

Socio-Economic and Demographic Determinants of Utilization of Maternal Health Care in Mauritania, 2001

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I. INTRODUCTION:

Providing MHC is of particular importance for both mother and child; it reduces the risk of pregnancy-related morbidity and mortality and reduces infant mortality as well. It is not enough that these services are made available, they must be utilized. In developing countries, even the limited services that are available are not fully utilized. Many pregnant women under great pressure to meet economic, household and child care responsibilities tend to neglect their health problems until they are too sick to move around. They are often dependent on other family members or friends to help them to get temporary and non-useful medication, which typically has the effect of delaying visits to health professionals, and deteriorating the illness, and certainly results in critical consequences during delivery. (World Bank, 1999).

Infants and children also suffer as a result of poor MHC. Children in their neonatal stage of life are most likely to suffer from neonatal tetanus, low birth weight and consequences from STDs (if the mother had infections), as a result of poor health care of the mother during pregnancy. The poor health of mothers and children represents a drain on all development efforts. Pregnancy related mortality and morbidity are preventable with simple cost effective interventions, including maximum utilization of MHC services. Failure to do so is a denial of fundamental human rights, the right to the highest attainable level of health. (Nagendi.G, 2001).

1.1. Importance of the Study:

The poor health and nutrition of women and the lack of care that contributes to their death in pregnancy and childbirth also compromise the health and survival of infants and children they leave behind. It is estimated that nearly two-thirds of the 8 million infant deaths that occur each year result largely from poor maternal health and hygiene, inadequate care, inefficient management of delivery, and lack of essential care of the newborn. (WHO, 2005).

This study is expected to identify the socio-economic and demographic characteristics of the unfortunate segment of the female population who under utilize the MHC services for different reasons and therefore suffer from high infant mortality rates. In addition, it will add more information on how to raise and improve the health status of women and children. (M. Ahmed, 2006)

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1.2. Objectives of the Study:

The overall objectives of the study are to describe and analyse the demographic and socio-economic determinants of maternal health care utilization and their impact on infant mortality. The specific objectives of the study include:

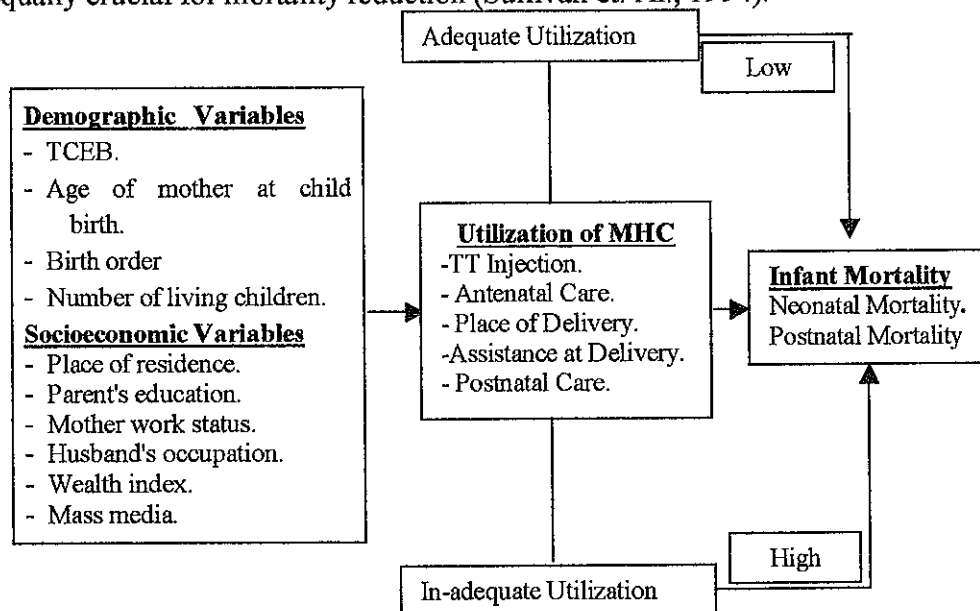
- To identify and examine maternal health care services offered to women in reproductive age.
- To examine the trends of utilization of maternal health care services (tetanus toxoid injection injections, antenatal care, medical assistance at child birth, place of delivery and post-natal care).
- To determine the factors influences the utilization of maternal health care services.

1.3. Data Sources and Limitations:

This study relies mainly on secondary data obtained from the final report of demographic health survey in Mauritania 2001. The questionnaire included information on each woman's residence, education, number of living children, antenatal care, place of delivery, attendants during delivery and postnatal care.

1.4. Conceptual Framework:

Although a substantial reduction in mortality can be achieved through socio-economic development, other factors such as use of health care services may be equally crucial for mortality reduction (Sullivan et. Al., 1994).



Source: Developed by the researcher.

1.5. Methodology:

The study is a retrospective one. It utilizes the data derived mainly from MDHS 2001 and other secondary data sources to study the factors that influence utilization of maternal health care services in Mauritania through:

- Simple analysis using cross tabulation and chi-square test are used to investigate and clarify the differentials in the utilization of maternal health care services by selected demographic and socioeconomic factors.
- The contingency coefficient is used to test for correlation and the strength of these relationships between the dependent and independent variables.
- Logistic regression model will be used to examine the net effect of each variable on maternal health care services utilization indicators (TT, ANC, Assistance at delivery, Place of delivery and Post-natal care). Logistic regression coefficients can be used to estimate odds ratio for each of the independent variables with a multivariate technique for estimating the probability that an event occurs. (Kleinbaum, 1994).
- **The Logistic regression model used is:**

$$\ln (p/1-p) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n. \quad (1)$$

Where:

Ln: is the natural logarithm to the base e. (e = 2.718).

P: is the probability of receiving maternal health care service.

β_0 : is the constant term.

β_i : is the logistic coefficient related to each category of the independent variables.

X_i : is the independent variable.

i = 1, 2, ..., n.

- **The probability can be calculated using the following formula:**

$$P(E_i) = e^{Z_i} / 1 + e^{Z_i} \quad (2)$$

Where:

E_i : is the i^{th} event of any maternal health care service occurrence.

It is also the event of neonatal or postnatal mortality.

Z_i : is the linear combination of independent variables.

$Z_i = \beta_0 + \beta_{1i} X_{1i} + \beta_{2i} X_{2i} + \dots + \beta_{ni} X_{ni}$

e^{Z_i} are the odds ratio.

β_i are the corresponding coefficients.

