

AMERICAN UNIVERSITY OF BEIRUT

EXAMINING EQUITY IN THE COMPONENTS AND  
UTILIZATION OF ANTENATAL CARE IN JORDAN

by  
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## AN ABSTRACT OF THE THESIS OF

Rim Jihad Kawkab for Master of Science  
Major: Epidemiology

Title: Examining Equity in the Components and Utilization of Antenatal Care in Jordan

**Background:** Antenatal care has always been a basic element of routine child and maternal health services. It is considered an important phase in the woman's pregnancy to prevent pregnancy related complications. Recently, there has been a shift from measuring ANC utilization to measuring content of care provided during ANC visits.

**Objective:** 1) Describe the variations in ANC utilization, based on the old and new WHO recommendations, and content of care over time in Jordan. 2) Examine the determinants of the number of ANC visits and the components of care received during ANC visits in Jordan.

**Methods:** The Demographic and Health Surveys conducted in Jordan in 1990, 1997, 2002, 2007, 2012 and 2017 were used to look at ANC trends and components of care. For every time period, a regression model was used to assess the association between content of care, utilization of care and each of the main independent variables.

**Results:** Women in Jordan had a very high mean number of ANC visits well within the new WHO guidelines. However, certain components of care including tetanus injections were received by a low percentage of women during ANC visits such as tetanus injections. Variations existed between different regions, education levels, wealth categories, age groups, nationalities and the place of which ANC visits happened.

**Conclusion:** Given the variations in ANC coverage between different groups, more effort should be made and further research is needed to examine the quality of ANC services that are given to the pregnant woman.

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# CHAPTER 1

## INTRODUCTION

### **1.1 The global perspective**

Antenatal care is the care provided by a skilled professional to a pregnant woman to prevent pregnancy-related complications. It includes three components which are: health promotion and education, management and prevention of diseases related to pregnancy, and risk identification [1]. Antenatal care has always been considered as a basic element of routine child and maternal health services [2]. Adequate antenatal care includes: skilled health care (provided by a health care professional), timely visits (introduced during the first trimester of pregnancy), sufficient visits and appropriate visits (which means that the pregnant woman is provided with the necessary services) [3]. Studies in the UK and other countries have shown that inadequate ANC puts the pregnant woman at an increased risk of maternal mortality [4, 5, and 6] and according to the WHO, inadequate ANC care is associated with preterm birth [7]. Antenatal care is a tool that helps in the identification of high risk women, such as women with medical comorbidities or anemia, and allows for timely interventions [8].

Globally, between 1990 and 2013, the percentage of women who accessed more than one ANC visit and more than four visits has increased from 65% to 83%, and from 37% to 64% respectively [9, 10]. Within the same time period, the percentage of early antenatal coverage, which takes place during the first trimester, has increased by 43% [11],

with variations within and between countries in terms of utilization and quality of ANC visits [12].

At the beginning of the SDGs era in 2016, preventable pregnancy-related morbidities and mortalities remained high particularly in low- and middle-income countries due to the lack of improvements in the quality of services given to pregnant women [13]. The measurement of antenatal care coverage alone, without considering quality and content was not enough to lead to good maternal health outcomes [14]. A high percentage of women were not receiving the necessary components such as blood and urine tests or regular blood pressure measurements, despite high number of antenatal visits [15, 16]. This has led to a clear shift in the scope of ANC, from measuring coverage to measuring the quality of care, which includes components of coverage and equity in accessing ANC, and this was highlighted in the new WHO guidelines on ANC in 2016 [1].

## **1.2 Antenatal Care and the World Health Organization**

The WHO ANC model was introduced in 2002 and it was known as focused ANC or basic ANC. This model included four minimum recommended number of visits throughout the woman's pregnancy. The hypothesis behind this model was that increased usage would result in women receiving appropriate and timely care during the ANC period to detect and prevent complications of pregnancy and delivery. It was a partial success in that there were increases in the utilization of ANC after the introduction of this model, particularly in low- and middle-income countries. Yet, the global percentage of women who attended four antenatal care visits remained low (64%) in 2013 after being 37% in

1990 [1]. In addition, concerns were raised that although ANC utilization increased it was unclear if this led to an improvement in the quality of care received. For instance, the results of a study that examined 41 Countdown countries showed that despite high ANC utilization rates of 90% for at least one ANC visit, essential services were not provided to the women. A low percentage (15%) of the women reported receiving supplements of iron and folic acid for healthier pregnancies and (49%) reported receiving information about the signs of danger that can be recognized during pregnancy [17]. This data showed that even though antenatal care was covered and took place, the number of visits does not reflect quality of care provided. In addition, a review of three cluster-randomized controlled trials showed that an association exists between low antenatal care utilization and increased risk of perinatal mortality [18, 19].

The WHO updated the 2002 recommendations in 2016 and increased the minimum number of recommended visits from four to eight. These visits are divided into one contact in the first trimester, two contacts in the second trimester and five contacts in the third trimester (Figure 1). The new recommendations focused on not only the increased usage of ANC, but also, the importance of a positive pregnancy experience that guarantees quality and equity. The concentration has also shifted from examining the number of ANC visits, to examining components of care provided during these visits. The total of the new recommendations is 49 and they are divided into: maternal and fetus assessment, preventive measures, nutritional interventions, interventions for common physiological symptoms, and health systems interventions. These recommendations were divided into being either recommended, recommended in specific contexts or not recommended [1].

Global, country and regional ANC coverage can be monitored using population based surveys such as the DHS and MICS surveys. These surveys have included a number of key indicators to monitor progress toward the MDG and SDGs. These indicators included ANC attendances, date of first ANC visit and several indicators of the components of care such as blood pressure measurement, tetanus toxoid vaccination, and urine testing [1]. The components of care that were asked consistently across the 6 DHS waves in Jordan and are recommended by the WHO are: blood pressure measurement, tetanus toxoid vaccination, urine and blood testing, weighing and receiving iron supplements.

WHO FANC model	2016 WHO ANC model
<i>First trimester</i>	
Visit 1: 8-12 weeks	Contact 1: up to 12 weeks
<i>Second trimester</i>	
Visit 2: 24-26 weeks	Contact 2: 20 weeks Contact 3: 26 weeks
<i>Third trimester</i>	
Visit 3: 32 weeks	Contact 4: 30 weeks Contact 5: 34 weeks
Visit 4: 36-38 weeks	Contact 6: 36 weeks Contact 7: 38 weeks Contact 8: 40 weeks
Return for delivery at 41 weeks if not given birth.	

**Figure 1: WHO FANC model and the 2016 WHO ANC model**

### 1.3 Antenatal Care in Jordan

Jordan, which is classified as a middle income country by the World Bank [20], achieved Millennium Development Goal 5, to reduce maternal mortality, and this was reflected in a decrease in the maternal mortality ratio from 97.9 per 100,000 live births in

1990 to 24.2 per 100,000 live births by 2015 [21]. Furthermore, Jordan has very good coverage of a number of maternal health indicators, including, a high level of antenatal care coverage with 94% of Jordanian women having more than four antenatal visits, 69% having more than eight antenatal visits and nearly all deliveries occurring in a health facility with a skilled provider [22, 23]. Health services in Jordan are delivered by the public and private sector. The two main public programs that Jordanians are insured in are the Ministry of Health and Royal Medical Services [24]. However, the majority of Jordanian women prefer to access ANC in private clinics and pay out of pocket to receive better quality of services [25, 26]. In addition, Jordan hosts approximately 664,226 Syrian refugees and the majority live in the urban areas of Jordan. Syrian refugees in Jordan benefit from free ANC covered by the UNHCR [27, 28]. The average number of ANC visits for Syrian refugees was found to be 6.2 visits with the majority taking place in private Jordanian clinics [29]. However, the content of care that Syrian women receive during the ANC visits has not been assessed yet.

#### **1.4 Rationale for this thesis**

Antenatal care is an important opportunity to provide women with information and to detect problems at an early stage. A positive ANC experience encourages women to come back to health facilities and assures the continuum of care during pregnancy, at delivery where ANC is an important way of connecting women with health-services and having them make arrangements for delivery in hospital and after the woman's pregnancy [1, 30]. In Jordan, a study by Khader et al. (2018) assessed maternal and newborn services including antenatal care; however, it only examined the availability of ANC services in

hospitals in different regions and at a single year [22]. Few studies have examined factors associated with utilization of 4 ANC visits in Jordan [24]. None of the studies examined the number of ANC visits based on the new WHO guidelines or the determinants of receiving the necessary components of care during ANC visits. In addition, this is the first study that looks at time trends. The objective of this thesis is to describe the variations in ANC utilization, based on the old and new WHO recommendations, and content of care over time and to examine the determinants of the two mentioned outcomes with the following research questions:

1. What are the variations in utilization, content and determinants of antenatal care in Jordan across the 6 DHS waves, during the period 1990 to 2017?
2. How equitable is antenatal care coverage and content in Jordan in public versus private facilities, across different nationalities, age groups, educational levels, socioeconomic statuses, and regions?

**Hypothesis:** This thesis hypothesizes that antenatal care in Jordan has improved across years in terms of utilization and content of care; however, inequities still exist between different nationalities, regions, wealth categories, age groups, educational levels and place of ANC.

## CHAPTER 2

### METHODS

#### **2.1 Study Design and Data Source**

A repeat cross-sectional analysis using Demographic and Health Surveys in Jordan was conducted to address the research questions. DHS are cross-sectional nationally representative household surveys that provide data for a wide range of indicators including maternal and child health indicators in more than 90 countries. DHS have covered antenatal care indicators since 1980 and have been extensively used in maternal and child health research to inform policy change and are considered a valuable source of information for public health researchers in regions with scarcity of publicly available data sets [31]. The DHS have a high response rate that usually exceeds 90% with a large sample size. The questionnaires are standardized which allow for the comparability of data across countries and over time [32]. In Jordan, the DHS is conducted every 5 years, starting 1990. In this thesis, data was used from the last six Demographic and Health surveys particularly the individual recoded data set from years 1990, 1997, 2002, 2007, 2012, and 2017.

