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EQUITY IN MATERNAL AND CHILD HEALTH SERVICES UTILISATION IN MAURITANIA

Doctoral thesis project:

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ABSTRACT

The objective of this study is to analyse the scope of equity in the Mauritanian health system in the use of maternal health care services and to identify the factors that contribute to its improvement measuring the level of horizontal inequity in the distribution of maternal and child health care services. Moreover, the study aims to analyze financial protection against catastrophic health expenditures and impoverishment in Mauritania.

Methodology. The variables of maternal and child health services utilization are five: contraceptive use, antenatal visits, skilled birth attendants, postnatal visits and children fully vaccinated. Equity measures are calculated through concentration curves, concentration indices, and incidence analysis of benefit incidence of public expenditure. Horizontal inequity is measured through inequality in the utilization of maternal health care in relation to socio-economic characteristics, mainly income. To this end, the standardization of the different needs between the poor and the rich is carried out. The analysis is based on Multiple Indicator Cluster Surveys 2015, which is a representative national survey of households, women, and children; and National health accounts (NHA 2008 and 2015). The analysis of catastrophic health care payments follows the approach by O'Donnell et al. (2008) which defines health spending as "catastrophic" if it exceeds some fraction or threshold of total expenditure, or of total non-food expenditure, in a given period. We defined expenditure as being catastrophic if a household's financial contributions to the health system exceed a threshold of 40% of non-food spending. A regression analysis was conducted to explore variables associated with catastrophic health expenditure. Data comes from Permanent Household Living Conditions Survey 2014.

Results. The finding reveals that the progress in equity on maternal and child health service utilization has been mixed.

First, the study reveals that concentration index for contraceptive use has a positive value in 2007, 2011 and in 2015 indicating that contraceptive use is concentrated among the wealthier women. Over time the concentration index has decreased from 0.41 in 2007 to 0.27 in 2015 confirming an improvement in equity in the use of contraceptive methods. The concentration curves in 2007, 2011 and 2015 lie under the 45°-line confirming that the contraceptive use is concentrated among the richest women during this period. However, between 2007 and 2015 the concentration curve moves slightly towards the equality line, indicating an improvement in equity contraceptive use. The concentration curves of family planning use show that the

poorest 50% of the married women use only 16% of contraceptive utilization rate in 2007. This situation had improved in 2015 where the poorest 50% of the population use 27% of contraceptive utilization.

Second, equity analysis for the fourth prenatal consultation shows that the concentration index for antenatal care visits (4 visits or more) has a positive value in 2011 and 2015 indicating that this indicator is concentrated among the wealthier women. The value of the index remains almost unchanged during this period (0.1173 versus 0.1129). The concentration curves in 2011 and 2015 lie under the 45°-line confirming that the antenatal care visits (4 visits or more) are concentrated among the richer women during this period. The two lines overlap indicating a stagnation of the concentration index overtime. In 2011, about 50% of the poorest women use 41.0 % of antenatal care visits (4 visits or more). This is almost the same in 2015 where about 50% of the poorest women used 41.2 % of antenatal care visits (4 visits or more).

Third, the concentration index for skilled birth attendant had a positive value from 2007 to 2015 denoting that this indicator is concentrated among the wealthier women. The value of the index was 0.2682 in 2007 compared to 0.2016 in 2015. The decrease in the concentration index is very limited compared to the decline observed in family planning concentration index. The concentration curves in 2007, 2011 and 2015 lie under the 45°-line confirming that skilled birth attendant is concentrated among the richest women during this period. Between 2007 and 2015, the upward movement of the concentration curve towards the equality line is limited and much less pronounced than in the case of family planning. The concentration curve shows that poorest 50% benefit only from 27% of skilled birth attendant in 2007. This situation slightly improved in 2015 where the poorest 50% of the population benefit from 34% of skilled birth attendant in 2015.

Fourth, the concentration index for postnatal visit has a positive value from 2011 to 2015 denoting that postnatal visit is concentrated among the wealthier women. The increase in the concentration index is striking, the value of the index was multiplied by three in five years: (0.0771) in 2011 compared to (0.2426) in 2015. The concentration curves in 2011 and 2015 lie under the 45°-line confirming that postnatal visits are concentrated among the richest women during this period. Between 2011 and 2015, the downward movement of the concentration curve far from the equality line confirm the increase in inequality between poorer and richer women. In 2011, 50% benefitted only from 44.7% of postnatal visits. This situation had

worsened in 2015 where the poorest 50% of the population benefitted from 30.1% of postnatal visits in 2015.