1.6. Review of Literature

In their study in Indonesia, Stratified et. al, (1990), observed U-shaped relationship between maternal education and immunization. Mothers with no education and those with a high level of education had a high level of use of immunization while those with intermediate education had a low level of use of immunization. Stratified et. Al, also noted that the effect of formal education on the probability of a child being fully immunized disappears once the mother has correct knowledge of vaccine function.

(WHO, 2005) states that each year 3.3 million babies – or maybe even more –are stillborn, more than 4 million die within 28 days of coming into the world, and a further 6.6 million young children die before their fifth birthday. Maternal deaths also continue unabated- the annual total now stands at 529000 often sudden, unpredicted deaths which occur during pregnancy itself(some 68000 as a consequence of unsafe abortion), during childbirth, or after the baby has been born –leaving behind devastated families, often pushed into poverty because of the cost of health care that came too late or was ineffective.

(Nagendi G. 2001) Previous studies in maternal health care in different countries indicate that mother's educational level, birth order, type of place of residence, partner's educational level, wealth index and mass media are the most important factors affecting the utilization of MHCS.

Although an increasing number of countries have succeeded in improving the health and well-being of mothers, babies and children in the recent years, the countries that started with the highest burdens of mortality and ill-health made least progress during the 1990s. In some countries the situation has actually worsened and worrying reversals in newborn, child and maternal mortality have taken place. Progress has slowed down and is increasingly uneven, leaving large disparities between countries as well as between the poor and the rich within countries. Unless efforts are stepped up radically, there is little hope of eliminating avoidable maternal and child mortality in all countries. (The world Health Report, 2005).

II.LEVELS AND TRENDS IN MATERNAL HEALTH CARE SERVICES

Early and regular antenatal checkups by medical providers are very important in assessing the physical status of women during pregnancy. (TT) Injection is given to women during pregnancy to prevent babies' death from neonatal tetanus. Neonatal tetanus can result when sterile procedures are not followed in cutting the umbilical cord after delivery (EDHS, 2003).

2.1 Immunization Against Tetanus:

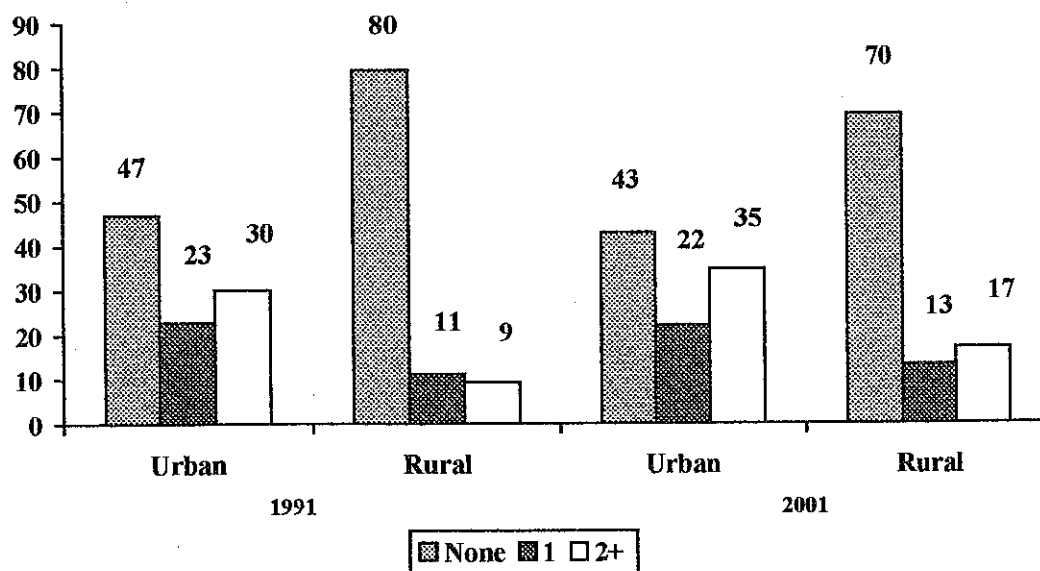
Pregnant women and women of childbearing age should seek TT vaccine at every opportunity. Neonatal tetanus still kills some-five to six-hundred-thousands newborns each year. The disease can be prevented by using clean delivery practices and/or by protecting the mother by immunizing her with TT vaccine. Despite the availability of an expensive and safe vaccine, TT coverage levels in women of childbearing age are often far lower than child immunization levels. This problem is compounded by the inability of coverage figures to accurately indicate levels of immunity (WHO, 1996).

Table (2.1) Percent Distribution of Women who Received Tetanus Toxoid Injection by Place of Residence During 1991-2001

Residence	1990-1991			2001		
	one	2+	none	one	2+	none
Urban	22.8%	30.2%	47%	22.1%	34.8%	43%
rural	11.2%	9.3%	79.5%	13.2%	17.1%	69.6%

Source: MDHS, 2001 AND MMCHS, 1992

Figure (2.1) Trends in Tetanus Toxoid Injection 1991-2001



Source: MDHS, 2001 and MMCHS, 1992

Figure (2.1) indicates that 47% of women in urban areas didn't receive immunization against tetanus in 1991; the percentage decreased to 43% in 2001. About 80% of women in rural areas didn't receive tetanus injection compared to about 70% in 2001. Among the 53% of women in urban areas in 1991 who received tetanus injection, about 23% of them received 1 injection and 30% of them received 2+ tetanus injections compared to 11% and 9% respectively for women in rural areas. In 2001, about 22% of those women who received tetanus injection received only 1 injection compared to 13% of rural women while 34% of women received 2+ tetanus injections compared to 17% in rural areas.

2.2 Place of Delivery:

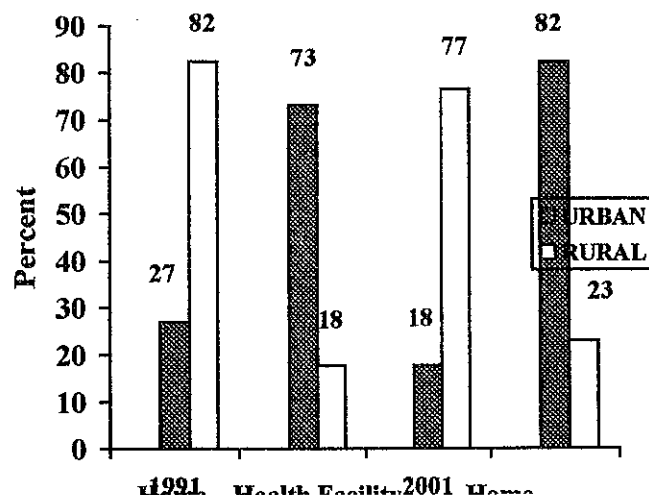
**Table (2.2) Percent Distribution of Place of Delivery by
Place of Residence 1991-2001**

Residence	1991		2001	
	Home	Health facility	Home	Health center
Urban	26.9%	73.1%	17.8%	82.2%
Rural	82.3%	17.7%	76.6%	23.1%

Source: MDHS, 2001

Figure (2.2) indicates that home deliveries are common in Mauritania. In 1991, more than 80% of women in rural areas gave their births at home compared to about 27% of women in urban areas. In 2001, despite the fact that the percentage of women who gave birth at home decreased, i.e. 17.8% of women in urban areas and 76.6% in rural areas, home births are still very high.