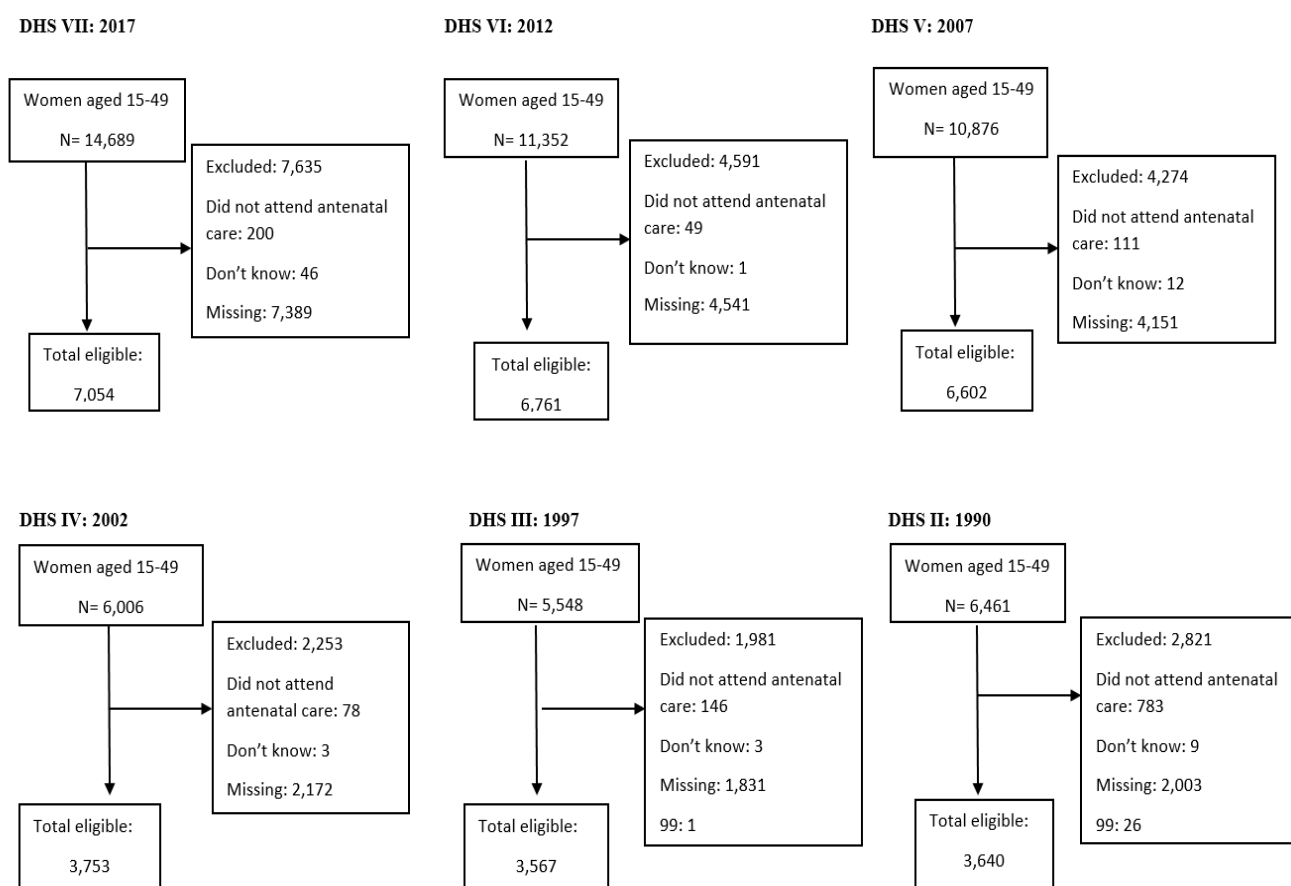
#### **2.2 Sampling and Study Population**

The sampling strategy used in DHS is multistage cluster sampling strategy. Each of the 12 governorates in Jordan is divided into districts, sub-districts, localities, areas and sub areas. Each sub- area is then divided into a census block. The census blocks are grouped into clusters also known as primary sampling units (PSU). After the selection of



the PSUs, household listing takes place in each of the selected clusters. A fixed number of 20 households per cluster are selected with an equal probability of systematic selection [33]. Women were asked about their children in the last 5 years preceding the survey. However, in this study we only considered data from the last birth. All ever married women aged 15-49 and with at least one antenatal care visit were included the analysis. Women who answered zero, don't know or had a missing answer on the question related to the number of antenatal care visits were excluded from the analysis. The derivation of the study population is shown in figure 2.

**Figure 2: Flow charts for sample size**



## **2.3 Concepts and Measures**

### ***2.3.1 Dependent variables***

This thesis considered two outcome variables. These are the frequency of antenatal care (ANC) visits and the content or items of care received during ANC visits.

A. Two definitions are considered for measuring antenatal care coverage throughout pregnancy:

A.1. Based on the old WHO guidelines in 2002: 1 to 3 visits, 4 to 8 visits, and 9 or more visits. Inadequate ANC was considered having less than four visits.

A.2. Based on the new WHO guidelines in 2016: less than 8 visits and 8 or more visits. Inadequate ANC was considered having less than eight visits.

B. Content of Antenatal care:

Measured as the number of specific antenatal care components received during pregnancy. In the last four DHS waves (2002, 2007, 2012 and 2017), women in Jordan were asked whether they received six components during their pregnancy: blood pressure monitoring, urine testing, blood testing, receiving iron syrup or tablets, receiving tetanus shot, and having been weighed. Women were asked whether they received each component at least once during their pregnancy except for tetanus injections, where they were asked for the number of tetanus injections. In this thesis, the responses for tetanus were categorized as Yes/ No.

In addition to the response categories of Yes/ No, tetanus injections and the oral uptake of iron tablets/syrup had “don’t know” as an additional response item. Women who

responded “don’t know” for these two components were classified as not receiving it. Thus, all components had a final response of Yes coded as 1 or No coded as 0. A score for the components of care was formed with a minimum score of 0 and a maximum score 6. The two categories that were studied were 0-4 components (coded as 1) and 5-6 components (coded as 0).

### ***2.3.2 Independent variables***

- (i)* Household wealth: measured through the wealth index made by the DHS: poorest, poorer, middle, richer or richest. The index is calculated based on coefficients and items that are particular to urban and rural areas [31, 34].
- (ii)* Sector of ANC provision: categorized as **home** (the respondent’s home, other home), **public** (government hospital, government health center, university hospital, royal medical services, or other public), **private** (private hospital/clinic, UNRWA Health Center, UNHCR Health Center, other NGO, other private) or **other**. The sector of ANC provision was not asked in 1997 and 2002.
- (iii)* Nationality: categorized as Jordanian, Syrian, or other (Egyptian, Iraq, Other Arab nationalities and Non-Arab nationality). Nationality was only assessed in the most recent DHS survey (2017).
- (iv)* Region: Central (Amman, Zarqa, Balqa, and Madaba), North (Irbid, Jarash, Ajloun, and Mafraq), or South (Karak, Tafiela, Ma’an, and Aqaba).
- (v)* Age of the mother: categorized  $\leq 19$ , 20-24, 25-29, 30-34, or  $\geq 35$ . This categorization allowed us to look at different age groups and to mainly examine

ANC behaviors among advanced aged mothers who are at a higher risk of maternal mortality [4].

(vi) Educational level of the mother: categorized as no education/primary, secondary, or higher. This categorization allowed us to look at the ANC characteristics of lower educated women compared to higher educated women who are at a lower risk of receiving inadequate ANC.

## **2.4 Statistical methods**

Analyses accounted for the complex sampling design using the svyset command, which accounts for weights and clustering. Absolute numbers and weighted proportions of the number of antenatal visits and components of care across as well as their determinants for each of the selected waves of the Jordan DHS were presented. At the bivariate level, cross tabulation with percentages were presented for each determinant and outcome. For every time period, a logistic regression model was used for the binary outcomes ( $<8$  or  $\geq 8$  visits) and (0-4 or 5-6 components) and a multinomial model was used for the nominal outcomes (1-3, 4-8, more than 9 visits) to assess the association between content of care, utilization of care and each of the main independent variables. It was an exploratory analysis that was interested in all factors related the ANC utilization. Adjusted ORs and 95% confidence intervals were reported. Hosmer–Lemeshow goodness-of-fit was performed for each model to assess if the model fits the data well. Data analysis was conducted on Stata v15.

## **2.5 Ethics**

This thesis did not require ethical approval since it was based on a secondary analysis. The DHS data is available and accessible. The DHS follows ethical practices including confidentiality assurance, voluntary participation and informed consent.

## CHAPTER 3

### RESULTS

#### **3.1 Determinants of ANC**

The majority of women who responded to the DHS surveys across the years are between 25 and 29 years old. Most women had completed at least secondary education with slight variations across years. The percentage of women who completed higher education increased considerably from 13.2% to 39.5% between 1990 and 2017. The percentage of women with no/primary education decreased from 36.9% in 1990 to 7.7% in 2017. Most of the women live in central region followed by the north region and lastly the south region. Women were asked about their nationality only in 2017. The majority were Jordanian (85.11%), followed by Syrian (10.92%) and others (3.97%). The majority of the women accessed ANC in private settings compared to public settings, with 70.4% and 29.5% in 2017 respectively (Table 1).

