri sector	.9139473	.1014096	-0.81	0.417	.7353154	1.135975
Occupation (h)	No work and manual worker - omitted					
Managerial+clerk	1.207368	.2063678	1.10	0.270	.8636723	1.687836
Sales+Domestic	.9577491	.1690289	-0.24	0.807	.6776836	1.353557
Agri sector	1.002744	.0954718	0.03	0.977	.8320448	1.208463
Household wealth	Poorest - omitted					
Poorer	1.443645	.1383409	3.83	0.000	1.196443	1.741923

Middle	1.541277	.1678247	3.97	0.000	1.245076	1.907942
Richer	1.865411	.2344818	4.96	0.000	1.458071	2.38655
Richest	2.921663	.5580314	5.61	0.000	2.009335	4.248228
Residence (Rural)	.6202901	.0736049	-4.02	0.000	.4915747	.7827086
Region	Naypyidaw – omitted					
Kachin	1.495789	.312313	1.93	0.054	.9934452	2.252148
Kayah	2.413616	.511379	4.16	0.000	1.59339	3.65607
Kayin	1.18689	.2402821	0.85	0.397	.7981551	1.764954
Chin	.7474619	.1478664	-1.47	0.141	.5072247	1.101483
Sagaing	.972564	.1926907	-0.14	0.888	.6595879	1.434048
Tanintharyi	1.570319	.3214956	2.20	0.028	1.051282	2.345615
Bago	1.239607	.2524826	1.05	0.292	.8315949	1.847806
Magway	1.225822	.2527132	0.99	0.323	.8183618	1.836156
Mandalay	1.290248	.2774161	1.19	0.236	.846557	1.966481
Mon	2.007644	.4411479	3.17	0.002	1.305115	3.088337
Rakhine	.883214	.1745596	-0.63	0.530	.5995609	1.301064
Yangon	2.674669	.6740615	3.90	0.000	1.632123	4.383158
Shan	.9776293	.1991712	-0.11	0.912	.6557828	1.457433
Ayeyarwady	1.650459	.3256115	2.54	0.011	1.121179	2.429597
Planned pregnancy	.8310966	.1006431	-1.53	0.127	.6555017	1.05373
Twin/multiple preg.	2.588824	1.026466	2.40	0.016	1.190151	5.631229
First born	1.079962	.1097106	0.76	0.449	.884987	1.317892

**Table B-2: Results in OR for ANC (Sub-sample)**

Ordered logistic regression	Number of obs	=	2532
	LR chi2(37)	=	682.21
	Prob > chi2	=	0.0000
Log likelihood = -2182.6992	Pseudo R2	=	0.1352

X (with Ins. deli.)	Dydx	Std. Err.	z	P >  z	[95% Conf. Interval]	
Age	1.039419	.0089178	4.51	0.000	1.022086	1.057045
Parity	.7996028	.0234503	-7.63	0.000	.7549372	.8469111
Birth interval	.5976584	.0678088	-4.54	0.000	.4784954	.7464973
Abort history	1.00657	.1127722	0.06	0.953	.8081251	1.253745
Education (w)	No education - omitted					
Primary	1.480096	.1701326	3.41	0.001	1.181535	1.854099
Secondary	2.094317	.303377	5.10	0.000	1.576666	2.781923
Higher	2.838964	1.042375	2.84	0.004	1.382376	5.830333
Education (h)	No education - omitted					
Primary	1.411558	.1622939	3.00	0.003	1.126761	1.768339
Secondary	2.017248	.2710411	5.22	0.000	1.550209	2.624994
Higher	2.584243	.9978755	2.46	0.014	1.212416	5.508267
Occupation (w)	No work and manual worker - omitted					
Managerial+clerk	1.316554	.387092	0.94	0.350	.7398932	2.342654
Sales+Domestic	1.353339	.1775692	2.31	0.021	1.046459	1.750215
Agri sector	1.003132	.1281787	0.02	0.980	.7808949	1.288615
Occupation (h)	No work and manual worker - omitted					
Managerial+clerk	1.341017	.2877704	1.37	0.172	.8805902	2.042183
Sales+Domestic	.9526566	.1984054	-0.23	0.816	.6333746	1.432888
Agri sector	1.025679	.1128574	0.23	0.818	.8267079	1.272538
Household wealth	Poorest - omitted					
Poorer	1.297633	.1416158	2.39	0.017	1.047748	1.607114
Middle	1.378445	.1767893	2.50	0.012	1.072064	1.772386
Richer	1.584182	.2328636	3.13	0.002	1.187639	2.113128

Richest	3.008528	.7176983	4.62	0.000	1.884933	4.801889
Residence (Rural)	.7003212	.0985989	-2.53	0.011	.5314419	.9228663
Region	Naypyidaw – omitted					
Kachin	1.605858	.3974264	1.91	0.056	.9886604	2.608357
Kayah	2.827429	.6991824	4.20	0.000	1.741414	4.590729
Kayin	1.084603	.2576887	0.34	0.732	.6808255	1.727851
Chin	.9246881	.21615	-0.33	0.738	.5848212	1.462068
Sagaing	.9820403	.2312471	-0.08	0.939	.6190015	1.557998
Tanintharyi	1.653571	.4002366	2.08	0.038	1.028951	2.657363
Bago	1.337044	.3282066	1.18	0.237	.8264182	2.163175
Magway	1.297556	.3232708	1.05	0.296	.7962681	2.114428
Mandalay	1.272696	.3307262	0.93	0.353	.7647669	2.117972
Mon	2.165463	.5579313	3.00	0.003	1.306889	3.588085
Rakhine	.8237101	.1969229	-0.81	0.417	.5155599	1.316042
Yangon	3.128222	.9299477	3.84	0.000	1.746848	5.60196
Shan	.8913251	.2186752	-0.47	0.639	.5510674	1.441676
Ayeyarwady	1.604903	.3826377	1.98	0.047	1.005789	2.560887
Planned pregnancy	.7063107	.0942122	-2.61	0.009	.5438225	.9173486
Twin/multiple preg.	2.141782	.932603	1.75	0.080	.9122916	5.028248

This sub-sample is run to examine the effect of birth interval on the utilization of ANC services. According to this Table B-2, birth interval is statistically and negatively correlated with the utilization of at least 4 times of ANC services at 1% significant level. If a woman has birth interval of equal or less than 24 months between the last two births, she is about 1.4 times less likely to use at least 4 times ANC services compared with those with more than 24 months birth interval.