Figure (2.2) Trends in Place of Delivery by Residence 1991-2001



Source: MDHS 2001

The figure shows also that there is improvement in the percentage of delivery at health facility across time. The percentage increased from 73.1% in urban areas and 17.7% in rural areas in 1991 to 82.2% and 23.1% respectively in 2001.

2.3 Assistance at Delivery:

Hygienic conditions and proper medical assistance at the time of delivery can reduce the risk of complications and infection for both the mother and the new born baby (EIDHS, 2003).

Out of the single most important way to reduce maternal deaths is to ensure that a skilled health professional is present at every birth. However, there is a serious shortage of these professional in developing countries weather by choice or out of necessity. Sixty million women in the developing world give birth each year without skilled help-care; the deliveries are assisted by only a traditional birth attendant, a family member, or no one at all.

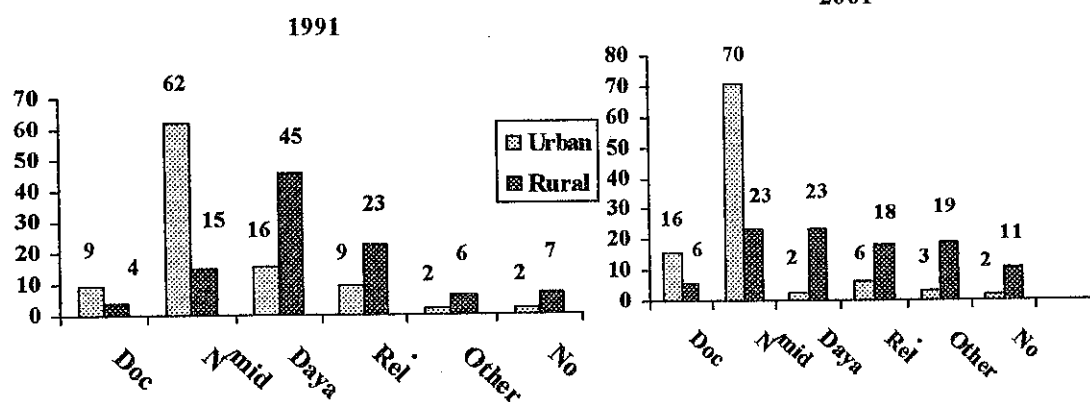
Skilled care during childbirth is important because millions of women and newborns develop serious and to-predict complications during or immediately such as delivery. Skilled attendants-health professional such as doctors or midwives who have midwifery skills-can recognize these complications, and either treat them or refer women to health centers or hospitals immediately if more advanced care is needed.

Table (2.3) Percent Distribution of Assistance at Delivery by Residence 1991-2001

Residence	1991						2001					
	Doc	N/mid	Daya	Rel.	Other	No	Doc	N/mid	Daya	Rel.	Other	No
Urban	9.2	61.8	15.9	9.3	1.8	1.8	15.5	70.3	2.4	6.4	3.4	1.9
Rural	3.7	15	45.4	22.7	6.1	7.1	5.5	23.4	23.2	18.4	18.9	10.6

Source: MDHS, 2001 AND MCHS, 1992

Figure (2.3) Trends in Medically-Assisted Deliveries by Place of Residence 1991-2001



Source: MDHS 2001

The figure shows that assistance at delivery by medical personnel is very low. The percentage of women who were medically assisted at delivery by a doctor was 9.2% in urban areas and 3.7% in rural areas in 1991 which increased to 15.5% and 5.5% in urban and rural areas respectively in 2001. The same trend is noticed in the case of delivery assistance by nurse /midwife /daya in both urban and rural areas.

Although assistance at delivery is very important especially for those women who are exposed to pregnancy complications, only 86.9% of women in urban areas and 64.1% of women in rural areas in 1991 were assisted at delivery by qualified personnel: doctor, nurse /midwife and daya compared to 88.2% and 52.1% respectively in 2001, there is a decrease in the level of medical assistance at delivery in rural areas, the level decreased from 64.1% in 1991 to 52.1% in 2001 this reflect the emergency need to more governmental efforts to increase women awareness' in rural areas and to encourage them to use the services.

There is still a wide gap between the level of medically-assisted deliveries between urban and rural areas (16% for urban and 6% for rural and 70% for urban and 23% for rural in case of assistance by doctor and nurse respectively). Although, Mauritania has achieved a great improvement in the level of medically-assisted deliveries during this period there is still a gap between this level and the level in developed countries and there is dire need for more governmental efforts to reach the targeted levels. (World Bank, 1999).

III. DETERMINANTS OF THE UTILIZATION OF MATERNAL HEALTH CARE SERVICES

3.1 Immunization Against Tetanus:

Table (3.1) shows the percentage distribution of live births born five years preceding the survey by receiving tetanus toxoid injection (TT) during pregnancy and some selected demographic and socioeconomic characteristics. The percentage of pregnant mothers who didn't receive TT was higher than those who received it. About 71% of pregnant women didn't receive TT compared to 29% only who received it.

Younger women are more likely to receive TT than older ones; about 31% of women aged less than 20 years at the time of delivery were immunized against tetanus while this percentage decreased to 29% for women aged at least 35 years. The table also shows that the percentage of births whose mothers received TT decreased with higher birth order; about 28.2% of women with the first birth order received TT injection compared to 26.6% of those women who had more than five birth order. The highest level of immunization against tetanus was among women with 2-3 birth orders (about 31%).