**Table 1: Sample characteristics of women aged 15-49 with a child in the last 5 years and attended at least one ANC visit, by survey**

Independent variable		1990 (N=3640)		1997 (N=3567)		2002 (N=3,753)		2007 (N=6,602)		2012 (N=6,761)		2017 (N=7,054)	
		N	%	N	%	N	%	N	%	N	%	N	%
Age	≤19					118	(3.4)	189	(3.1)	189	(3.00)	293	(4.05)
	20-24					743	(19.8)	1,194	(19.1)	1,169	(18.3)	1,351	(18.9)
	25-29					1,120	(30.4)	1,936	(29.5)	1,965	(29.0)	2,113	(29.9)
	30-34					1,003	(26.5)	1,721	(24.9)	1,762	(25.8)	1,767	(24.9)
	≥35					769	(19.9)	1,562	(23.4)	1,676	(23.8)	1,530	(22.3)
Educational Level	No education/primary	1,388	(36.9)	714	(18.0)	589	(11.7)	758	(7.4)	643	(7.8)	665	(7.70)
	Secondary	1,774	(49.9)	1,993	(57.2)	2,181	(61.1)	3,909	(61.8)	3,837	(59.9)	3,785	(52.8)
	Higher	478	(13.2)	860	(24.8)	983	(27.2)	1,935	(30.8)	2,281	(32.2)	2,604	(39.5)
Region	Central			2,067	(65.5)	1,712	(63.8)	2,411	(61.9)	2,355	(61.6)	2,327	(57.9)
	North			999	(28.1)	1,137	(26.6)	2,197	(29.4)	2,467	(28.9)	2,766	(32.8)
	South			501	(6.4)	904	(9.6)	1,994	(8.7)	1,939	(9.4)	1,961	(9.34)
Wealth index	Poorest							2,049	(22.9)	1,704	(20.8)	2377	(24.5)
	Poorer							1,772	(23.3)	1,763	(21.3)	1882	(23.2)
	Middle							1,386	(21.5)	1,590	(22.5)	1485	(22.0)
	Richer							905	(18.0)	1,141	(20.2)	910	(18.9)
	Richest							490	(14.2)	563	(15.3)	400	(11.4)
Place of ANC	Home	0	(0.00)					2	(0.01)	1	(0.03)	4	(0.04)
	Public	1,672	(44.7)					1,932	(24.6)	1,717	(21.7)	2,516	(29.5)
	Private	1,889	(53.6)					4,666	(75.4)	5,043	(78.2)	4,526	(70.4)
	Other	79	(1.6)					2	(0.01)	0	(0.00)	0	(0.00)
Nationality	Jordanian											5,773	(85.1)
	Syrian											1,018	(10.9)
	Other <sup>1</sup>											263	(3.9)

<sup>1</sup> Egyptian: 40, Iraq: 15, Other Arab nationalities: 193 and Non-Arab nationality: 15

## 3.2 Outcomes of Interest

### 3.2.1 Number of ANC visits across the latest 6 DHS waves

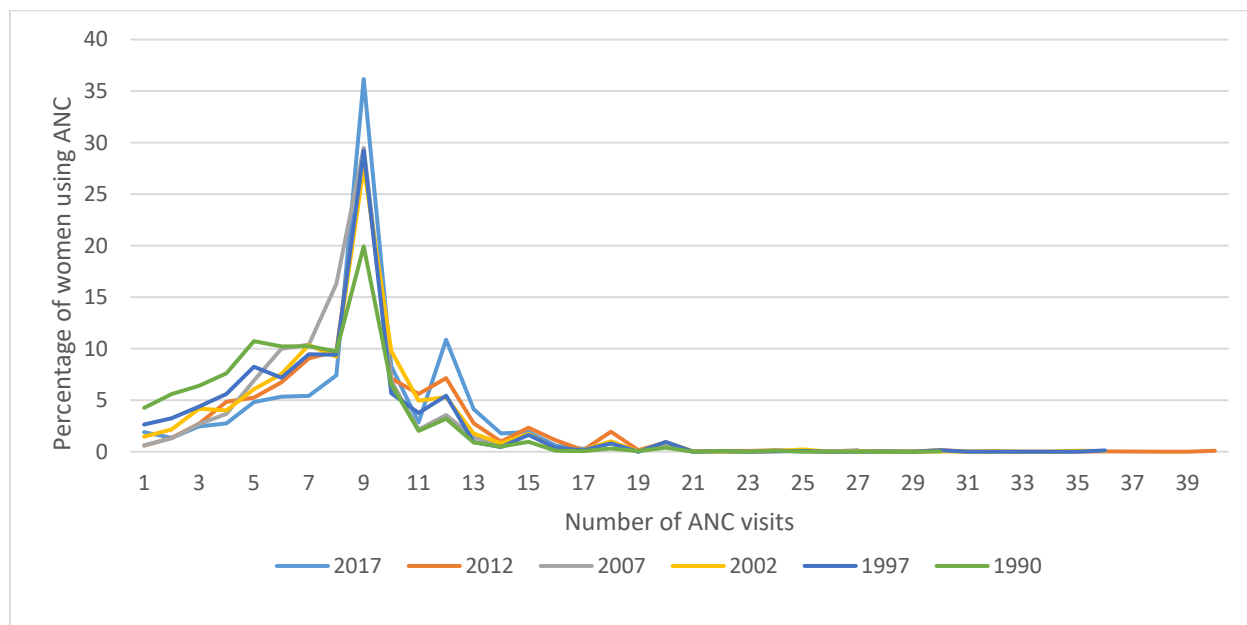
Women across the 6 DHS waves have mostly attended 9 ANC visits throughout their pregnancies (Table 2 and Figure 3). The mean number of visits ranged between 6.85 (S.D.  $\pm 3.28$ ) in 1990 and 8.79 (S.D.  $\pm 3.63$ ) in 2012 and the median of the visits ranged between 7 and 9 (Table 3).

Number of visits	1990		1997		2002		2007		2012		2017	
	N	%	N	%	N	%	N	%	N	%	N	%
1	163	(4.25)	107	(2.64)	65	(1.46)	60	(0.62)	35	(0.60)	152	(1.90)
2	202	(5.60)	121	(3.25)	98	(2.15)	112	(1.31)	87	(1.33)	101	(1.35)
3	238	(6.40)	158	(4.38)	162	(4.17)	222	(2.67)	194	(2.72)	152	(2.45)
4	276	(7.61)	205	(5.61)	164	(4.01)	326	(3.67)	318	(4.85)	196	(2.76)
5	396	(10.73)	292	(8.24)	252	(6.07)	498	(6.90)	421	(5.26)	429	(4.82)
6	376	(10.21)	253	(7.17)	294	(7.55)	649	(9.99)	456	(6.74)	524	(5.34)
7	379	(10.24)	333	(9.46)	415	(10.35)	695	(10.38)	642	(9.06)	444	(5.42)
8	356	(9.75)	325	(9.41)	369	(9.22)	1,034	(16.28)	672	(9.76)	650	(7.40)
9	729	<b>(19.93)</b>	1,054	<b>(29.22)</b>	1,011	<b>(27.64)</b>	1,861	<b>(29.49)</b>	2,087	<b>(28.72)</b>	2,535	<b>(36.16)</b>
10	230	(6.55)	202	(5.68)	314	(9.79)	447	(6.88)	433	(7.11)	645	(8.31)
11	66	(2.01)	133	(3.76)	184	(4.95)	149	(2.16)	334	(5.62)	178	(2.84)
12	107	(3.21)	185	(5.44)	180	(5.30)	222	(3.56)	422	(7.15)	590	(10.87)
13	32	(0.90)	33	(0.93)	59	(1.77)	65	(1.40)	162	(2.77)	170	(4.13)
14	14	(0.50)	17	(0.45)	27	(0.82)	38	(0.64)	93	(0.98)	70	(1.77)
15	35	(0.96)	55	(1.63)	59	(1.74)	81	(1.70)	119	(2.33)	99	(1.91)
16	3	(0.09)	12	(0.37)	11	(0.27)	18	(0.30)	46	(1.10)	22	(0.59)
17	2	(0.06)	4	(0.13)	7	(0.15)	10	(0.19)	16	(0.16)	7	(0.28)
18	11	(0.31)	31	(0.81)	32	(1.00)	57	(0.93)	114	(1.94)	47	(0.85)
19	2	(0.06)	-	-	2	(0.03)	2	(0.04)	6	(0.16)	2	(0.01)
20	15	(0.38)	31	(0.95)	27	(0.93)	36	(0.64)	50	(0.89)	41	(0.88)
>20	8	(0.23)	16	(0.47)	21	(0.60)	20	(0.27)	54	(0.83)	0	(0.00)
<b>Total</b>	<b>3,640</b>	<b>(100)</b>	<b>3,567</b>	<b>(100)</b>	<b>3,753</b>	<b>(100)</b>	<b>6,602</b>	<b>(100)</b>	<b>6,761</b>	<b>(100)</b>	<b>7,054</b>	<b>(100)</b>

Table 2: Number of antenatal care visits across the 6 DHS waves



**Figure 3: Distribution of the number of ANC visits across the 6 DHS waves.**



**Table 3: Descriptive statistics for the ANC visits and the distribution of number of antenatal care visits, by Old and Updated WHO guidelines, across the 6 DHS waves**

ANC visits		1990	1997	2002	2007	2012	2017
<b>Mean</b>		6.85	7.88	8.20	7.97	8.79	8.55
<b>Median</b>		7	8	9	8	9	9
<b>Range</b>		1-30	1-36	1-36	1-27	1-40	1-20
<b>SD</b>		3.28	3.63	3.54	3.02	3.63	2.98
<b>IQR</b>		(5,9)	(6,9)	(6,9)	(6,9)	(7,10)	(7,10)
<b>95% CI of ANC visits</b>		6.74- 6.95	7.76- 8.00	8.08- 8.31	7.90- 8.04	8.71- 8.88	8.48 - 8.62
<b>Old WHO Guidelines (%)</b>	<b>1-3</b>	16.25	10.27	7.78	4.59	4.65	5.69
	<b>4-8</b>	48.55	39.89	37.21	47.23	35.64	25.73
	<b>9+</b>	35.20	49.84	55.00	48.18	59.71	68.58
<b>Updated WHO guidelines (%)</b>	<b>&lt;8</b>	55.04	40.75	35.77	35.55	30.53	24.02
	<b>≥8</b>	44.96	59.25	64.23	64.45	69.47	75.98

Across time, ANC visits in Jordan increased and the majority of the women attended 9+ ANC visits starting 1997. The percentage of 9+ visits increased across years as well, reaching 68.58% in 2017 compared to 35.20% in 1990. On the other hand, the percentage of women attending 1-3 and 4-8 visits decreased over the years from 16.25% to 5.69% and from 48.55% to 25.73% respectively. The number of women receiving <4 has stayed consistent at 5% from 2007 to 2017 (Table 3). After categorizing the number of visits to <8 and ≥8, just over half of women (55.04%) had less than 8 ANC visits in 1990 and this decreased over time to reach 35.77% in 2002 and 24.02% in 2017. On the hand, the number of women who were attending eight and more antenatal care visits increased from 44.96% in 1990 to reach 64.23% and 75.98% in 2002 and 2017 respectively (Table 3).