**Table B-3: Results in marginal effect for ANC (Full sample)**

Marginal effect for Pr(outcome 2)

Ordered logistic regression	Number of obs	=	3721
	LR chi2(37)	=	1059.19
	Prob > chi2	=	0.0000
Log likelihood = -2975.8218	Pseudo R2	=	0.1511

X (with Ins. deli.)	M.E.	Std. Err.	z	P >  z	[95% Conf. Interval]	
Age	.0088345	.0013456	6.57	0.000	.0061972	.0114718
Parity	-.04278	.0049856	-8.58	0.000	-.0525517	-.0330083
Abort history	-.0062141	.0192976	-0.32	0.747	-.0440366	.0316085
Education (w)	No education - omitted					
Primary	.0962395	.0193823	4.97	0.000	.0582509	.1342281
Secondary	.1573524	.0229331	6.86	0.000	.1124045	.2023004
Higher	.2055559	.0496132	4.14	0.000	.1083158	.3027959
Education (h)	No education - omitted					
Primary	.0682436	.0192731	3.54	0.000	.030469	.1060182
Secondary	.1381566	.0214159	6.45	0.000	.0961821	.1801311
Higher	.2270392	.0564179	4.02	0.000	.1164621	.3376163
Occupation (w)	No work and manual worker - omitted					
Managerial+clerk	.0294541	.0416762	0.71	0.480	-.0522297	.1111378
Sales+Domestic	.0516905	.0213614	2.42	0.016	.0098229	.093558
Agri sector	-.0168235	.0207407	-0.81	0.417	-.0574745	.0238276
Occupation (h)	No work and manual worker - omitted					
Managerial+clerk	.035232	.0319454	1.10	0.270	-.0273799	.0978439
Sales+Domestic	-.0080711	.032996	-0.24	0.807	-.0727422	.0565999
Agri sector	.0005123	.0178009	0.03	0.977	-.0343769	.0354015
Household wealth	Poorest - omitted					
Poorer	.0686478	.0178219	3.85	0.000	.0337176	.1035781
Middle	.0808828	.0202203	4.00	0.000	.0412518	.1205137
Richer	.1165687	.0232318	5.02	0.000	.0710352	.1621022

Richest	.2004541	.0352645	5.68	0.000	.131337	.2695713
Residence (Rural)	-.0892881	.0220383	-4.05	0.000	-.1324825	-.0460937
Region	Naypyidaw – omitted					
Kachin	.0752818	.038974	1.93	0.053	-.0011057	.1516694
Kayah	.164739	.0393175	4.19	0.000	.087678	.2417999
Kayin	.0320337	.0378347	0.85	0.397	-.042121	.1061884
Chin	-.05442	.0369618	-1.47	0.141	-.1268639	.0180238
Sagaing	-.0052012	.0370423	-0.14	0.888	-.0778028	.0674004
Tanintharyi	.084373	.0381994	2.21	0.027	.0095035	.1592425
Bago	.0401589	.0380602	1.06	0.291	-.0344378	.1147556
Magway	.0380681	.0385264	0.99	0.323	-.0374422	.1135784
Mandalay	.0476448	.0401708	1.19	0.236	-.0310886	.1263782
Mon	.1303069	.0409002	3.19	0.001	.050144	.2104698
Rakhine	-.0232186	.036954	-0.63	0.530	-.0956472	.0492099
Yangon	.1839401	.0467927	3.93	0.000	.0922281	.2756521
Shan	-.00423	.0380901	-0.11	0.912	-.0788853	.0704253
Ayeyarwady	.093679	.0367819	2.55	0.011	.0215878	.1657701
Planned pregnancy	-.0345901	.0226263	-1.53	0.126	-.0789369	.0097567
Twin/multiple preg.	.177841	.0739585	2.40	0.016	.032885	.322797
First born	.0143823	.0189849	0.76	0.449	-.0228275	.0515921



Table B-4: Results in odd-ratio of ordered logit models (Antenatal Care)

ANC	Region	PHC	Beds	Workforce	Distance
Naypyidaw	Omitted	Omitted	Omitted	Omitted	Omitted
Kachin	1.495789* (.312313)	1.500855* (.313207)	1.495789* (.312313)	1.494235* (.3119778)	1.494235* (.3119778)
Kayah	2.413616*** (.511379)	2.419843*** (.512422)	2.413616*** (.511379)	2.414345*** (.5115443)	2.414345*** (.5115443)
Kayin	1.18689 (.2402821)	1.185529 (.2398232)	1.18689 (.2402821)	1.079584 (.1951874)	1.079584 (.1951874)
Chin	.7474619 (.1478664)	.7501596 (.1483096)	.7474619 (.1478664)	.7483829 (.1480456)	.7483829 (.1480456)
Sagaing	.972564 (.1926907)	.9784333 (.1937239)	.972564 (.1926907)	.9720479 (.1925904)	.9720479 (.1925904)
Tanintharyi	1.570319** (.3214956)	1.748921*** (.3222642)	1.570319** (.3214956)	1.568232** (.3210771)	1.568232** (.3210771)
Bago	1.239607 (.2524826)	1.449746** (.2569332)	1.239607 (.2524826)	1.238082 (.252185)	1.238082 (.252185)
Magway	1.225822 (.2527132)	1.227122 (.2528392)	1.225822 (.2527132)	1.226133 (.2527718)	1.226133 (.2527718)
Mandalay	1.290248 (.2774161)	1.294801 (.2782229)	1.290248 (.2774161)	1.290708 (.2775384)	1.290708 (.2775384)
Mon	2.007644*** (.4411479)	1.748921*** (.3222642)	2.007644*** (.4411479)	2.004733*** (.4405078)	2.004733*** (.4405078)
Rakhine	.883214 (.1745596)	.8797802 (.1737772)	.883214 (.1745596)	.8835871 (.174633)	.8835871 (.174633)
Yangon	2.674669*** (.6740615)	2.679689*** (.6749106)	2.674669*** (.6740615)	2.668159*** (.6724087)	2.668159*** (.6724087)
Shan	.9776293 (.1991712)	.9773847 (.1990023)	.9776293 (.1991712)	1.079584 (.1951874)	1.079584 (.1951874)
Ayeyarwady	1.650459** (.3256115)	1.449746** (.2569332)	1.650459** (.3256115)	1.647757** (.3250914)	1.647757** (.3250914)