Table (3.1): Percent Distribution of the Live Births Born Five Years Preceding the Survey by Tetanus Toxoid Injection According to Some Background Characteristics, 2001

Background Characteristics	Received Tetanus Injection		Total
	NO	YES	
Age of mother			
<20	68.9	31.1	470
20-34	71.4	28.6	2998
35+	71.0	29.0	1294
Birth order			
1	71.8	28.2	948
2-3	69.1	30.9	1517
4-5	70.4	29.6	1047
6+	73.4	26.6	1250
Mother's education			
No education	75.5	24.5	2912
Primary	66.5	33.5	1254
Secondary	59.0	41.0	541
high	56.4	43.6	55
Partner's education			
No education	70.6	29.4	2714
Primary	73.7	26.3	961
Secondary	72.3	27.7	780
High	63.5	36.5	307
Type of place of residence			
Urban	64.1	35.9	2778
Rural	80.8	19.2	1984
Region			
Nouakchott	56.7	43.3	1162
Zone Sud(G1)	84.6	15.4	952
Zone fleuve(G2)	70.9	29.1	1316
Zone Nord(G3)	73.6	26.4	799
Zone center(G4)	74.9	25.1	533
Reading Newspapers			
No	72.0	28.0	4380
Yes	60.7	39.3	354
Watching T.V			
No	74.3	25.7	3493
Yes	61.9	38.1	1264
Listening to the Radio			
No	73.4	26.6	3821
Yes	61.6	38.4	932
Women's work status			
Working for cash	70.4	29.6	3208
Not working for cash	71.4	28.6	1545
Total	71	29	4754

Source: MDHS 2001

Women's education showed positive impact on level of immunization against tetanus. The data revealed that increasing in education level increased the level of immunization against tetanus. The percentage of mothers who received TT injection among uneducated women was 24.5% which increased to 33.5% for women who had primary education, 41% for women who had secondary education and the highest percentage was among women who had higher education (43.6%).

Partner's education had the same impact on TT injection .Increasing husband's education increases the mother's immunization against Tetanus. The percentage of women's immunization against tetanus increases for those women whose husbands are more educated than women with uneducated husbands. The percentage was 29.4% of women with uneducated husbands which increased to 36.5% for women with highly educated husbands. Type of place of residence has a strong impact on immunization against tetanus. Women in urban areas had a higher chance to be immunized against tetanus than women in rural areas. As shown in table (4.1), about 36% of urban women received TT compared to about 19% of women in rural areas. This is due to the fact that the socioeconomic conditions in urban areas are better than those in rural areas.

The data in table (4.1) indicate also that the region of residence affects the level of immunization against tetanus. Women residing in Nouakchott region are more likely to be immunized against tetanus than women residing in other regions. More than 43% of women residing in Nouakchott were immunized against tetanus compared to 15.4% in zone Sud (G1), 29.1% in zone flevuve (G2), 26.4% in zone nord (G3) and 25.1% in zone center (G4).

Women who were reading newspapers were more likely to receive TT injection 39.3% than those who were not reading newspapers (28%). Watching T.V. had a positive impact on receiving TT injection .About 38% of women who were watching T.V were immunized against tetanus compared to about 26% of women who were not watching T.V. Listening to the radio had the same trend, about 38% of women who were listening to the radio received TT injection compared to 26.6% of women who were not listening to the radio.

Women who were working for cash were more likely to receive TT injection than those women who were not working for cash; the percentage was 29.6% compared to 28.6% respectively.

Although immunization against tetanus is essential to prevent the mother's and her child's health, the level of immunization against tetanus in Mauritania is still very low.

3.2 Place of Delivery:

One of the important factors related to pregnancy outcome is the place of delivery. Delivery at home is common in Mauritania, especially in rural areas.

Table (4.3) shows that the percentages of deliveries that took place at home were 45.8%. The percentage of births at a public health facility was 51.8%,and about 2.1%

of births were delivered at a private health facility. Less than 0.5% of births were delivered at other places.

The table shows positive association between age of mother at birth and home child birth, the percentage was 46.3% for women aged less than 20 years compared to 47.7% for women aged at least 35 years. The table shows that the higher the birth order, the more likely the delivery occurred at home. About 51.6% of births for mothers with birth order more than five were delivered at home compared to 38.6% of births for mothers with the first birth order.

Mother's education has a negative impact on delivery at home; the higher the level of mother's education, the lower was the percentage of births delivered at home. The percentage of births which were delivered at home for uneducated women was 58.8% compared to 9.1% for highly educated women. Partner's education had the same trend as mother's education. About 46.5% of births for women whose husbands were uneducated were delivered at home compared to 35.8% for those whose husbands were highly educated.

Women residing in rural areas were more likely to give their births at home than women in urban areas. About 23% of births for women in urban areas were delivered at home compared to about 78% of births for women in rural areas. About 77% of births in urban areas were delivered in a health facility compared to 22% of births in rural areas which were delivered in a health facility.

Region of residence has strong impact on place of delivery. More than 85% of births for mothers who were living in Nouakchott were delivered in a health facility compared to about 22% of births for women who were living in region G1, 40.6% of births for women in region G2, about 62% of births for women in region G3 and 45% of births for women in region G4.

Reading newspapers decreases the percentages of home deliveries. As the data show, more than 48% of births for women who were not reading newspapers were delivered at home while about 52% of them were delivered at a health facility in comparison to less than 14% of births for women who were reading newspapers who were delivered at home and about 86% who were delivered at a health facility.

Watching T.V. has a positive impact on deliveries in health facilities. More than 56% of births for women who were not watching T.V were delivered at home compared to 17% of births for women who were watching T.V. The same trend can be noticed for listening to the radio. About 50% of births for women who were not listening to the radio were delivered at home compared to about 30% of births who were not listening to the radio.

Mother's work status has a slight effect on place of delivery. About 55% of births for women who were working for cash were delivered in a health facility compared to about 52% of births for women who were not working for cash.

Table (3.2) Percent Distribution of the Live Births Born Five Years Preceding the Survey by Place of Delivery According to Some Background Characteristics, 2001