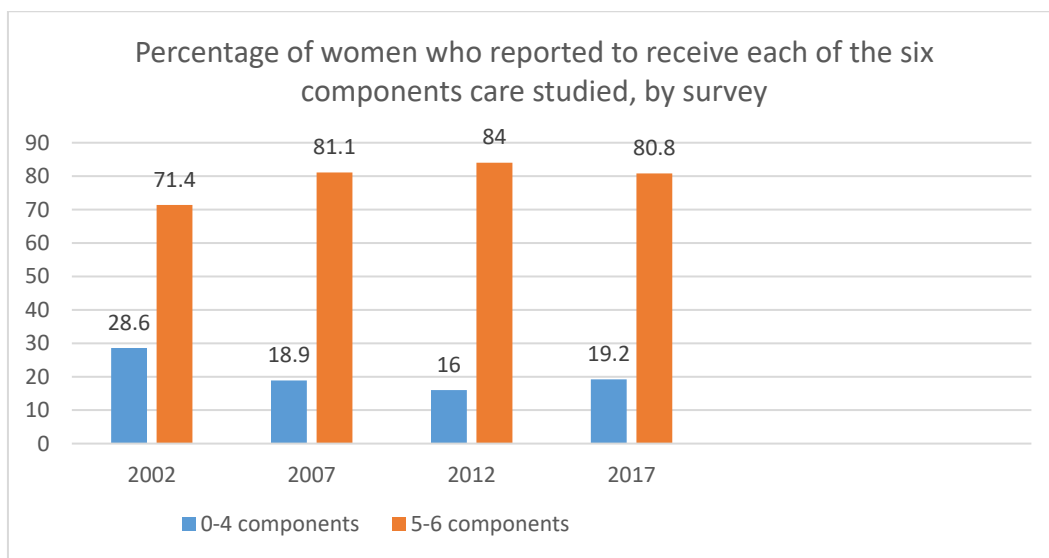
During pregnancy:		2002		2007		2012		2017	
		N(3,753)	%	N (6,602)	%	N(6,761)	%	N(7,054)	%
<b>Weighed</b>	Yes	3,484	93.7	6,368	97.3	6,577	97.2	6,878	97.4
<b>Blood pressure taken</b>	Yes	3,548	95.6	6,420	98.3	6,625	98.2	6,869	97.4
<b>Urine sample taken</b>	Yes	3,292	88.9	6,122	94.1	6,410	95.1	6,748	95.5
<b>Blood sample taken</b>	Yes	3,326	89.8	6,128	94.6	6,420	95.4	6,798	96.5
<b>Given or bought iron tablets/syrup</b>	Yes	2,572	72.9	5,110	81.2	5,653	85.1	5,350	78.7
<b>Tetanus</b>	Yes	1,262	33.7	2,212	31.8	2,197	31.2	2,662	32.8
<b>0-4 components</b>		1,213	28.6	1,492	18.9	1,170	16.0	1,422	19.2
<b>5-6 components</b>		2,540	71.4	5,110	81.1	5,591	84.0	5,632	80.8

**Table 4: Distribution of components of care across the latest 6 DHS waves**

### 3.2.2 Components of care across the latest 4 DHS waves

Women in 1990 and 1997 were not asked about the components provided to them. Nearly all women in 2002 were weighed (93.7%), had their blood pressure measured (95.6%), urine sample taken (88.9%), blood sample taken (89.8%) and were taking iron tablets/ syrup (72.9%). Despite the high prevalence in 2002, they still increased even more by 2017. Out of the 6 collected components, receiving tetanus injections was the least common ANC component received with percentages of 33.7% in 2002 to 32.8% in 2017 (Table 4).

Since 2002, the majority of women have received between 5 and 6 components of care during their ANC visits with slight variations across years. The percentage of women receiving 0-4 components decreased from 28.6% in 2002 to 19.2% in 2017 while the percentage of women receiving 5-6 components increased from 71.4% in 2002 to 80.8% in 2017 (Table 4 and Figure 4).



**Figure 4: Components of care reported to be received during ANC visits, by survey**

### 3.3 Determinants of inadequate ANC visits

#### 3.3.1 Updated WHO Guidelines

Table 5: Using the updated WHO guidelines, distribution of the number of visits (%) by nationality, region, wealth, place of ANC, educational level and age.

Independent variable		1990 (N=3640)		1997 (N=3567)		2002 (N=3,753)		2007 (N=6,602)		2012 (N=6,761)		2017 (N=7,054)	
		<8	≥8	<8	≥8	<8	≥8	<8	≥8	<8	≥8	<8	≥8
Nationality	Jordanian	55.04	44.96	40.75	59.25	35.77	64.23	35.55	64.45	30.53	69.47	21.54	78.46
	Syrian											42.86	57.14
	Other											25.52	74.48
Region	Central			36.22	63.78	32.5	67.50	30.39	69.61	31.84	68.16	19.86	80.14
	North			51.25	48.75	42.66	57.34	44.49	55.51	27.32	72.68	28.60	71.40
	South			40.92	59.08	38.48	61.52	41.96	58.04	31.86	68.14	33.81	66.19
Wealth index	Poorest							45.66	54.34	40.99	59.01	35.36	64.64
	Poorer							37.63	62.37	33.19	66.81	25.68	74.32
	Middle							35.17	64.83	27.96	72.04	20.88	79.12
	Richer							30.03	69.97	26.99	73.01	18.45	81.55
	Richest							23.39	76.61	21.06	78.94	11.70	88.30
Place of ANC	Home	-----	-----					0.00	100.00	100.00	0.00	29.37	70.63
	Public	54.03	45.97					41.33	58.67	33.07	66.93	27.69	72.31
	Private	55.50	44.50					33.67	66.33	29.80	70.20	22.51	77.49
	Other	68.23	31.77					53.54	46.46	-----	-----	----	----
Educational level	No/primary	60.78	39.22	50.77	49.23	45.87	54.13	47.75	52.25	46.18	53.82	40.56	59.44
	Secondary	53.52	46.48	42.50	57.50	37.2	62.80	37.72	62.28	31.95	68.05	25.50	74.50
	Higher	44.73	55.27	29.43	70.57	28.22	71.78	28.25	71.75	24.10	75.90	18.85	81.15
Age	≤19					30.55	69.45	21.38	78.62	28.70	71.30	26.14	73.86
	20-24					32.11	67.89	34.00	66.00	29.38	70.62	25.11	74.89
	25-29					35.25	64.75	33.87	66.13	29.26	70.74	24.51	75.49
	30-34					37.68	62.32	36.02	63.98	30.78	69.22	21.36	78.64
	≥35					38.56	61.44	40.28	59.72	32.94	67.06	25.05	74.95

Table 6: Logistic regression model, examining factors associated with accessing <8 ANC visits compared to ≥8 ANC visits, by survey

Independent Variables		1990		1997		2002		2007		2012		2017	
		OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Nationality	Jordanian(Ref)											1	
	Syrian											1.59	(1.33-1.89)
	Other											1.20	(0.91-1.59)
Region	Central(Ref)			1		1		1		1		1	
	North			<i>1.81</i>	<i>(1.55-2.11)</i>	<i>1.42</i>	<i>(1.21-1.66)</i>	<i>1.69</i>	<i>(1.49-1.92)</i>	0.99	(0.87-1.12)	<i>1.47</i>	<i>(1.28-1.68)</i>
	South			1.11	(0.90- 1.36)	1.16	(0.98-1.37)	<i>1.60</i>	<i>(1.41-1.81)</i>	1.03	(0.90-1.17)	<i>2.06</i>	<i>(1.78-2.38)</i>
Wealth	Richest (Ref)							1		1		1	
	Poorest							<i>1.75</i>	<i>(1.39-2.21)</i>	<i>2.68</i>	<i>(2.09-3.44)</i>	<i>1.72</i>	<i>(1.28-2.31)</i>
	Poorer							<i>1.36</i>	<i>(1.08-1.70)</i>	<i>2.20</i>	<i>(1.72-2.82)</i>	<i>1.47</i>	<i>(1.10-1.97)</i>
	Middle							1.25	(0.99-1.58)	<i>1.92</i>	<i>(1.50-2.45)</i>	1.23	(0.91-1.65)
	Richer							1.13	(0.88-1.45)	<i>1.65</i>	<i>(1.28-2.13)</i>	1.30	(0.95-1.77)
Place of ANC	Private(Ref)	1						1		1		1	
	Public	0.90	(0.78-1.02)					1.05	(0.94-1.18)	0.94	(0.84-1.07)	<i>1.15</i>	<i>(1.02-1.29)</i>
	Home	-----	-----					Omitted		Omitted		0.64	(0.06-6.55)
	Other	<i>1.72</i>	<i>(1.05-2.83)</i>					3.10	(0.19-50.2)	-----	-----	-----	-----
Education	Higher (ref)	1		1		1		1		1		1	
	No/primary	<i>1.82</i>	<i>(1.47-2.25)</i>	<i>2.58</i>	<i>(2.09-3.18)</i>	<i>2.27</i>	<i>(1.83-2.82)</i>	<i>1.81</i>	<i>(1.50-2.18)</i>	<i>1.81</i>	<i>(1.48-2.21)</i>	<i>1.65</i>	<i>(1.34-2.03)</i>
	Secondary	<i>1.32</i>	<i>(1.07-1.61)</i>	<i>1.76</i>	<i>(1.48-2.10)</i>	<i>1.63</i>	<i>(1.38-1.92)</i>	<i>1.29</i>	<i>(1.15-1.46)</i>	<i>1.20</i>	<i>(1.06-1.36)</i>	<i>1.29</i>	<i>(1.14-1.46)</i>
Age	25-29(Ref)					1		1		1		1	
	<=19					0.70	(0.46-1.05)	<i>0.68</i>	<i>(0.49-0.94)</i>	<i>0.67</i>	<i>(0.48-0.95)</i>	0.88	(0.67-1.17)
	20-24					<i>0.75</i>	<i>(0.61-0.91)</i>	<i>0.88</i>	<i>(0.76-1.03)</i>	<i>0.87</i>	<i>(0.74-1.02)</i>	0.97	(0.83-1.13)
	30-34					1.12	(0.94-1.34)	<i>1.15</i>	<i>(1.01-1.32)</i>	<i>1.16</i>	<i>(1.01-1.33)</i>	0.96	(0.83-1.11)
	>=35					1.14	(0.94-1.38)	<i>1.27</i>	<i>(1.11-1.47)</i>	1.08	(0.93-1.24)	1.05	(0.90-1.22)