\* =  $P \leq 0.1$ ; \*\* =  $P \leq 0.05$ ; \*\*\* =  $P \leq 0.01$

Table B-4 shows the results of ordered logit regression for PNC services in odd-ratio for coverage of PHCs, available beds, SRH workforce and distance to the nearest health facility. Each of these variables is run separately without region variable together with all other variables as the full sample regression as each of these variables has multicollinearity with region variables. These results are almost the same with that of region let omitting Naypyidaw as reference group.

Only 6 out of 14 regions are statistically significant, and all these 6 regions are positive correlated with the utilization of at least 4 times ANC visits. Women in Yangon Region is more likely to use at least 4 times ANC visits compared with Naypyidaw Region. Although Bago Region does not statistically correlate with ANC services when it is regression is running with region variable, it becomes statistically significant when PHC coverage is examined. It may be due to the fact that PHC coverage of Bago is the same with that of Ayeyawady Region which is statistically significant with region variable.

## APPENDIX – C

## Detailed Regression Results for Institutional Delivery

Table C-1: Results in OR for Institutional Delivery (Full sample)

Logistic regression	Number of obs	=	3743
	LR chi2(37)	=	1241.54
	Prob > chi2	=	0.0000
Log likelihood = -1866.6071	Pseudo R2	=	0.2496

X (with Ins. deli.)	OR	Std. Err.	z	P >  z	[95% Conf. Interval]	
Age	1.072695	.00896	8.40	0.000	1.055277	1.090401
Parity	.7921822	.0295084	-6.25	0.000	.7364076	.8521812
Abort history	1.181677	.1425238	1.38	0.166	.9328976	1.496799
Education (w)	No education - omitted					
Primary	1.403162	.2065643	2.30	0.021	1.051477	1.872476
Secondary	2.19538	.3520147	4.90	0.000	1.603338	3.006036
Higher	2.566056	.6381611	3.79	0.000	1.576079	4.177864
Education (h)	No education - omitted					
Primary	1.297089	.1830558	1.84	0.065	.9836512	1.710402
Secondary	1.432639	.2133507	2.41	0.016	1.069978	1.918222
Higher	2.421776	.6440478	3.33	0.001	1.438021	4.078521
Occupation (w)	No work and manual worker - omitted					
Managerial+clerk	.9597771	.2040104	-0.19	0.847	.6327596	1.455801
Sales+Domestic	.8684103	.1012851	-1.21	0.226	.6909506	1.091448
Agri sector	.8125141	.1153907	-1.46	0.144	.6151002	1.073287
Occupation (h)	No work and manual worker - omitted					
Managerial+clerk	1.361399	.2314865	1.81	0.070	.9755528	1.899854
Sales+Domestic	1.334812	.2296571	1.68	0.093	.9527287	1.870127
Agri sector	.8389002	.095805	-1.54	0.124	.670657	1.049349
Household wealth	Poorest - omitted					
Poorer	1.226406	.1534804	1.63	0.103	.9596427	1.567326

Middle	1.557882	.2042789	3.38	0.001	1.204813	2.014416
Richer	1.901641	.2662695	4.59	0.000	1.445249	2.502157
Richest	3.698059	.6787377	7.13	0.000	2.580746	5.299104
Residence (Rural)	.4923093	.0553746	-6.30	0.000	.3949075	.6137346
Region	Naypyidaw – omitted					
Kachin	.6487875	.1486089	-1.89	0.059	.414123	1.016425
Kayah	.6269155	.1452192	-2.02	0.044	.3981401	.9871475
Kayin	1.472082	.3358374	1.69	0.090	.9413281	2.302095
Chin	.3330314	.0833791	-4.39	0.000	.2038801	.5439957
Sagaing	.7468537	.1677919	-1.30	0.194	.4808396	1.160034
Tanintharyi	1.343085	.3038922	1.30	0.192	.8619998	2.092667
Bago	.8345121	.1906352	-0.79	0.428	.5333163	1.305811
Magway	.8814614	.2040212	-0.55	0.586	.5599973	1.387461
Mandalay	.9422853	.218119	-0.26	0.797	.5986147	1.483261
Mon	.7891418	.1922889	-0.97	0.331	.4894904	1.272231
Rakhine	.5660032	.1380617	-2.33	0.020	.3509057	.9129505
Yangon	1.218277	.3011043	0.80	0.424	.7505276	1.977541
Shan	.7829012	.1878025	-1.02	0.308	.4892385	1.252833
Ayeyarwady	.9238841	.2059009	-0.36	0.722	.5969184	1.429947
Planned pregnancy	.8732926	.1248978	-0.95	0.343	.6598138	1.155841
Twin/multiple preg.	8.470139	3.495203	5.18	0.000	3.772612	19.01686
First born	2.595752	.3011873	8.22	0.000	2.067748	3.258583