Background Characteristics	Place of delivery				Total
	home	public	private	others	
Age of mother					
<20	46.3	52.7	1.1	-	469
20-34	44.8	52.5	2.4	0.3	2993
35+	47.7	50	2.0	0.3	1294
Birth order					
1	38.6	58.5	3.0	-	946
2-3	43.9	53.4	2.2	0.5	1517
4-5	47.9	49.8	2.2	0.1	1047
6+	51.6	46.6	1.4	0.3	1246
Mother's education					
No education	58.8	40.0	0.9	0.2	2907
Primary	31.2	66.0	2.5	0.3	1253
Secondary	13.1	80.0	6.7	0.2	541
High	9.1	74.5	14.5	1.8	55
Partner's education					
No education	46.5	51.4	1.8	0.3	2708
Primary	47.2	49.1	3.4	0.3	962
Secondary	45.2	52.6	1.9	0.3	779
High	35.8	62.2	2.0	-	307
Place of residence					
Urban	22.8	73.5	3.4	0.3	2772
Rural	77.8	21.6	0.4	0.3	1984
Region					
Nouakchott	10.6	84.9	4.0	0.5	1159
Zone Sud(G1)	77.1	22.3	0.4	0.2	954
zone Fleuve(G2)	58.6	40.6	0.5	0.3	1314
Zone Nord(G3)	33.0	61.9	5.0	0.1	796
Zone Center(G4)	53.3	45.2	0.9	0.6	533
Reading Newspaper					
No	48.4	49.6	1.8	0.2	4374
Yes	13.8	78.8	6.8	0.6	354
Watching T.V					
No	56.2	42.6	0.9	0.3	3488
Yes	17.0	77.0	5.6	0.3	1263
Listening to the Radio					
No	49.6	48.2	2.0	0.2	3815
Yes	30.3	66.5	2.8	0.4	932
Women's work status					
Working for cash	44.8	53.0	1.9	0.2	3206
Not working for cash	47.9	49.3	2.5	0.3	1541
Total	45.8	51.8	2.1	0.3	4756

Source: Calculated from MDHS 2001

3.3 Assistance at Delivery:

Proper medical assistance at delivery can reduce the risk of complications and infection for both mother and her child.

Table (3.3) shows that 30.7% of births were medically assisted by a doctor, 59.1% of births were assisted by a nurse or midwife, 10% of births were assisted by a traditional birth attendant and 0.2% were assisted by others.

Increasing in age of mother at birth increased the percentage of medical assistance at delivery. More than 90% of women aged 35 years and above were medically assisted at delivery by doctor or nurse/midwife compared to about 89% of women aged 20-34 years and about 87% of women aged less than 20 years.

Women with a lower birth order were more likely to have deliveries attended by a doctor than women with a higher birth order. More than 32% of women with the first birth order were assisted at delivery by a doctor compared to about 29% of women with more than five births.

The data indicate that, as the level of mother's education was higher, deliveries attended by trained persons increased. About 98.0% of births for highly educated mothers were medically assisted at delivery compared to about 88% of birth for uneducated mothers. The same trend was noticed in the case of father's education: birth for women whose husbands were secondary educated were more likely to be assisted at delivery by trained persons than other births from those husbands who were not educated.

The data also show that medical assistance at delivery was most common in urban areas than in rural areas. About 41% of births for women in urban areas were assisted by a doctor compared to 16.5% of births for women in rural areas.

Region of residence affects assistance at delivery. Among all regions, births for women who were living in Nouakchott were more likely to be assisted during delivery by a doctor than births for women who were living in other regions. Births for women who were living in region Zone Sud (G1) were less likely to be medically assisted at delivery than births for women who were living in other regions.

The table shows that 44.4% of births for mothers who were reading newspapers were assisted at delivery by doctors compared to 29.5% of births for mothers who were not reading newspapers. About 45% of births for women who were watching T.V. were assisted by doctors compared to about 26% of births for women who were not watching T.V. The same trend was noticed in the case of listening to the radio, about 41% of births for women who were listening to the radio were deliveries assisted by a doctor compared to about 28% of births for women who were not listening to the radio.

Table (3.3) Percent Distribution of the Live Births Born Five Years Preceding the Survey by Assistance at Delivery and Background Characteristics, 2001

the Survey by Assistance at Delivery and Background Characteristics, 2002					
Background Characteristics	Assistance at delivery				Total
	Doctor	Nurse/midwife	Traditional	Others	
Age of Mothers					
<20	26.6	60.1	9.4	0.9	469
20-34	30.4	58.7	10.7	0.2	2993
35+	31.8	59.2	8.9	0.1	1293
Birth order					
1	32.2	58.5	9.0	0.3	946
2-3	31.8	58.1	9.7	0.4	1518
4-5	29.7	59.0	11.1	0.2	1044
6+	29.0	60.5	10.4	-	1247
Mother's Education					
No Education	25.4	63.0	11.5	0.2	2906
Primary	36.6	54.0	9.0	0.5	1253
Secondary	45.8	48.4	5.7	-	541
High	29.1	69.1	1.8	-	55
Partner's Education					
No education	30.5	60.7	8.7	0.1	2707
Primary	27.2	56.8	15.5	0.5	962
Secondary	36.1	55.8	8.0	0.1	779
High	30.0	59.3	10.4	0.3	307
Type of Place of Residence					
Urban	40.9	51.6	7.4	0.1	2773
Rural	16.5	69.4	13.8	0.4	1982
Region					
Nouakchott	45.5	47.4	6.9	0.2	1160
Zone Sud(G1)	14.0	63.3	21.9	0.7	954
Zone Fleuve(G2)	28.0	64.3	7.6	-	1312
Zone Nord(G3)	30.2	62.8	6.9	0.1	796
Zone Center(G4)	35.6	57.8	6.4	0.2	533
Reading Newspaper					
No	29.5	60.0	10.3	0.2	4373
Yes	44.4	48.3	6.2	1.1	354
Watching T.V					
No	25.5	62.1	12.1	0.3	3487
Yes	44.8	50.8	4.4	-	1263
Listening To the Radio					
No	28.2	61.0	10.5	0.2	3814
Yes	41.1	50.5	8.3	0.1	932
Women's work Status					
No	29.5	61.4	9.0	0.2	3204
Yes	33.0	54.3	12.3	0.4	1542
Total	30.7	59.1	10.0	0.2	4755

Source: Calculated from MDHS 2001

Women who were working for cash were more likely to be assisted at delivery by a doctor. As the data show 33% of births for working mothers for cash compared to 29.5% of births for non-working mothers had their deliveries assisted by a doctor.

The extent to which the utilization of MHCS considered in this thesis is affected by the different variables. These variables are age of mother at child birth, birth order, type of place of residence, mother's educational level, husband's educational level, mothers' work status, wealth index and exposure to mass media.

The socioeconomic and demographic variables that showed significant relationships with the dependent variables which are antenatal care, immunization against tetanus, place of delivery and assistance at delivery at the bivariate level of analysis will be considered to fit a logistic regression model.

The equations of the fitted model and the probability of use of any of the MHCS are estimated as follows;

$$p(E_i) = \frac{e^{x_i}}{1 + e^{x_i}} \quad \text{where;}$$

E_i is the event of any of the MHCS occurrence.

Z_i is the linear combination of independent variables such that,

$$Z_i = (0 + (1 \times x_1 + (2 \times x_2 + \dots + (n \times x_n$$

(0 is constant term and (i are the corresponding coefficients.

e^{z_i} are the odds ratio.