\*≥8 visits is the reference category

\*Adjusted for all variables

\*Significant results are shown in italics

### 3.3.2 Old WHO Guidelines

**Table 7: Using the old WHO guidelines, distribution of the number of visits (%) by nationality, region, wealth, place of ANC, educational level and age**

	Independent variable	1990 (N=3640)			1997 (N=3567)			2002 (N=3,753)			2007 (N=6,602)			2012 (N=6,761)			2017 (N=7,054)		
		1-3	4-8	9+	1-3	4-8	9+	1-3	4-8	9+	1-3	4-8	9+	1-3	4-8	9+	1-3	4-8	9+
		16.25	48.55	35.20	10.27	39.89	49.84	7.78	37.21	55.00	4.59	47.23	48.18	4.65	35.64	59.71	5.69	25.73	68.58
Nationality	Jordanian																5.01	23.98	71.00
	Syrian																10.7	39.29	50.02
	Other																6.51	25.89	67.60
Region	Central				9.01	36.58	54.41	6.38	34.46	59.15	3.74	43.83	52.42	4.83	36.44	58.72	5.43	20.28	74.28
	North				12.67	48.95	38.38	10.52	42.31	47.17	5.46	54.11	40.42	3.94	34.57	61.48	6.64	30.80	62.56
	South				12.57	33.95	53.48	9.57	41.35	49.07	7.60	48.15	44.25	5.63	33.64	60.73	3.98	41.68	54.33
Wealth index	Poorest										6.92	54.20	38.87	9.31	40.84	49.85	8.45	35.21	56.33
	Poorer										5.04	49.39	45.57	5.43	38.07	56.50	6.45	26.98	66.57
	Middle										3.82	49.33	46.85	4.44	34.62	60.93	5.15	23.08	71.77
	Richer										4.41	41.50	54.08	1.82	33.97	64.21	3.78	20.93	75.28
	Richest										1.46	36.55	61.99	1.26	28.85	69.89	2.46	15.93	81.60
Place of ANC	Private	20.26	44.63	35.11							4.55	45.76	49.68	4.57	34.79	60.64	5.34	24.32	70.33
	Public	11.77	52.47	35.76							4.70	51.73	43.57	4.79	38.74	56.47	6.50	29.13	64.37
	Home	-----	-----								0.00	56.27	43.73	100.0	0.00	0.00	29.37	44.29	26.34
	Other	7.22	70.08	22.70							0.00	53.54	46.46	-----	-----		-----	-----	
Educational level	No/primary	21.12	50.08	28.80	18.55	43.64	37.81	13.89	41.63	44.48	11.24	51.91	36.85	10.39	42.93	46.68	10.21	36.79	52.99
	Secondary	14.46	47.99	37.55	10.15	42.43	47.42	7.70	39.06	53.24	4.39	48.67	46.94	4.94	36.94	58.12	6.01	26.95	67.03
	Higher	9.39	46.36	44.24	4.52	31.31	64.17	5.34	31.15	63.50	3.39	43.23	53.37	2.71	31.44	65.85	4.39	21.95	73.66
Age	≤19							5.09	36.72	58.19	1.60	38.62	59.78	6.32	35.92	57.75	4.76	31.58	63.66
	20-24							6.09	34.96	58.94	3.68	44.15	52.16	3.08	36.85	60.07	5.04	27.25	67.70
	25-29							7.62	36.42	55.96	4.22	46.51	49.26	3.79	35.06	61.15	6.72	24.14	69.13
	30-34							8.46	38.13	53.40	5.78	48.92	45.29	5.71	34.94	59.35	5.84	23.07	71.09
	≥35							9.27	39.50	51.22	4.91	49.99	45.10	5.54	36.12	58.34	4.87	28.46	66.67

**Table 8: Multinomial regression model, examining factors associated with accessing ANC 1-3 and 4-8 compared to  $\geq 9$  times in 1990, 1997 and 2002**

Independent Variables		1990				1997				2002			
		OR(1-3)	95% CI	OR(4-8)	95% CI	OR(1-3)	95% CI	OR(4-8)	95% CI	OR(1-3)	95% CI	OR(4-8)	95% CI
Nationality	Jordanian(Ref)												
	Syrian												
	Other												
Region	Central(Ref)					1				1			
	North					<i>1.94</i>	<i>(1.51-2.51)</i>	<i>1.84</i>	<i>(1.56-2.17)</i>	<i>1.79</i>	<i>(1.35-2.38)</i>	<i>1.39</i>	<i>(1.19-1.64)</i>
	South					<i>1.12</i>	<i>(0.81-1.55)</i>	<i>0.88</i>	<i>(0.71-1.09)</i>	<i>1.57</i>	<i>(1.16-2.13)</i>	<i>1.23</i>	<i>(1.04-1.47)</i>
Place of ANC	Private(Ref)	1											
	Public	<i>0.52</i>	<i>(0.42-0.64)</i>	<i>1.11</i>	<i>(0.96-1.29)</i>								
	Home												
	Other	<i>0.59</i>	<i>(0.23-1.45)</i>	<i>2.49</i>	<i>(1.41- 4.40)</i>								
Education	Higher(ref)	1				1				1			
	No/primary	<i>3.51</i>	<i>(2.49-4.96)</i>	<i>1.55</i>	<i>(1.23-1.95)</i>	<i>7.67</i>	<i>(5.20-11.33)</i>	<i>2.40</i>	<i>(1.92-3.00)</i>	<i>4.37</i>	<i>(3.00-6.36)</i>	<i>1.86</i>	<i>(1.49-2.33)</i>
	Secondary	<i>1.61</i>	<i>(1.15-2.27)</i>	<i>1.16</i>	<i>(0.94-1.45)</i>	<i>3.13</i>	<i>(2.17-4.49)</i>	<i>1.77</i>	<i>(1.49-2.11)</i>	<i>2.12</i>	<i>(1.52-2.95)</i>	<i>1.60</i>	<i>(1.36-1.89)</i>
Age	25-29(Ref)									1			
	$\leq 19$									<i>0.46</i>	<i>(0.19-1.12)</i>	<i>0.79</i>	<i>(0.53-1.18)</i>
	20-24									<i>0.65</i>	<i>(0.45-0.95)</i>	<i>0.77</i>	<i>(0.63-0.94)</i>
	30-34									<i>1.17</i>	<i>(0.86-1.61)</i>	<i>1.10</i>	<i>(0.91-1.32)</i>
	$\geq 35$									<i>1.18</i>	<i>(0.85-1.66)</i>	<i>1.11</i>	<i>(0.91-1.36)</i>

\*9+ visits is the reference category

\*Adjusted for all variables

\*Significant results are shown in italics

**Table 9: Multinomial regression model, examining factors associated with accessing ANC 1-3 and 4-8 compared to  $\geq 9$  times in 2007, 2012 and 2017**

Independent Variables		2007				2012				2017			
		OR(1-3)	95% CI	OR(4-8)	95% CI	OR(1-3)	95% CI	OR(4-8)	95% CI	OR(1-3)	95% CI	OR(4-8)	95% CI
Nationality	Jordanian(Ref)									1			
	Syrian									1.38	(0.99-1.91)	1.55	(1.30-1.86)
	Other									1.47	(0.92-2.36)	1.15	(0.87-1.53)
Region	Central(Ref)	1				1				1			
	North	1.67	(1.27-2.19)	1.49	(1.32-1.69)	1.08	(0.81-1.43)	1.14	(1.01-1.29)	1.44	(1.13-1.84)	1.51	(1.32-1.72)
	South	1.80	(1.37-2.36)	1.29	(1.13-1.46)	1.19	(0.89-1.60)	0.95	(0.83-1.08)	1.03	(0.76-1.40)	2.48	(2.16-2.85)
Wealth	Richest(Ref)	1				1				1			
	Poorest	3.33	(1.85-5.99)	1.88	(1.51-2.35)	10.03	(3.99-25.17)	2.00	(1.59-2.50)	2.63	(1.33-5.19)	1.59	(1.21-2.09)
	Poorer	2.31	(1.28-4.17)	1.60	(1.29-1.99)	6.83	(2.72-17.12)	1.78	(1.42-2.21)	2.50	(1.27-4.89)	1.35	(1.04-1.77)
	Middle	2.01	(1.10-3.64)	1.40	(1.13-1.74)	4.15	(1.63-10.54)	1.64	(1.32-2.04)	1.84	(0.93-3.65)	1.13	(0.86-1.48)
	Richer	1.48	(0.78-2.80)	1.25	(0.99-1.58)	3.23	(1.24-8.42)	1.38	(1.10-1.74)	1.40	(0.67-2.91)	1.19	(0.89-1.58)
Place of ANC	Private(Ref)	1				1				1			
	Public	0.71	(0.56-0.91)	0.97	(0.87-1.09)	0.88	(0.67-1.15)	1.05	(0.93-1.18)	1.09	(0.86-1.37)	1.13	(1.01-1.27)
	Home	Omitted		0.94	(0.05-15.08)	Omitted				4.70	(0.40-54.16)	0.75	(0.06-8.68)
	Other	Omitted		1.46	(0.09-23.64)	-----				-----			
Education	Higher(ref)	1				1				1			
	No/primary	3.11	(2.18-4.44)	1.48	(1.22-1.80)	2.86	(1.93-4.25)	1.60	(1.31-1.96)	1.81	(1.23-2.68)	1.37	(1.11-1.70)
	Secondary	1.38	(1.05-1.83)	1.21	(1.08-1.36)	1.26	(0.92-1.71)	1.16	(1.03-1.31)	1.30	(1.01-1.68)	1.21	(1.07-1.37)
Age	25-29(Ref)	1				1				1			
	$\leq 19$	0.44	(0.17-1.12)	0.80	(0.59-1.09)	0.69	(0.29-1.66)	0.86	(0.63-1.19)	0.58	(0.32-1.06)	1.00	(0.76-1.31)
	20-24	0.92	(0.65-1.32)	0.85	(0.73-0.98)	1.13	(0.77-1.65)	0.94	(0.81-1.10)	0.78	(0.57-1.07)	0.97	(0.83-1.14)
	30-34	1.68	(1.25-2.25)	1.07	(0.94-1.23)	1.50	(1.08-2.09)	1.11	(0.96-1.27)	1.02	(0.77-1.35)	1.02	(0.88-1.17)
	$\geq 35$	1.75	(1.29-2.38)	1.21	(1.05-1.39)	1.48	(1.07-2.06)	1.02	(0.89-1.18)	1.03	(0.77-1.38)	1.15	(0.99-1.33)