**Table C-2: Results in OR for Institutional Delivery (Sub-sample)**

Logistic regression	Number of obs	=	2551
	LR chi2(37)	=	637.38
	Prob > chi2	=	0.0000
Log likelihood = -1204.8675	Pseudo R2	=	0.2092

X (with Ins. deli.)	Dydx	Std. Err.	z	P >  z	[95% Conf. Interval]	
Age	1.070906	.0112222	6.54	0.000	1.049135	1.093128
Parity	.7953822	.0319799	-5.69	0.000	.7351088	.8605976
Birth interval	.7635646	.1249222	-1.65	0.099	.5540971	1.052218
Abort history	1.334774	.1791045	2.15	0.031	1.026102	1.7363
Education (w)	No education - omitted					
Primary	1.313636	.2238999	1.60	0.109	.9405758	1.834663
Secondary	2.167763	.4157757	4.03	0.000	1.488511	3.15698
Higher	2.278524	.7252907	2.59	0.010	1.220963	4.252112
Education (h)	No education - omitted					
Primary	1.305552	.2185245	1.59	0.111	.9404148	1.812463
Secondary	1.487626	.2703687	2.19	0.029	1.041819	2.1242
Higher	2.580721	.868929	2.82	0.005	1.333956	4.99276
Occupation (w)	No work and manual worker - omitted					
Managerial+clerk	.9934604	.2770047	-0.02	0.981	.5751905	1.71589
Sales+Domestic	.8357359	.1196738	-1.25	0.210	.6312198	1.106516
Agri sector	.7512806	.1338102	-1.61	0.108	.5299015	1.065146
Occupation (h)	No work and manual worker - omitted					
Managerial+clerk	1.274012	.2813929	1.10	0.273	.826356	1.964172
Sales+Domestic	1.083812	.2303975	0.38	0.705	.7145042	1.644004
Agri sector	.8425055	.1183822	-1.22	0.223	.6396886	1.109627
Household wealth	Poorest - omitted					
Poorer	1.299224	.2005818	1.70	0.090	.9599981	1.758318
Middle	1.705435	.2814779	3.23	0.001	1.234089	2.356807
Richer	1.99546	.344882	4.00	0.000	1.422089	2.800006

Richest	3.420993	.7731959	5.44	0.000	2.196685	5.327661
Residence (Rural)	.4725129	.0658966	-5.38	0.000	.3595052	.6210435
Region	Naypyidaw – omitted					
Kachin	.7549098	.2212633	-0.96	0.337	.4250194	1.340854
Kayah	.6353336	.1891401	-1.52	0.128	.3544846	1.138692
Kayin	1.927726	.5480002	2.31	0.021	1.104261	3.365261
Chin	.3780479	.1218315	-3.02	0.003	.2010178	.7109827
Sagaing	.8341708	.2396838	-0.63	0.528	.4749826	1.464982
Tanintharyi	1.352295	.3896988	1.05	0.295	.7687334	2.378851
Bago	.9515967	.2829754	-0.17	0.867	.5312904	1.704409
Magway	.7949754	.245806	-0.74	0.458	.4336732	1.457286
Mandalay	.8573191	.2589209	-0.51	0.610	.4743175	1.549586
Mon	1.130717	.3428281	0.41	0.685	.624128	2.048492
Rakhine	.5008363	.1737282	-1.99	0.046	.2537665	.9884562
Yangon	1.462248	.4536202	1.22	0.221	.7960866	2.68585
Shan	.8678484	.2728473	-0.45	0.652	.4686302	1.607154
Ayeyarwady	.9565585	.2831008	-0.15	0.881	.53554	1.708564
Planned pregnancy	.8760917	.1442967	-0.80	0.422	.6343843	1.209892
Twin/multiple preg.	5.718054	2.745051	3.63	0.000	2.231589	14.65151

This sub-sample is run to examine the effect of birth interval on the utilization of institutional delivery services. According to this Table C-2, birth interval is statistically and negatively correlated with the utilization of institutional delivery at 10% significant level. If a woman has birth interval of equal or less than 24 months between the last two births, she is over 1.2 times less likely to use institutional delivery compared with those with more than 24 months birth interval.

**Table C-3: Results in marginal effect for Institutional Delivery (Full sample)**

Marginal effect for Pr(outcome 1)

Logistic regression	Number of obs	=	3743
	LR chi2(37)	=	1241.54
	Prob > chi2	=	0.0000
Log likelihood = -1866.6071	Pseudo R2	=	0.2496

X (with Ins. deli.)	M.E.	Std. Err.	z	P >  z	[95% Conf. Interval]	
Age	.0070935	.0014085	5.04	0.000	.0043329	.0098541
Parity	-.0254087	.0054599	-4.65	0.000	-.0361099	-.0147074
Abort history	-.0084087	.0203002	-0.41	0.679	-.0481963	.0313789
Education (w)	No education - omitted					
Primary	.0573529	.0218158	2.63	0.009	.0145948	.100111
Secondary	.1154074	.0254988	4.53	0.000	.0654306	.1653841
Higher	.1658139	.0437925	3.79	0.000	.0799823	.2516456
Education (h)	No education - omitted					
Primary	.0486595	.0216582	2.25	0.025	.0062102	.0911089
Secondary	.0620776	.0239861	2.59	0.010	.0150657	.1090894
Higher	.0580182	.045489	1.28	0.202	-.0311387	.147175
Occupation (w)	No work and manual worker - omitted					
Managerial+clerk	-.0125086	.0371892	-0.34	0.737	-.0853982	.060381
Sales+Domestic	.0389994	.0213891	1.82	0.068	-.0029223	.0809212
Agri sector	.026023	.0225842	1.15	0.249	-.0182412	.0702872
Occupation (h)	No work and manual worker - omitted					
Managerial+clerk	.0518201	.0301879	1.72	0.086	-.0073471	.1109873
Sales+Domestic	.0492652	.0324183	1.52	0.129	-.0142735	.1128039
Agri sector	-.0297739	.0189408	-1.57	0.116	-.0668973	.0073494
Household wealth	Poorest - omitted					
Poorer	.0604504	.019768	3.06	0.002	.0217059	.099195
Middle	.0985931	.0221652	4.45	0.000	.0551502	.1420361
Richer	.1170248	.0246613	4.75	0.000	.0686895	.1653602