X_i are the independent variable.

The logistic regression model used can be written as follow:

$$\ln(p_i / 1 - p_i) = (0 + (1 \times x_1 + (2 \times x_2 + \dots + (n \times x_n .$$

Where;

\ln : is the natural logarithm to the base e. (e = 2.718).

P : is the probability of utilization of any of the MHCS, in this study these are ANC by a medical provider, immunization against tetanus, delivering in a health facility and assistance at delivery by a medical personnel.

The stepwise logistic regression model will be used in this analysis. This chapter contains four logistic regression models, which introduce the relationship between the different MHCS and the socio-economic and demographic variables.

The reference categories are selected on the basis that they are thought to have the least likelihood of influencing the dependent variable. The interpretation of the results is done in relation to the reference categories. The odds ratio of the reference category is usually equal to one.

Table (3.4) Definitions of the Determinants of MHCS Utilization

Variables	Definitions
Dependent Variables	
1- Prenatal care by doctor or nurse	"1" if yes , "0" if no. 1 st application.
2- <i>Receiving tetanus Toxoid injection</i>	"1" if yes , "0" if no. 2 nd application.
3- Delivery in a health facility "health facility refers to : Hospitals, health units and clinks	"1" if delivery in a health facility , "0" if otherwise 3 rd application.
4- Assistance during delivery by doctor or nurse	"1" if Doctor or nurse, "0" if otherwise. 4 th application.
Age of mother X1	Three categories (<20, 20-34 and 35+) were represented by one binary category : X11=1 if "20-34","0" if otherwise. X12 =1 if "35+","0" if otherwise. "Less than 20" is the reference category.*
Birth order X2	Four categories (1,2-3,4-5 and 6+) were represented by one binary category. X21 =1 if "1", "0" if otherwise. X22 =1 if "1", "0" if otherwise. X23 = 1 if "1", "0" if otherwise. "6+" is the reference category.*
Type of place of residence X3	Two categories (urban and Rural) were identified and represented by one binary category: X3 =1 if urban , "0" if Rural*
Woman's education X4	Four categories (not educated ,primary , secondary and high)were identified and represented by one binary category: X41 = 1 if primary,"0" if otherwise. X42 =1 if secondary, "0" if otherwise. X43 =1 if high, "0" if otherwise. "Not educated "is the reference category.*

Variables	Definitions
Husband's education X5	Four categories (not educated ,primary , secondary and high)were identified and represented by one binary category: X51=1 if primary,"0" if otherwise. X52=1 if secondary, "0" if otherwise. X53=1 if high,"0" if otherwise. "Not educated "is the reference category.*
Region X6	Five categories (Nouakchott, zone sud (G1), zone fleuve (G2),zone Nord (G3), and zone center (G4) were identified and represented by one binary category as follows: X61 =1 if zone sud,"0" if otherwise. X62 = 1 if zone fleuve, "0" if otherwise. X63 = 1 if zone nord, "0"if otherwise. X64 =1 if zone center,"0" if otherwise. "Nouakchott "is the reference category.*
Woman's work status X7	Two categories (working for cash and not working for cash) were identified and represented by one binary category as follows: X7 =1 if not working for cash*, "0" if working for cash.
Husband's occupation X8	Two categories (agriculture and other) were identified and represented by one binary category: X8 =1 if agriculture , "0" if "other "
Exposure to mass media X9	Two categories exposed to mass media and not exposed to mass media " were identified and represented by one binary category as follows: X9 =1 if exposed to mass media, "0" if not exposed to mess media*.

O/w: other wise. *Reference category.

3.4 Determinants of Prenatal Care:

Table (3.5) presents the logistic regression results of receiving prenatal care services from qualified medical personnel (doctor/nurse). The results indicate that the model correctly classifies 87% of the cases.

Mother's age has a significant negative relationship with receiving prenatal care from qualified personnel. Women aged (20-34) are less likely to receive prenatal care than women aged less than 20 years old with odds ratio 0.192 times and probability of 0.16. Women aged 35+ are less likely to receive prenatal care than women aged <20 with odds ratio 0.044 times and a probability of 0.04.

Birth order has a significant association with receiving prenatal care from qualified personnel. Increasing in birth order decreases the probability of mother to receive prenatal care. There is a highly significant relationship between residing in urban areas and prenatal care. Mothers who live in urban areas are less likely to receive prenatal care than mothers in rural areas with odds ratio 0.566 times and a probability of 0.36.

Table (3.5) Logistic Regression Results for the Determinants of Receiving Prenatal Care from Qualified Medical Personnel

Variables	Beta	S.E	Significant	Odds ratio	Probability
Age of women					
<20-34 X ₁₁	-1.650	0.102	0.000	0.192	0.16
35+ X ₁₂	-3.130	0.116	0.000	0.044	0.04
Birth order					
1 X ₂₁	-1.834	0.090	0.000	0.160	0.14
2-3 X ₂₂	-1.347	0.075	0.000	0.260	0.21
4-5 X ₂₃	-0.823	0.074	0.000	0.439	0.31
Type of place of residence X ₃	-0.569	0.070	0.000	0.566	0.36
Woman's education					
Primary X ₄₁	0.300	0.067	0.000	1.350	0.57
Secondary X ₄₂	0.709	0.093	0.000	2.033	0.67
High X ₄₃	1.096	0.229	0.000	2.993	0.75
Region					
G1 X ₆₁	0.051	0.091	0.577	1.052	0.51
G2 X ₆₂	-0.572	0.088	0.000	0.565	0.36
G3 X ₆₃	-0.247	0.082	0.003	0.781	0.44
G4 X ₆₄	-0.272	0.099	0.006	0.761	0.43
Woman's work status X ₇	0.265	0.054	0.000	1.303	0.57
Constant	1.529				
Percent of correctly classification 87%					

Source: Calculated from MDHS 2001

There is a positive relationship between mother's education and receiving prenatal care. Increasing mother's education level leads to increasing in the prevalence of receiving prenatal care. The odds ratios were about 1.4 times for primary education, about 2times for secondary education and about 3 times for higher education compared to non-educated women.

Region of residence has a highly significantly association with receiving prenatal care services from a qualified medical personnel. Women who were living in region G2, G3 and G4 were less likely to receive prenatal care than women in Nouakchott city with odds ratio (0.565),(0.781) and 0.761 respectively Mother's who were working for cash are more likely to receive prenatal care from medical

personnel than women who were not working for cash with odds ratio 1.3 times and a probability of 0.57.