\*9+ visits is the reference category

\*Adjusted for all variables

\*Significant results are shown in italics



### **Nationality**

Among Jordanian women, 21.54 % accessed less than 8 ANC visits and 5.01% accessed less than 4 ANC visits, while among Syrian women, 42.86% accessed less than 8 ANC visits and 10.7% accessed less than 4 ANC visits. Both, Syrian women and women from other nationalities accessed less ANC visits compared to Jordanian women. Adjusting for region, wealth, place of ANC, education and age, the odds of having less than 8 ANC visits were 1.59 (95% CI: 1.33-1.89) and 1.20 (95% CI: 0.91-1.59) times for a Syrian and for a woman from other nationality respectively compared to a Jordanian woman in 2017. The categorization of the number of ANC visits into 1-3, 4-8 and 9+ showed that, taking into account other variables, the odds of having less than 4 ANC visits were 1.38 (95% CI: 0.99-1.91) and 1.47 (95% CI: 0.92-2.36) times for a Syrian and for a woman from other nationality respectively compared to a Jordanian woman in 2017 but the results were not statistically significant.

### **Region**

The use of ANC increased in the three regions between 1997 and 2017. Across all waves, women living in the central region had the least access to inadequate ANC (<8 visits) compared to women living in the northern and southern region. Adjusting for other variables, the odds of having less than 8 ANC visits were 1.81 (95% CI: 1.55-2.11) and 1.47 (95% CI: 1.28-1.68) times for women living in the north compared to women living in the center in 1997 and 2017, respectively. There were slight variations in 2012. For women living in the south, after taking into account other variables, the odds of having less than 8 ANC visits were 1.11 (95% CI: 0.90- 1.36), which is not statistically significant, and 2.06 (95% CI: 1.78-2.38) times compared to women living in the center in 1997 and 2017,

respectively. The categorization on ANC visits to 1-3, 4-8 and 9+ shows that the percentage of women accessing less 4 ANC visits decreased over time. Across all waves, women living in the central region had accessed less inadequate ANC (<4 visits) compared to women living in the northern and southern region. Adjusting for other variables, the odds of having less than 4 ANC visits were 1.94 (95% CI: 1.51-2.51) and 1.44 (95% CI: 1.13-1.84) times for women living in the north compared to women living in the center in 1997 and 2017, respectively. For women living in the south, after adjusting for other variables, the odds of having less than 4 ANC visits were 1.12 (95% CI: 0.81-1.55) and 1.03 (95% CI: 0.76-1.40) times compared to women living in the center in 1997 and 2017, respectively but the results were not statistically significant.

### **Wealth**

A larger proportion of women who belong to the poorest wealth category had accessed <8 ANC visits compared to other wealth categories with consistencies across time. Results from regression analysis showed that the odds of having less than 8 ANC visits were 1.75 (95% CI: 1.39-2.21) and 1.72 (95% CI: 1.28-2.31) times in poorest wealth category compared to the richest wealth category in 2007 and 2017, respectively. Similarly, women who belong to the poorest wealth category had accessed <4 ANC visits compared to other wealth categories. Adjusting for other variables, the odds of having less than 4 ANC visits were 3.33 (95% CI: 1.85-5.99) and 2.63 (95% CI: 1.33-5.19) times in poorest wealth category compared to the richest wealth category in 2007 and 2017, respectively.

### **Place of ANC**

The results of the place of ANC with respect to receiving inadequate ANC varied across years. In 1990 and 2012, after adjusting for other variables, the odds of having less

than 8 ANC visits were 0.90 (95% CI: 0.78-1.02) and 0.94 (95% CI: 0.84-1.07) times lower in public settings compared to private settings, respectively; although this was not statistically significant. The results were varied in 2007 and 2017, where the odds of having less than 8 ANC visits were 1.05 (95% CI: 0.94-1.18) and 1.15 (95% CI: 1.02-1.29) times in public compared to private respectively based on the results from regression analysis. In 1990 and 2007 the odds of having less than 4 ANC visits were 0.52 (95% CI: 0.42-0.64) and 0.71 (95% CI: 0.56-0.91) times lower in public compared to private sector facilities adjusting for other variables. In 2012 and 2017, the results were not statistically significant between public and private with odds of 0.88 (0.67-1.15) and 1.09 (95% CI: 0.86-1.37) in public compared to private, respectively taking into account other variables.

### **Education**

Across all years, women with lower education had inadequate use of ANC compared to those with higher education with consistencies across time. In 2017, the odds of having less than 8 ANC visits were 1.65 (95% CI: 1.34-2.03) for primary educated women and 1.29 (95% CI: 1.14-1.46) times for women who completed their secondary education compared to women who completed higher education adjusting for other variables. In 2017, the odds of having less than 4 ANC visits were 1.81 (95% CI: 1.23-2.68) for primary educated women and 1.30 (95% CI: 1.01-1.68) times for women who completed their secondary education compared to women who completed their higher education taking into account other variables.

### **Age**

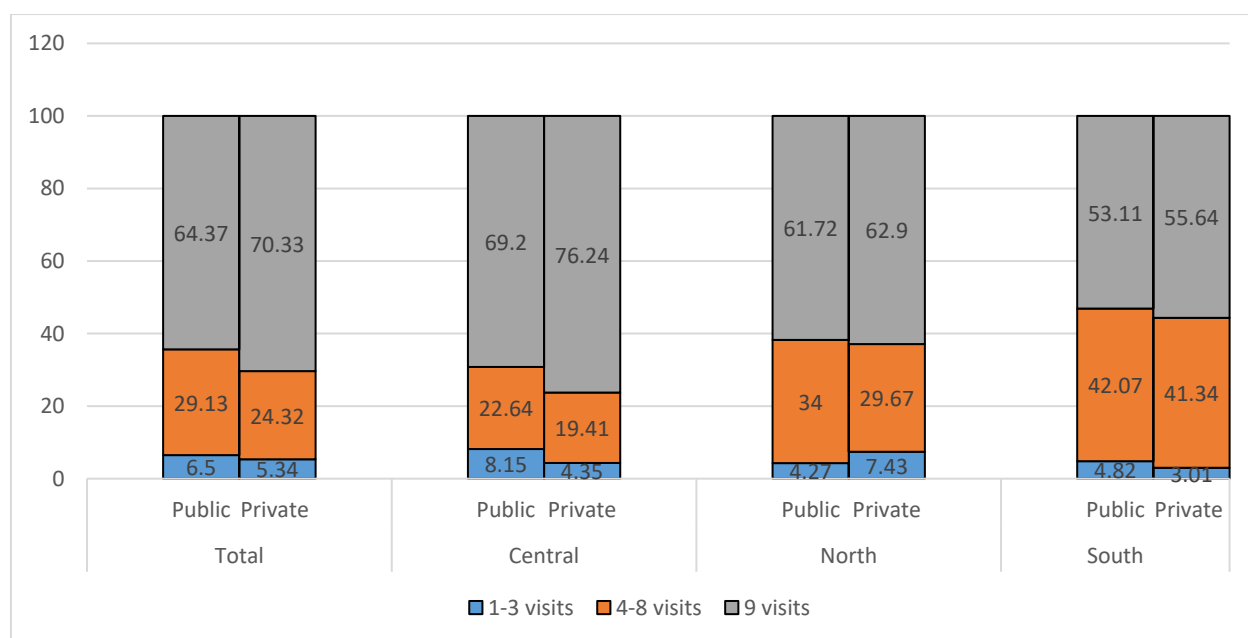
The risk of inadequate ANC use was higher at older age and lower for younger age groups. Older age groups had inadequate ANC compared to lower age groups consistently

across years. In 2007, the odds of having less than 8 ANC visits were 0.68 (95% CI: 0.49-0.94) times lower for  $\leq 19$  old women and 1.27 (95% CI: 1.11-1.47) for women  $\geq 35$  compared to women who were between 25 and 29 years old taking into account other variables. In 2007, the odds of having less than 4 ANC visits were 0.44 (95% CI: 0.17-1.12) times lower for  $\leq 19$  old women and 1.75 (95% CI: 1.29-2.38) for women  $\geq 35$  compared to women were between 25 and 29 years old adjusting for other variables. However, the results of lower age groups are not statistically significant.