Richest	.1559091	.0334068	4.67	0.000	.090433	.2213852
Residence (Rural)	-.0149539	.0213968	-0.70	0.485	-.0568909	.0269831
Region	Naypyidaw – omitted					
Kachin	-.2266472	.0403421	-5.62	0.000	-.3057162	-.1475782
Kayah	-.0370742	.0424129	-0.87	0.382	-.120202	.0460535
Kayin	.0216194	.0433015	0.50	0.618	-.0632499	.1064887
Chin	-.456011	.040771	-11.18	0.000	-.5359207	-.3761014
Sagaing	-.1157217	.0397577	-2.91	0.004	-.1936453	-.0377981
Tanintharyi	.1301619	.0449911	2.89	0.004	.041981	.2183428
Bago	-.1043138	.0409684	-2.55	0.011	-.1846105	-.0240172
Magway	.030343	.0446891	0.68	0.497	-.057246	.117932
Mandalay	-.1021175	.0427205	-2.39	0.017	-.1858481	-.0183868
Mon	.1103161	.0485665	2.27	0.023	.0151275	.2055047
Rakhine	-.1400576	.0407134	-3.44	0.001	-.2198544	-.0602608
Yangon	-.082875	.0452128	-1.83	0.067	-.1714904	.0057404
Shan	-.1280729	.0422806	-3.03	0.002	-.2109413	-.0452045
Ayeyarwady	-.072731	.0410294	-1.77	0.076	-.1531471	.0076851
Planned pregnancy	-.0181614	.0239956	-0.76	0.449	-.0651918	.0288691
Twin/multiple preg	.1717631	.0762442	2.25	0.024	.0223273	.3211989
First born	.0597984	.0196763	3.04	0.002	.0212336	.0983632



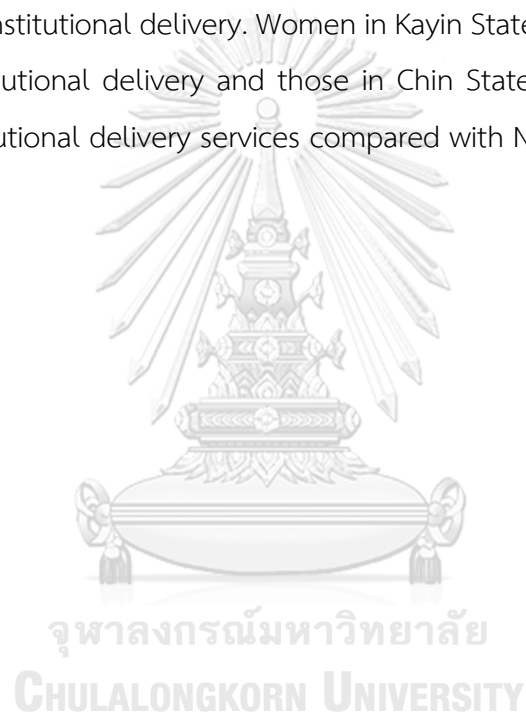
Table C-4: Results in odd-ratio of logit model (Institutional Delivery)

Ins. del	Region	PHC	Beds	Workforce	Distance
Naypyidaw	Omitted	Omitted	Omitted	Omitted	Omitted
Kachin	.6487875* (.1486089)	.6491787* (.1484899)	.6487875* (.1486089)	.6475275* (.1482269)	.6475275* (.1482269)
Kayah	.6269155** (.1452192)	.6281016** (.1453328)	.6269155** (.1452192)	.6279365** (.1453969)	.6279365** (.1453969)
Kayin	1.472082* (.3358374)	1.479301* (.337115)	1.472082* (.3358374)	1.103648 (.2264044)	1.103648 (.2264044)
Chin	.3330314*** (.0833791)	.3318625*** (.0829668)	.3330314*** (.0833791)	.3338338*** (.0835246)	.3338338*** (.0835246)
Sagaing	.7468537 (.1677919)	.7492828 (.1681161)	.7468537 (.1677919)	.7447022 (.1672407)	.7447022 (.1672407)
Tanintharyi	1.343085 (.3038922)	1.068062 (.2186103)	1.343085 (.3038922)	1.336758 (.3023583)	1.336758 (.3023583)
Bago	.8345121 (.1906352)	.8799683 (.175081)	.8345121 (.1906352)	.8310457 (.1898059)	.8310457 (.1898059)
Magway	.8814614 (.2040212)	.8823828 (.2040304)	.8814614 (.2040212)	.8838029 (.2044806)	.8838029 (.2044806)
Mandalay	.9422853 (.218119)	.9482656 (.2192443)	.9422853 (.218119)	.9439233 (.2184527)	.9439233 (.2184527)
Mon	.7891418 (.1922889)	1.068062 (.2186103)	.7891418 (.1922889)	.7866881 (.1915793)	.7866881 (.1915793)
Rakhine	.5660032** (.1380617)	.5663091** (.1379651)	.5660032** (.1380617)	.5670976** (.1383092)	.5670976** (.1383092)
Yangon	1.218277 (.3011043)	1.228294 (.3031254)	1.218277 (.3011043)	1.21117 (.2991607)	1.21117 (.2991607)
Shan	.7829012 (.1878025)	.7881607 (.1888303)	.7829012 (.1878025)	1.103648 (.2264044)	1.103648 (.2264044)
Ayeyarwady	.9238841 (.2059009)	.8799683 (.175081)	.9238841 (.2059009)	.9194353 (.2048576)	1.21117 (.2991607)

\* =  $P \leq 0.1$ ; \*\* =  $P \leq 0.05$ ; \*\*\* =  $P \leq 0.01$

Table C-4 shows the results of ordered logit regression for institutional delivery in odd-ratio for coverage of PHCs, available beds, SRH workforce and distance to the nearest health facility. Each of these variables is run separately without region variable together with all other variables as the full sample regression as each of these variables has multicollinearity with region variables. These results are almost the same with that of region let omitting Naypyidaw as reference group.