3.5 Determinants of Tetanus Toxoid Injection:

Table (3.6) presents the logistic regression results of the likelihood of receiving Tetanus Toxoid Injection. The results indicate that the model correctly classifies 71.1% of the cases.

Table (3.6) Logistic Regression Results for the Determinants of Receiving Tetanus Toxoid Injection

Variables	Beta	S.E	Significant	Odds ratio	Probability*
Type of place of residence X3	0.549	0.093	0.000	1.73	0.6340
Woman's education					
Primary X ₄₁	0.206	0.079	0.009	1.229	0.5514
Secondary X ₄₂	0.396	0.108	0.000	1.486	0.5977
High X ₄₃	0.425	0.286	0.138	1.529	0.6064
Region					
G1 X ₆₁	-0.869	0.125	0.000	0.419	0.2953
G2 X ₆₂	-0.127	0.103	0.215	0.880	0.4681
G3 X ₆₃	-0.707	0.101	0.000	0.493	0.3302
G4 X ₆₄	-0.393	0.126	0.002	0.675	0.4030
Exposure to mass media X ₉	0.207	0.076	0.007	1.230	0.5516
Constant	-1.099				
Percent of correctly classification 71.1%					

Source: Calculated from MDHS 2001

*:Probability = (EXP B/1+ EXP B).

The table demonstrates that, a significant relationship is observed between residing in urban areas and receiving TT. Women in urban areas are more likely to receive TT injection than women in rural areas with odds ratio 1.73 times and a probability of 0.6340.

Mother's education has a significant positive association with receiving TT injection. Women with primary education are 22.9% more likely to receive TT with a probability of 0.5514. The odds ratio of receiving TT was 1.48 times for women with secondary education and 1.529 times for highly educated women compared to non-educated women.

The results indicates that region of residence is highly significantly associated with receiving TT injection. The odds ratios were 0.419, 0.493 and 0.675 times for region (G1), region (G3) and region (G4) compared to Nouakchott city.

Women who were exposed to mass media were 23% more likely to receive TT injection than those women who were not exposed to mass media with a probability of 0.5516.

3.6 Determinants of Place of Delivery:

Table (3.7) presents the logistic regression results of likelihood of having child birth in a health facility. The results indicate that the model correctly classifies 84.9% of the cases.

Table (3.7) Logistic regression Results for the Determinants of Place of Delivery

Variables	Beta	S.E	Significant	Odds ratio	Probability*
Age of women					
<20-33 X ₁₂	-1.575	0.105	0.000	0.207	0.1715
35+ X ₂₁	-3.170	0.119	0.000	0.042	0.0403
Birth order					
1 X ₂₁	-1.572	0.085	0.000	0.208	0.1722
2-3 X ₂₂	-1.245	0.074	0.000	0.288	0.2236
4-5 X ₂₃	-0.809	0.074	0.000	0.445	0.3080
Type of place of residence X ₃	1.115	0.072	0.000	3.049	0.7530
Woman's education					
Primary X ₄₁	0.672	0.059	0.000	1.959	0.6620
Secondary X ₄₂	1.079	0.077	0.000	2.943	0.7464
High X ₄₃	1.197	0.196	0.000	3.309	0.7679
Region					
G1 X ₆₁	-0.751	0.094	0.000	0.472	0.3207
G2 X ₆₂	-0.331	0.073	0.000	0.718	0.4179
G3 X ₆₃	-0.450	0.067	0.000	0.638	0.3895
G4 X ₆₄	-0.331	0.089	0.000	0.718	0.4179
Woman's work status X ₇	0.457	0.052	0.000	1.579	0.6122
Exposure to mass media X ₉	0.156	0.054	0.004	1.169	0.5390
Constant	0.290				
Percent of correctly classification 84.9%					

Source: Calculated from MDHS 2001

*:Probability = (EXP B/1+ EXP B).

The table indicates that, mother's age has a high significant association with place of delivery. Women aged (20-34) or (35+) are less likely to deliver at a health facility than women aged less than 20 years old with odds ratio 0.207 and 0.0403 respectively.

Birth order has significant association with place of delivery. The odds ratio for a woman to give birth at a health facility was 0.208 times for woman with first birth order, 0.288 times for women with the second birth order and 0.445 times for woman with the fourth or fifth birth order compared to women with the sixth or more birth order.

Women in urban areas are more likely to give a birth a health facility than women in rural areas with odds ratio 3.049 times and a probability of 0.7530. Mother's education has a highly significantly association with place of delivery. Increasing in mother's education increases the prevalence to give birth in a health facility. Women with high education are more likely to give birth at a health facility than non-educated women with odds ratio 3.3 times and a probability of 0.7679.

Region of residence has a significant effect on place of delivery. Women who are living outside Nouakchott are less likely to give a birth in a health facility than women living in Nouakchott, the odds ratio were 0.472, 0.718, 0.638 and 0.718 times for region G1, G2, G3 and G4 respectively. Women work status is highly significantly related to place of delivery. Women who were working for cash were 57.9% more likely to give birth at a health facility than women who were not working for cash with a probability of 0.6122. The prevalence of women to give birth at a health facility was higher among women who were exposed to mass media than women who were not exposed to mass media with odds ratio 1.2 times and a probability of 0.5390.

3.7 Determinants of Assistance at Delivery:

Table (3.8) presents the logistic regression results of likelihood of medical assistance at delivery by qualified personnel. The result indicates that, the model correctly classifies 80% of the cases. The regression results can be written as follow:

The result indicates that, age of mother at birth is one of the determinants of getting medical assistance at delivery. Women aged (20-34) or (35+) are less likely to be medically assisted at delivery than women aged less than 20 years with odds ratio 0.184 and 0.031 times respectively. Birth order is highly significantly associated with medical assistance at delivery. The odds ratio was 0.149 times for women with the first birth order, 0.231 times for woman with the second or third birth order and 0.384 times for woman with the fourth or fifth birth order.

Mother's education has a highly positive significant association with medical assistance at delivery. Highly educated woman has the highest chance to be medically assisted at delivery with odds ratio equals 2.8 times and probability of 0.73. Husband's education has a significant relationship with medical assistance at delivery.

Women in regions G1 and G2 were more likely to be medically assisted at delivery than women in Nouakchott with odds ratio 1.5 and 1.2 times and probability of 0.6064 and 0.5432 respectively. Woman work status has a significant impact on medical assistance at delivery. Women who were working for cash are more likely to be medically assisted at delivery than women who were not working for cash with odds ratio about 1.3 times and a probability of 0.5631.