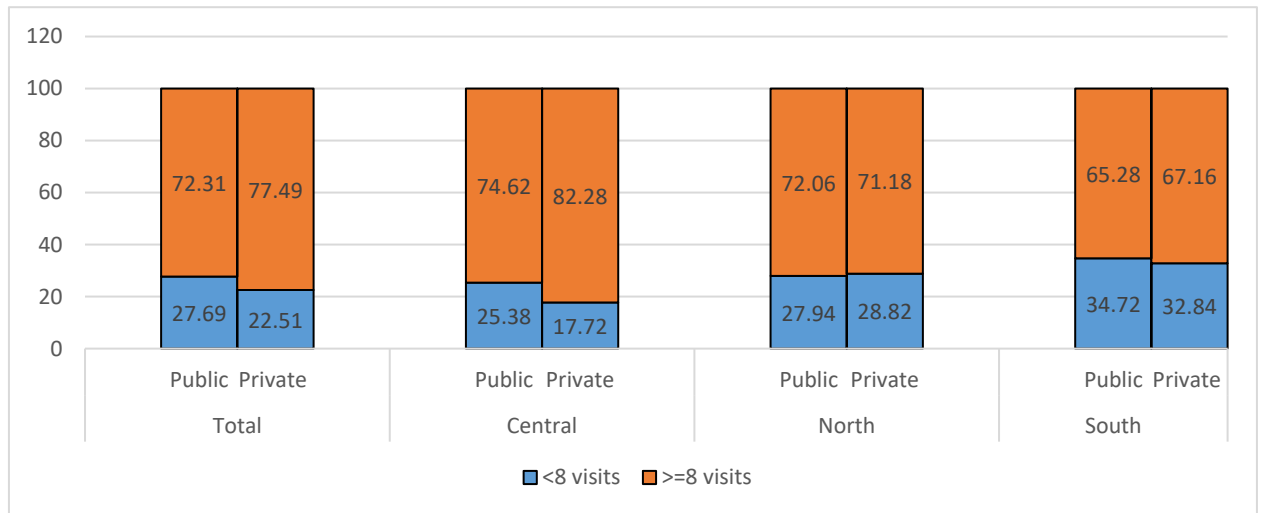
**Table 10: Hosmer–Lemeshow for goodness-of-fit for number of visits**

DHS wave	1990	1997	2002	2007	2012	2017
Outcome 1: <8, $\geq 8$	0.0862*	0.0464	0.7891*	0.0309	0.2797*	0.1169*
Outcome 2: 1-3, 4-8, 9+	-----	-----	0.848*	0.347*	0.082*	0.759*

\*model fits the data well



**Figure 5: Percentage of women using ANC with one to three, four to eight, and nine or more ANC visits, by region and sector of provision in 2017**



**Figure 6: Percentage of women with <8 or ≥8 ANC visits, by region and sector of provision in 2017**

### 3.4 Determinants of receiving inadequate components of care during ANC visits

**Table 11: Distribution of receiving 0-4 or 5-6 components of care (%) across nationality, region, wealth, place of ANC, educational level**

Independent variables		2002		2007		2012		2017	
		0-4	5-6	0-4	5-6	0-4	5-6	0-4	5-6
Nationality	Jordanian							18.21	81.79
	Syrian							26.71	73.29
	Other							20.89	79.11
Region	Central	23.89	76.11	14.16	85.84	14.22	85.78	18.37	81.63
	North	36.24	63.76	26.85	73.15	18.87	81.13	19.23	80.77
	South	39.10	60.90	25.72	74.28	18.81	81.19	24.75	75.25
Wealth	Poorest			25.50	74.50	20.96	79.04	22.29	77.71
	Poorer			19.34	80.66	15.02	84.98	20.63	79.37
	Middle			19.14	80.86	16.13	83.87	15.95	84.05
	Richer			12.84	87.16	14.88	85.12	20.55	79.45
	Richest			14.87	85.13	11.91	88.09	14.12	85.88
Place of ANC	Private			18.49	81.50	15.32	84.68	16.61	83.39
	Public			20.18	79.82	18.33	81.67	25.47	74.53
	Home			56.27	43.73	100.0	0.00	73.66	26.34
	Other			0.00	100.00	-----	-----	-----	-----
Education	No/primary	42.05	57.95	32.46	67.54	24.33	75.67	31.42	68.58
	Secondary	29.06	70.94	19.24	80.76	16.66	83.34	19.90	80.10
	Higher	21.86	78.14	14.98	85.02	12.75	87.25	16.02	83.98
Age	<=19	24.56	75.44	15.09	84.91	14.40	85.60	19.00	81.00
	20-24	23.03	76.97	16.42	83.58	13.57	86.43	20.20	79.80
	25-29	29.51	70.49	19.14	80.86	14.19	85.81	19.37	80.63
	30-34	30.66	69.34	17.33	82.67	17.35	82.65	19.85	80.15
	>=35	30.82	69.18	22.81	77.19	18.83	81.17	17.65	82.35

and age in 2002, 2007, 2012 and 2017

**Table 12: Logistic regression model, examining factors associated with receiving 0-4 components compared to 5-6 components of care during ANC visits in 2002, 2007, 2012 and 2017.**

Independent Variables		2002		2007		2012		2017	
		OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Nationality	Jordanian(Ref)							1	
	Syrian							1.22	(1.00-1.49)
	Other							0.84	(0.60-1.18)
Region	Central(Ref)	1		1		1		1	
	North	<i>1.65</i>	<i>(1.40-1.95)</i>	<i>2.18</i>	<i>(1.88-2.53)</i>	<i>1.58</i>	<i>(1.35-1.86)</i>	<i>1.02</i>	<i>(0.88-1.19)</i>
	South	<i>1.75</i>	<i>(1.46-2.08)</i>	<i>1.76</i>	<i>(1.51-2.06)</i>	<i>1.73</i>	<i>(1.46-2.04)</i>	<i>1.46</i>	<i>(1.25-1.70)</i>
Wealth index	Richest(Ref)			1		1		1	
	Poorest			<i>1.45</i>	<i>(1.10-1.92)</i>	<i>1.67</i>	<i>(1.24-2.24)</i>	<i>1.26</i>	<i>(0.92-1.72)</i>
	Poorer			<i>1.22</i>	<i>(0.92-1.61)</i>	<i>1.28</i>	<i>(0.95-1.72)</i>	<i>1.20</i>	<i>(0.89-1.63)</i>
	Middle			<i>1.12</i>	<i>(0.84-1.49)</i>	<i>1.30</i>	<i>(0.97-1.75)</i>	<i>1.02</i>	<i>(0.74-1.39)</i>
	Richer			<i>0.92</i>	<i>(0.67-1.25)</i>	<i>1.19</i>	<i>(0.88-1.62)</i>	<i>1.18</i>	<i>(0.85-1.62)</i>
Place of ANC	Private(Ref)			1		1		1	
	Public			<i>1.02</i>	<i>(0.90-1.17)</i>	<i>1.01</i>	<i>(0.87-1.17)</i>	<i>1.44</i>	<i>(1.27-1.64)</i>
	Home			<i>4.34</i>	<i>(0.26-70.96)</i>	Omitted		<i>3.82</i>	<i>(0.52-28.17)</i>
	Other			Omitted		-----		-----	
Education	Higher(ref)	1		1		1		1	
	No/primary	<i>2.57</i>	<i>(2.06-3.21)</i>	<i>2.41</i>	<i>(1.96-2.96)</i>	<i>1.72</i>	<i>(1.36-2.17)</i>	<i>1.70</i>	<i>(1.35-2.14)</i>
	Secondary	<i>1.56</i>	<i>(1.31-1.86)</i>	<i>1.27</i>	<i>(1.10-1.47)</i>	<i>1.17</i>	<i>(1.00-1.37)</i>	<i>1.20</i>	<i>(1.04-1.38)</i>
Age	25-29(Ref)	1		1		1		1	
	≤19	<i>0.62</i>	<i>(0.40-0.97)</i>	<i>0.76</i>	<i>(0.51-1.11)</i>	<i>1.01</i>	<i>(0.67-1.53)</i>	<i>0.87</i>	<i>(0.63-1.20)</i>
	20-24	<i>0.76</i>	<i>(0.62-0.94)</i>	<i>0.83</i>	<i>(0.69-1.00)</i>	<i>1.04</i>	<i>(0.85-1.27)</i>	<i>0.99</i>	<i>(0.83-1.18)</i>
	30-34	<i>1.03</i>	<i>(0.86-1.24)</i>	<i>1.07</i>	<i>(0.91-1.25)</i>	<i>1.30</i>	<i>(1.09-1.55)</i>	<i>1.16</i>	<i>(0.99-1.36)</i>
	≥35	<i>1.03</i>	<i>(0.84-1.26)</i>	<i>1.10</i>	<i>(0.93-1.29)</i>	<i>1.15</i>	<i>(0.96-1.37)</i>	<i>1.13</i>	<i>(0.95-1.33)</i>

\*5-6 components is the reference category

\*Adjusted for all variables

\*Significant results are shown in italics

### **Nationality**

In 2017, 26.71% of the Syrian women received 0-4 components of care compared to 18.21% of the Jordanian and 20.89% of the women from other nationalities. Results from the regression analysis show that the odds of receiving 0-4 components of ANC care were 1.22 (95% CI: 1.00-1.49) and 0.84 (95% CI: 0.60-1.18) times lower for a Syrian woman and for a woman from other nationality compared to a Jordanian woman, respectively, although these results were not statistically significant.

### **Region**

The number of ANC components received by a woman varied by region with consistency across time. In 2007, the proportion of women receiving 0-4 components of ANC was 26.85%, 25.72% and 14.16 % in the northern, southern and central regions, respectively. Women living in the northern and southern regions were at higher odds of receiving fewer components of ANC in comparison to women residing in the central region, which was consistent across all years. In 2012, regression analysis results show that the odds of receiving 0-4 components were 1.58 (95% CI: 1.35-1.86) and 1.73 (95% CI: 1.46-2.04) times for a woman living in the north and the south respectively compared to a woman living in the center.

### **Place of ANC**

Comparing the private and public sector, the percentage of women who received inadequate number of antenatal care components varied slightly between the two sectors. In 2017, the odds of receiving 0-4 components were 1.44 (95% CI: 1.27-1.64) times for women who attended ANC in public settings compared to women who attend ANC in



private settings, adjusting for other variables. There was no significant difference between the two sectors in 2007 and 2012.

### **Wealth**

The percentage of women who received 0-4 components was higher in the poorest wealth categories and with consistency across all years. In 2007, 25.50% of the women who belong to the poorest category received 0-4 components compared to 14.87% of the richest women. The difference in receiving 0-4 components of care was only significant between the poorest categories compared to the richest categories. The odds of receiving 0-4 components were 1.45 (95% CI: 1.10-1.92) and 1.67 (95% CI: 1.24-2.24) times for women who belong to the poorest category compared to women who belong to the richest category in 2007 and 2012 respectively, taking into account other variables.