Only 5 out of 14 regions are statistically significant. And out of these 5 regions, only Kayin State positive correlation and other 4 regions are negatively correlated with the utilization of institutional delivery. Women in Kayin State are nearly 1.5 times more likely to use institutional delivery and those in Chin State are nearly 1.7 times less likely to use institutional delivery services compared with Naypyidaw Region.



## APPENDIX – D

## Detailed Regression Results for Postnatal Care

Table D-1: Results in OR for PNC (Full sample)

Ordered logistic regression	Number of obs	=	3707
	LR chi2(37)	=	854.88
	Prob > chi2	=	0.0000
Log likelihood = -3275.6242	Pseudo R2	=	0.1154

X (with Ins. deli.)	OR	Std. Err.	z	P >  z	[95% Conf. Interval]	
Age	1.03545	.0072345	4.99	0.000	1.021367	1.049727
Parity	.8826894	.0238455	-4.62	0.000	.8371689	.9306851
Abort history	.959546	.095673	-0.41	0.679	.7892153	1.166638
Education (w)	No education - omitted					
Primary	1.325328	.1423513	2.62	0.009	1.073735	1.635873
Secondary	1.762557	.2225244	4.49	0.000	1.376189	2.257398
Higher	2.257622	.4883503	3.76	0.000	1.477496	3.449659
Education (h)	No education - omitted					
Primary	1.269937	.1353827	2.24	0.025	1.030478	1.565039
Secondary	1.356439	.160264	2.58	0.010	1.076045	1.709898
Higher	1.329665	.2972409	1.27	0.202	.8579459	2.060747
Occupation (w)	No work and manual worker - omitted					
Managerial+clerk	.940419	.1717668	-0.34	0.737	.6574308	1.345218
Sales+Domestic	1.211097	.1274071	1.82	0.069	.9854455	1.488418
Agri sector	1.136325	.1261232	1.15	0.250	.9141673	1.41247
Occupation (h)	No work and manual worker - omitted					
Managerial+clerk	1.289802	.1913746	1.72	0.086	.9643302	1.725123
Sales+Domestic	1.27372	.2030035	1.52	0.129	.9319886	1.740752
Agri sector	.8639679	.0804289	-1.57	0.116	.7198751	1.036903
Household wealth	Poorest - omitted					
Poorer	1.345643	.1311394	3.05	0.002	1.111671	1.628859

Middle	1.622861	.178068	4.41	0.000	1.308831	2.012237
Richer	1.776613	.2173294	4.70	0.000	1.397871	2.257972
Richest	2.150433	.3562924	4.62	0.000	1.554159	2.975476
Residence (Rural)	.9291932	.0976537	-0.70	0.485	.7562212	1.141729
Region	Naypyidaw – omitted					
Kachin	.3285508	.0660256	-5.54	0.000	.2215873	.4871471
Kayah	.8335417	.1736926	-0.87	0.382	.5540575	1.254007
Kayin	1.112014	.2364799	0.50	0.618	.7329841	1.687042
Chin	.106515	.0221305	-10.78	0.000	.0708855	.160053
Sagaing	.5664825	.1110649	-2.90	0.004	.3857442	.8319046
Tanintharyi	1.895011	.4201503	2.88	0.004	1.227125	2.926409
Bago	.599125	.1209364	-2.54	0.011	.4033648	.889891
Magway	1.16069	.2547858	0.68	0.497	.7548607	1.784701
Mandalay	.6056224	.1273981	-2.38	0.017	.4009996	.9146603
Mon	1.719033	.4110094	2.27	0.023	1.07589	2.746635
Rakhine	.5026694	.1010397	-3.42	0.001	.338989	.7453827
Yangon	.6656449	.148021	-1.83	0.067	.4304859	1.029263
Shan	.5331429	.111225	-3.01	0.003	.3542132	.8024583
Ayeyarwady	.6996454	.1412205	-1.77	0.077	.4710494	1.039177
Planned pregnancy	.9146714	.1078045	-0.76	0.449	.7260077	1.152362
Twin/multiple preg.	2.324555	.8721871	2.25	0.025	1.114202	4.84971
First born	1.341341	.130184	3.03	0.002	1.108985	1.62238

**Table D-2: Results in OR for PNC (Sub-sample)**

Ordered logistic regression	Number of obs	=	2529
	LR chi2(37)	=	598.96
	Prob > chi2	=	0.0000
Log likelihood = -2315.1669	Pseudo R2	=	0.1145