**Table (3.8) Logistic Regression Results for the Determinants of
Medical Assistance at Delivery**

Variables	Beta	S.E	Significant	Odds ratio	Probability*
Age of women					
<20-33 X ₁₁	-1.693	0.099	0.000	0.184	0.1554
35+ X ₁₂	-3.459	0.111	0.000	0.031	0.0301
Birth order					
1 X ₂₁	-1.905	0.078	0.000	0.149	0.1297
2-3 X ₂₂	-1.464	0.066	0.000	0.231	0.1877
4-5 X ₂₃	-0.958	0.065	0.000	0.384	0.2775
Woman's education					
Primary X ₄₁	0.310	0.057	0.000	1.364	0.5770
Secondary X ₄₂	0.431	0.083	0.000	1.539	0.6061
High X ₄₃	1.031	0.208	0.000	2.803	0.7370
Husband's education					
Primary X ₅₁	0.016	0.056	0.770	1.017	0.5042
Secondary X ₅₂	-0.175	0.062	0.005	0.839	0.4562
High X ₅₃	0.159	0.089	0.076	1.172	0.5396
Region					
G1 X ₆₁	0.432	0.079	0.000	1.541	0.6064
G2 X ₆₂	-0.040	0.074	0.592	0.961	0.4901
G3 X ₆₃	0.173	0.070	0.014	1.189	0.5432
G4 X ₆₄	-0.138	0.087	0.111	0.871	0.4655
Woman's work status X ₇	0.254	0.046	0.000	1.289	0.5631
Constant	2.091				
Percent of correctly classification 80%					

Source: Calculated from MDHS 2001

*: Probability = (EXP B/1 + EXP B).

IV. SUMMARY AND RECOMMENDATIONS

4.1 Summary:

This thesis attempted to analyze the determinants of maternal health care services (MHCS) and their effect on infant mortality. The data used in this study was derived from Mauritania Demographic and Health Survey (MDHS 2001). The determinants of MHCS were based on a sample of 4754 women. The analysis of the effect of MHCS on infant mortality was based on all live births born five years before the survey.

The socioeconomic and demographic variables studied were age of mother at birth, birth order, place of residence, region, mother's education, husband's education, mother's work status, reading newspapers, listening to radio and watching T.V.

Many studies mention that the most important factors affecting the utilization of MHCS are parents' educational level, place of residence, parity and standard of living. These studies proved that births for women who utilized MHCS were less likely to die in neonatal or post-natal stage than those births whose mothers were not utilizing MHCS.

A descriptive analysis for levels and trends on utilization of MHCS and infant and child mortality was done in chapter three. The results show that MHCS utilization in Mauritania has improved within the last 10 years, during the period from 1991 to 2001. It can be deduced that the increase in the level of utilization was faster in urban areas than in rural areas, although there was a wide gap in utilizing MHCS between urban and rural areas. All maternal health care indicators are higher in urban areas than in rural areas.

In the case of TT 47% of women in urban areas didn't receive immunization against tetanus in 1991; the percentage decreased to 43% in 2001. About 80% of women in rural areas didn't receive tetanus injection compared to about 70% in 2001. There is a wide gap in the level of utilization of TT between urban and rural areas through the period from 1991 to 2001.

Home deliveries are common in Mauritania. In 1991, more than 80% of women in rural areas gave their births at home compared to about 27% of women in urban areas. In 2001, despite the fact that the percentage of women who gave birth at home decreased, i.e. 17.8% of women in urban areas and 76.6% in rural areas, home births are still very high.

Although assistance at delivery is very important specially for those women who are exposed to pregnancy complications, only 28.9% of women in urban areas and 21.3% of women in rural areas in 1991 were assisted at delivery by qualified personnel: doctor, nurse /midwife and daya compared to 29.4% and 20.4% respectively in 2001.

There is still a wide gap between the level of medically-assisted deliveries between urban and rural areas (16% for urban and 6% for rural and 70% for urban and 23% for rural in case of assistance by doctor and nurse respectively).

There was a decreasing trend in child mortality during the last 20 years preceding MDHS 2001. Child mortality rate decreased from 77 deaths per 1000 births in 1981 to 55 deaths per 1000 births in 2001. Under-five mortality rate decreased from 164 deaths per 1000 births in 1981 to 123 deaths per 1000 births in 2001.

4.2 Recommendations:

- One of the main findings of the study is that women with a higher birth order are less likely to receive maternal health care services in a proper way than women with a lower birth order. Consequently, the Ministry of Health and Population should take firm steps to make family planning a main part of the messages which are given during the antenatal care, assistance at delivery, and at the time of

Tetanus Toxoid injection. This can be done through making linkages between family planning clinics and maternity clinics.

- The results reveal that mother's education is considered as one of the most important factors affecting the level of utilization of maternal health care services. Educated mothers are more likely to receive proper maternal health care services than uneducated ones. For this reason, more governmental efforts should be made to increase women's education level, especially in rural and less developed areas.
- The study suggests that mothers less than 20 years old and those who are above 35 years, i.e. the high risk groups, are less likely to utilize the maternal health care services; consequently, more governmental efforts are needed to increase their awareness of the risks they might be exposed to and encourage them to utilize the services. This can be done through media campaigns and outreach workers.
- The conditions in the rural areas should be improved. This can be done by trying to urbanize rural areas, and increasing allowances for medical personnel who work in rural areas so as to make rural areas more attractive to skilled medical personnel. This will encourage women to visit health care facilities.
- The government should improve women status, by providing women with employment especially the kind of employment where they can earn cash for their work. Employers should be encouraged to fit more women in the labor force. This will enable women to be able to afford the costs of medical services associated with pregnancy and delivery.
- The government and concerned organizations should consider training traditional birth attendants so that they can provide medical assistance at delivery and be able to refer complicated cases to better skilled personnel. Training of traditional birth attendants will increase the number of qualified personnel who can attend to women in need, and especially those in rural areas.
- The Study indicates that, the level of utilization of MHCS in urban areas is higher than in rural areas; therefore, more governmental efforts are needed to improve the socio-economic conditions in rural areas through building new hospitals, FP units to equip these areas with the proper MHCS.
- The government should continue investing in maternal health care services, so as lower to infant mortality rate, as it has been observed mothers who use maternal health care services suffer the least mortality among their infants.
- Place of residence has been shown to have a strong relationship with all the MHCS. The government and concerned non governmental organizations should make these services more readily available and affordable to utilize in the rural areas, so that the poor women can afford to make use of these services.
- Further researches are needed to study the other factors affecting the level of utilization of maternal health care services (cultural, geographical, political and financial factors) which are not included in this study to be able to improve the level of utilization of maternal health care services in Mauritania.

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