### **Education**

Women with less education receive fewer components of ANC compared to more educated mothers with consistencies across time. In 2002, 42.05% of the primary and non-educated women received 0-4 components compared to 21.86% of the higher educated women. In 2017, the odds of receiving 0-4 components were 1.70 (95% CI: 1.35-2.14) times for non/primary educated mothers compared to higher educated mothers while the odds of receiving 0-4 components were 1.20 (95% CI: 1.04-1.38) times for secondary educated mothers compared to higher educated mothers, taking into account other variables.

### **Age**

Older age groups were at increased odds of receiving fewer components of care during ANC visits compared to lower age groups; however the difference between age groups was only significant in 2002. In 2002, regression analysis results show that the odds of receiving 0-4 components were 0.62 (0.40-0.97) and 0.76 (0.62-0.94) times lower for women aged  $\leq 19$  years and 20-24 years respectively compared to women aged between 25 to 29.

**Table 13: Hosmer–Lemeshow for goodness-of-fit for components of care**

DHS wave	2002	2007	2012	2017
Outcome 3: 0-4 or 5-6 components	0.5578*	0.3258*	0.0441	0.0971*

\*model fits the data well

**Table 14: Distribution of number of ANC visits by components of care across the latest 4 DHS waves**

During pregnancy:		2002		2007		2012		2017	
		<8	$\geq 8$	<8	$\geq 8$	<8	$\geq 8$	<8	$\geq 8$
<b>Weighed</b>	Yes	34.08	65.92	35.00	65.00	29.75	70.25	23.23	76.77
<b>Blood pressure taken</b>	Yes	34.16	65.84	35.03	64.97	29.85	70.15	23.23	76.77
<b>Urine sample taken</b>	Yes	32.72	67.28	33.81	66.19	29.15	70.85	22.48	77.52
<b>Blood sample taken</b>	Yes	32.77	67.23	34.02	65.98	29.26	70.74	22.8	77.2
<b>Given or bought iron tablets/syrup</b>	Yes	30.19	69.81	32.75	67.25	28.97	71.03	21.66	78.34
<b>Tetanus</b>	Yes	32.77	67.23	32.84	67.16	30.23	69.77	23.81	76.19

Comparing separate components with the number of ANC visits shows that the majority of the women who had each component measured had  $\geq 8$  ANC visits (Table 14).

## CHAPTER 4

### DISCUSSION

#### **4.1 Main findings**

Using nationally representative data, this work presented a broad analysis of ANC services in Jordan across 6 different DHS waves from 1990 to 2017. It showed that ANC utilization has been high since 1990 with the majority of women attending 9 visits. Jordan's ANC coverage improved even more to reach 36.16% of women attending 9 visits and 68.58% attending 9+ visits throughout their pregnancies in 2017. These percentages varied across the studied determinants which were: age, wealth, region, nationality, educational level and place of antenatal care. All the determinants remained consistent across time except for the place of ANC. With the increase in ANC utilization across time, the percentage of women who received all the six measured components increased slightly to reach 80.8% in 2017 compared to 71.4% in 2002.

#### **4.2 Contextualization of findings**

##### ***4.2.1 Nationality***

The difference in the number of ANC visits was significant between Jordanian and Syrian women, where Jordanian women accessed more ANC visits. However, the difference in receiving inadequate number of components of care between the Jordanian and Syrian women was of modest significance and can be explained by the fact that Syrian women in Jordan, particularly who meet vulnerability criteria, have free access to antenatal

care by the UNHCR and those with a Ministry of Interior card pay heavily subsidized rates [35]. However, some of them still do not access ANC due to other costs and due to the economic hardships they face [36]. In the Syrian Refugee Health Access Survey in Jordan in 2014, the mean number of ANC visits reported by the Syrian women is 6.2. However, the average month of pregnancy in which the first ANC visit took place was 4.7, which means that the timing of the first ANC visit was not early compared to the average number for Syrian refugees in Lebanon which was 3.9. As a consequence, the later they start, the less likely they are to receive the full number of visits. Syrian women reported cost, not thinking that ANC was important, ANC not being a priority for the household and not knowing where to go as barriers to accessing ANC [37, 38].

#### ***4.2.2. Geographical disparities***

Women living in the northern and southern regions of Jordan were of higher odds of receiving fewer components of care as well as attending fewer ANC visits. Some of the public centers in these regions do not provide Maternal and Child Health services [26] ; thus, women are less likely to pay out of pocket for private clinics and end up not getting the required and adequate services and not travelling far to access ANC. These findings are consistent with other studies which showed that living close to a clinic increases the utilization of ANC due to less transport costs and indirect costs [39]. This is in addition to the large influx of refugees to the northern governorates of Jordan who usually access less visits compared to Jordanian women [40]. As for the components of care, a study that assessed the provision of antenatal care services in different regions in Jordan has found

wide variations. It found that out 13 out of the 14 chosen hospitals (92.2%) in the North do not provide tetanus toxoid vaccination and 9 out of the 14 hospitals (64.3%) do not provide iron supplementation. In the south, none of the hospitals provided tetanus toxoid vaccination and 42.9% did not provide iron supplementation. Numbers were lower for hospitals in the center. Blood pressure and blood samples were available in all hospitals [22]. This indicates that the health system factors in the Southern and Northern regions are affecting ANC quality of services.

#### ***4.2.3 Place of ANC***

Since 1990, more than half of the women (53.6%) accessed the private sector for ANC services. However, this private-public gap increased with years. In 2012, 78.2% of women accessed ANC in the private sector. Women prefer to access maternal services in private clinics rather than public ones except for emergencies, which are of high cost in the private sector. This finding is worrying especially that the majority of the women in Jordan are publicly insured and that ANC services are free of charge in the public sector. Qualitative studies highlighted that women reported lack of confidence, lack of privacy and low quality services in public settings as barriers to accessing ANC there [23, 41]. This thesis showed that women who access ANC in public settings are of higher odds of receiving inadequate number of components of care; however, the difference between the two sectors was not significant across all years. Other factors that women reported as barriers to accessing care in the public sector is the high travel costs particularly for women

living in disadvantaged communities [26]. Thus, the proximity of the facility is a major determinant for the choice of facility; however, it is not asked by the DHS.

#### ***4.2.4 Wealth***

Women who belong to wealthier categories accessed more ANC visits compared to women who belong to poorer wealth categories and this is consistent with other studies [42, 43]. Women who belong to lower wealth categories also had higher odds of receiving less components of care. However, the difference was only significant between the poorest and richest categories again because ANC is free in Jordan which means that even women who belong to poorer and middle categories receive the necessary components. This again highlights the association between the standards of living and maternal health care.

#### ***4.2.5 Education***

Woman's level of education was found to be an important predictor to the frequency of ANC visits and to the receipt of components of care during ANC visits. These findings are consistent with the literature from different countries [24, 44, and 45]. This can be explained in different ways. Educated mothers are more likely to know about maternal care and importance of frequent visits with appropriate components given during these visits for her health and the health of her baby [46, 47]. Educated mothers are also more autonomous and more likely to make informed decisions such as her own health. Moreover, educated mothers are more likely to be working and are financially more capable compared

to unemployed and non-educated women [24]. This highlights the importance of education for the achievement of better quantity and quality of ANC usage.

#### ***4.2.6 Age of the mother***

Women who belong to lower age groups are of lower risk of getting inadequate care for both, the number of visits and the components received during these visits. This is consistent with other results that found that women in younger age groups were more likely to have ANC services compared to women in higher age groups [48]. However, this is contradictory to some studies that mentioned that younger women particularly <20 years might be less likely to access ANC due to several reasons that might include: age differences between them and other pregnant women, and embarrassment about an unplanned pregnancy [49].

#### ***4.2.7 Number of ANC visits and the components received during these visits***

Results show that there is a significant positive association between higher number of ANC components and the frequency of ANC visits. It is shown that women who did not receive a component of care during the visits were more likely to have less than 8 ANC visits. On the other hand, women who had received the component of care were more likely to have more than 8 ANC visits. Comparable findings were reported by many studies in different settings [43, 50 and 51].

### **4.3 Strengths and limitations**

This thesis analyzed large datasets that are based on the Demographic Health Surveys which are nationally representative with validated and standardized methodologies and questionnaires. This makes the results generalizable at the national level and comparable between and across countries and years. This study is the first of its kind to look into time trends in Jordan starting 1990. This gives the reader as well as policy makers an overview of the changes over time. It is also one of the first studies in Jordan that evaluated the ANC visits with respect to the new WHO recommendations (minimum of 8 visits) rather than the old recommendations of four visits. The data collected by the DHS is of high quality and missing data is very low.

However, the data is cross sectional and is based on women who had given birth to a child in the last 5 years preceding the survey. This retrospective and self-reporting nature of the data collected might have led to recall bias particularly with respect to the number of visits and number of components received during these visits.

The main determinants studied were socio-economic and demographic. Other potential factors might have acted as barriers for achieving recommended level of ANC services such as cost of care, availability and accessibility of health facilities, and timing of ANC visits but were not collected by the DHS.

Furthermore, not all of the studied determinants were available across all years which led to different models and the DHS does not assess all the components that are required by the WHO. This thesis studied ANC characteristics for the last birth which might have missed looking at how ANC behaviors change between different pregnancies.



## CHAPTER 5

### CONCLUSION

Although Jordan had a very high rate of ANC utilization starting 1990, percentages still increased until 2017. It is an example of a country that has improved and is still improving in the antenatal care field, with more than 68% of the women accessing more than 9 visits in 2017. As for the components of care during ANC visits, despite the fact that 80% of the women responding to the survey reported receiving the six components studied, certain components such as tetanus injections were received by few women (32.8%). This highlights the importance of looking into the components provided during the visits and shifting interventions from measuring coverage to measuring the components of coverage and equity in accessing ANC. The results of this study are of significance to policy makers to intervene and put effort in areas with highest quality gaps, focusing of the vulnerable population who are always at a disadvantage and on inequities that were detected between different socioeconomic statuses, regions, nationalities, age groups, education levels and even place of ANC. Further research is needed to examine structural determinants behind the imbalance between components received and coverage.

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