X (with Ins. deli.)	Dydx	Std. Err.	z	P >  z	[95% Conf. Interval]	
Age	1.021245	.008583	2.50	0.012	1.00456	1.038206
Parity	.9060791	.026567	-3.36	0.001	.8554766	.9596747
Birth interval	.7038054	.0812053	-3.04	0.002	.5613589	.8823981
Abort history	1.036384	.1134396	0.33	0.744	.8362779	1.284372
Education (w)	No education - omitted					
Primary	1.239964	.1474023	1.81	0.070	.9822489	1.565297
Secondary	1.726284	.2531504	3.72	0.000	1.295054	2.301105
Higher	1.792072	.510304	2.05	0.040	1.025582	3.131414
Education (h)	No education - omitted					
Primary	1.19867	.1427164	1.52	0.128	.949191	1.51372
Secondary	1.240225	.1697874	1.57	0.116	.9483542	1.621923
Higher	1.276259	.3813253	0.82	0.414	.7105816	2.29226
Occupation (w)	No work and manual worker - omitted					
Managerial+clerk	.7859841	.1867982	-1.01	0.311	.4933054	1.25231
Sales+Domestic	1.235431	.1536222	1.70	0.089	.9682202	1.576387
Agri sector	1.140269	.1467257	1.02	0.308	.88609	1.467361
Occupation (h)	No work and manual worker - omitted					
Managerial+clerk	1.429769	.2723532	1.88	0.061	.9842885	2.076869
Sales+Domestic	1.217422	.234952	1.02	0.308	.8340011	1.777116
Agri sector	.825561	.0895223	-1.77	0.077	.6674926	1.021061
Household wealth	Poorest - omitted					
Poorer	1.229788	.1372692	1.85	0.064	.9881412	1.530529
Middle	1.496263	.1932414	3.12	0.002	1.161651	1.927259
Richer	1.553933	.2251155	3.04	0.002	1.169823	2.064165

Richest	2.33759	.4887364	4.06	0.000	1.551678	3.52156
Residence (Rural)	.8972154	.116056	-0.84	0.402	.696294	1.156114
Region	Naypyidaw – omitted					
Kachin	.297082	.0737257	-4.89	0.000	.1826573	.4831876
Kayah	.6358123	.1589772	-1.81	0.070	.3894899	1.037914
Kayin	1.073481	.2742171	0.28	0.781	.6506653	1.77105
Chin	.0909504	.023216	-9.39	0.000	.0551477	.1499968
Sagaing	.5678003	.1364565	-2.36	0.019	.3545119	.9094115
Tanintharyi	1.730812	.4595214	2.07	0.039	1.028633	2.912322
Bago	.5334202	.1342078	-2.50	0.012	.3257679	.8734352
Magway	1.016599	.2747023	0.06	0.951	.598605	1.726469
Mandalay	.5855547	.1540869	-2.03	0.042	.349604	.9807505
Mon	1.563123	.4449864	1.57	0.117	.894695	2.730935
Rakhine	.3645718	.0910354	-4.04	0.000	.2234775	.5947471
Yangon	.6601234	.1828863	-1.50	0.134	.3835313	1.136186
Shan	.3588777	.0918566	-4.00	0.000	.2173086	.5926742
Ayeyarwady	.5536029	.1382349	-2.37	0.018	.3393539	.9031166
Planned pregnancy	.835825	.1092739	-1.37	0.170	.646891	1.07994
Twin/multiple preg.	1.957478	.8322355	1.58	0.114	.8507508	4.503925

This sub-sample is run to examine the effect of birth interval on the utilization of institutional delivery services. According to this Table D-2, birth interval is statistically and negatively correlated with the utilization of PNC services within 24 hours of delivery at 1% significant level. If a woman has birth interval of equal or less than 24 months between the last two births, she is over 1.3 times less likely to receive PNC service within 24 hours of delivery compared with those with more than 24 months birth interval.

**Table D-3: Results in marginal effect for PNC (Full sample)**

Marginal effect for Pr(outcome 2)

Ordered logistic regression	Number of obs	=	3707
	LR chi2(37)	=	854.88
	Prob > chi2	=	0.0000
Log likelihood = -3275.6242	Pseudo R2	=	0.1154

X (with Ins. deli.)	M.E.	Std. Err.	z	P >  z	[95% Conf. Interval]	
Age	.0070935	.0014085	5.04	0.000	.0043329	.0098541
Parity	-.0254087	.0054599	-4.65	0.000	-.0361099	-.0147074
Abort history	-.0084087	.0203002	-0.41	0.679	-.0481963	.0313789
Education (w)	No education - omitted					
Primary	.0573529	.0218158	2.63	0.009	.0145948	.100111
Secondary	.1154074	.0254988	4.53	0.000	.0654306	.1653841
Higher	.1658139	.0437925	3.79	0.000	.0799823	.2516456
Education (h)	No education - omitted					
Primary	.0486595	.0216582	2.25	0.025	.0062102	.0911089
Secondary	.0620776	.0239861	2.59	0.010	.0150657	.1090894
Higher	.0580182	.045489	1.28	0.202	-.0311387	.147175
Occupation (w)	No work and manual worker - omitted					
Managerial+clerk	-.0125086	.0371892	-0.34	0.737	-.0853982	.060381
Sales+Domestic	.0389994	.0213891	1.82	0.068	-.0029223	.0809212
Agri sector	.026023	.0225842	1.15	0.249	-.0182412	.0702872
Occupation (h)	No work and manual worker - omitted					
Managerial+clerk	.0518201	.0301879	1.72	0.086	-.0073471	.1109873
Sales+Domestic	.0492652	.0324183	1.52	0.129	-.0142735	.1128039
Agri sector	-.0297739	.0189408	-1.57	0.116	-.0668973	.0073494
Household wealth	Poorest - omitted					
Poorer	.0604504	.019768	3.06	0.002	.0217059	.099195
Middle	.0985931	.0221652	4.45	0.000	.0551502	.1420361
Richer	.1170248	.0246613	4.75	0.000	.0686895	.1653602

Richest	.1559091	.0334068	4.67	0.000	.090433	.2213852
Residence (Rural)	-.0149539	.0213968	-0.70	0.485	-.0568909	.0269831
Region	Naypyidaw – omitted					
Kachin	-.2266472	.0403421	-5.62	0.000	-.3057162	-.1475782
Kayah	-.0370742	.0424129	-0.87	0.382	-.120202	.0460535
Kayin	.0216194	.0433015	0.50	0.618	-.0632499	.1064887
Chin	-.456011	.040771	-11.18	0.000	-.5359207	-.3761014
Sagaing	-.1157217	.0397577	-2.91	0.004	-.1936453	-.0377981
Tanintharyi	.1301619	.0449911	2.89	0.004	.041981	.2183428
Bago	-.1043138	.0409684	-2.55	0.011	-.1846105	-.0240172
Magway	.030343	.0446891	0.68	0.497	-.057246	.117932
Mandalay	-.1021175	.0427205	-2.39	0.017	-.1858481	-.0183868
Mon	.1103161	.0485665	2.27	0.023	.0151275	.2055047
Rakhine	-.1400576	.0407134	-3.44	0.001	-.2198544	-.0602608
Yangon	-.082875	.0452128	-1.83	0.067	-.1714904	.0057404
Shan	-.1280729	.0422806	-3.03	0.002	-.2109413	-.0452045
Ayeyarwady	-.072731	.0410294	-1.77	0.076	-.1531471	.0076851
Planned pregnancy	-.0181614	.0239956	-0.76	0.449	-.0651918	.0288691
Twin/multiple preg.	.1717631	.0762442	2.25	0.024	.0223273	.3211989
First born	.0597984	.0196763	3.04	0.002	.0212336	.0983632



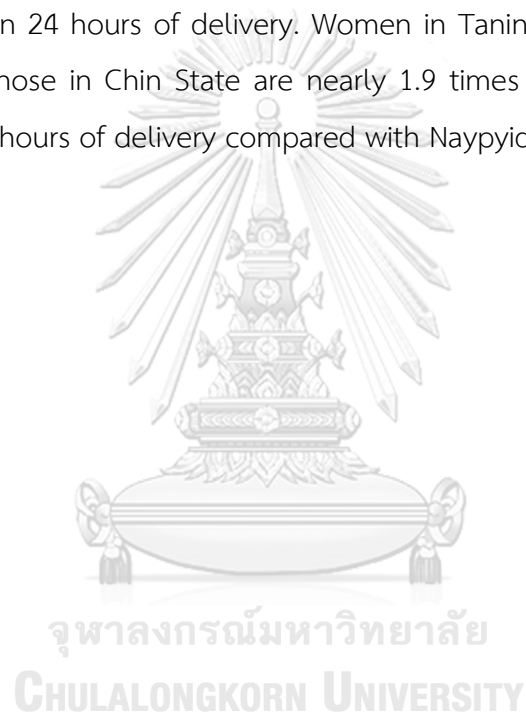
Table D-4: Results in odd-ratio of ordered logit model (Postnatal Care)

PNC	Region	PHC	Beds	Workforce	Distance
Naypyidaw	Omitted	Omitted	Omitted	Omitted	Omitted
Kachin	.3285508*** (.0660256)	.3291271*** (.0661126)	.3285508*** (.0660256)	.3291602*** (.0660959)	.3291602*** (.0660959)
Kayah	.8335417 (.1736926)	.834779 (.1738871)	.8335417 (.1736926)	.8390614 (.1747449)	.8390614 (.1747449)
Kayin	1.112014 (.2364799)	1.113791 (.2367539)	1.112014 (.2364799)	.7668526 (.1440395)	.7668526 (.1440395)
Chin	.106515*** (.0221305)	.1064999*** (.0221183)	.106515*** (.0221305)	.1072755*** (.0222688)	.1072755*** (.0222688)
Sagaing	.5664825*** (.1110649)	.5684769*** (.1113961)	.5664825*** (.1110649)	.567417*** (.1111738)	.567417*** (.1111738)
Tanintharyi	1.895011*** (.4201503)	1.819046*** (.3597466)	1.895011*** (.4201503)	1.887197*** (.4182083)	1.887197*** (.4182083)
Bago	.599125** (.1209364)	.6477116** (.117514)	.599125** (.1209364)	.5986317** (.1207713)	.5986317** (.1207713)
Magway	1.16069 (.2547858)	1.161457 (.2548706)	1.16069 (.2547858)	1.166021 (.255793)	1.166021 (.255793)
Mandalay	.6056224** (.1273981)	.607527** (.12774)	.6056224** (.1273981)	.6101419** (.1282876)	.6101419** (.1282876)
Mon	1.719033** (.4110094)	1.819046*** (.3597466)	1.719033** (.4110094)	1.716598** (.4102271)	1.716598** (.4102271)
Rakhine	.5026694*** (.1010397)	.5019614*** (.1008613)	.5026694*** (.1010397)	.5047689*** (.1014058)	.5047689*** (.1014058)
Yangon	.6656449* (.148021)	.6682885* (.1485384)	.6656449* (.148021)	.6647858* (.1477559)	.6647858* (.1477559)
Shan	.5331429*** (.111225)	.5347398*** (.1115088)	.5331429*** (.111225)	.7668526 (.1440395)	.7668526 (.1440395)
Ayeyarwady	.6996454* (.1412205)	.6477116** (.117514)	.6996454* (.1412205)	.6961267* (.1404433)	.6961267* (.1404433)

\* =  $P \leq 0.1$ ; \*\* =  $P \leq 0.05$ ; \*\*\* =  $P \leq 0.01$

Table D-4 shows the results of ordered logit regression for PNC in odd-ratio for coverage of PHCs, available beds, SRH workforce and distance to the nearest health facility. Each of these variables is run separately without region variable together with all other variables as the full sample regression as each of these variables has multicollinearity with region variables. These results are almost the same with that of region let omitting Naypyidaw as reference group.

10 out of 14 regions are statistically significant, and only Tanintharyi and Mon has positive correlation and other 8 regions are negatively correlated with receiving PNC services within 24 hours of delivery. Women in Tanintharyi are about 1.9 times more likely and those in Chin State are nearly 1.9 times less likely to receive PNC services within 24 hours of delivery compared with Naypyidaw Region.



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