Fifth, the study shows that the concentration index for children fully vaccinated has a negative value (-0.0932) in 2007. This denotes that this indicator was more concentrated among the poor. However, the inequity between the poor and the rich has shifted in favour of the rich from 2011 where the rate of concentration index had become positive (0,0391). In 2015, the inequity between the poor and the rich had worsened. The concentration raised from 0.0391 in 2011 to 0.1698 in 2015; in other words, the 2011 rate was quadrupled in 2015. The evolution of concentration index from 2007 to 2015 shows that the poor were left behind and not benefitted from the increase of child-vaccinated rate. Concentration Curve for children fully vaccinated for the period (2007, 2011 and 2015) showed that the concentration curve was above the equality line in 2007. The curve went down to be below but close to the equality line in 2011. In 2015, the curve moved away from the equality line. In 2007, the poorest 50% of the children benefitted from more than 60% of vaccination rate. This situation had worsened in 2015 where the poorest 50% of the population had benefitted only from 38 % of child vaccination.

Sixth, the benefit incidence of government health spending reveals that at the level of total subsidy the poorest quintile share (20 percent) is lower than its population share (20 percent) but greater than its share of total consumption. At higher quintiles, the cumulative subsidy shares amount also less than their respective population shares. Greater inequality emerges in the distribution of government subsidy on hospital outpatient care. At the level of primary health care, the inequality in the distribution of health benefits across quintiles for outpatient visits is less pronounced.

Except for health post subsidy, the concentration indices are significantly different from zero indicating a pro-rich distribution. The dominance tests and the Kakwani indices indicate that the subsidies are weakly progressive.

Overall, government spending on health is progressive, but benefits are mostly pro-rich. Greatest share of public subsidy goes to hospital care and this dominates distribution of total subsidy.

Seventh, in terms of financial protection: The study shows that the preconditions for catastrophic payments were given in Mauritanian's health system; the availability of health services requiring payment, low ability to pay, and the lack of prepayment mechanisms where health insurance covers less than 15% of the population. The study reveals that in 2014 about 66,924 people or 1.84% of the Mauritania's population incurred catastrophic spending at the 25% of total household expenditure threshold. This threshold is one of the indicators of sustainable development goal for catastrophic expenditures defined, by Sustainable development goal indicators 3.2.8, as the proportion of population with large household expenditures on health as a share of total household expenditure or income. Both the percentage and the size of the population facing catastrophic payments have decreased to this threshold since 2003. Comparing the incidence of catastrophic health spending patterns internationally, Mauritania has a somewhat lower incidence than the average of Africa region (2.5%). Using 40% of non-food consumption as threshold, we observe a similar trend as using catastrophic expenditures defined a 25% of total household expenditure. About 87,292 people or 2.4% of the Mauritania's population incurred catastrophic spending at the 40% of non-food consumption threshold. Overtime, catastrophic payment incidence has been decreasing between 2008 and 2014. Comparing the incidence of catastrophic health spending patterns internationally, considering this threshold, Mauritania has a somewhat lower incidence than the average of Africa region (3.3%).

Regarding impoverishment incidence, the study shows that health spending increases the absolute number of the impoverished. In 2014, the study estimates that about 80,018 people or 2.2% of the Mauritania's population have fallen below poverty line due to catastrophic health expenditures. The impoverishing health payment incidence has increased by 0.8 points over the period 2003-2014 (1.4 versus 2.2)

Discussion: The inequity pattern disfavouring the poor, uneducated and rural women is likely contributing to the non-achievement of maternal health-related Sustainable development goal and National Health Development Plan 2017-2020 targets. Key factors are: insufficient skilled health workers, lack of basic emergency obstetric care, poor infrastructure, inadequate budgetary allocations, low literacy levels among mothers and poverty, particularly in rural areas. The rural population has a major problem of access to maternal and child health services. For example, about 49% of health posts, 24 of health centers and 39% of hospitals do not provide family planning services. This is compounded by the problem of stock mis-

management at the district and delivery point levels. Indeed, the management of the supply chain in Mauritania, is characterized by dysfunctions causing serious disturbance in the availability of products at the desired time. Substantial progress has been made to improve access and utilization of family planning services, over the last few years. However, the inequity in contraceptive use is still high in Mauritania. Therefore, interventions to reduce inequity should target rural and less educated women. This could be done by (i) facilitating women access to education; (ii) Retention of girls in school; (iii) Delay of the age at first marriage; (iv) Economic empowerment of women's; (v) Tackling the constraints of availability and affordability of Reproductive, Maternal, Neonatal and Child Health and Nutrition (RMNCHN) commodities will reduce inequalities in RMNCHN utilization; (vi) Other areas of intervention include communication for behavioural change and considering religious and cultural factors that are one of the challenges to improve utilization to reproductive health services.

The burden of Out of Pocket (OOP) payments is high; many Mauritanians are being pushed into poverty due to health care expenditure. It is important that Mauritanian government provides financial protection for the population, particularly the poor by reducing a health system's dependence on out-of-pocket expenditures. This can be achieved by expanding population's access to prepayment schemes and risk pooling especially for the informal sector. For the poor households identified under the Social Register, a system of user fee exemptions can be introduced and subsidized from government revenue. The women eligible for the obstetrical insurance scheme might benefit from this exemption. In addition, it would be advisable to re-examine wider resource allocation issues by focusing on the primary level, which seems to be the most used by the poor.

DEDICATION

This research is dedicated to my parents.

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TABLE OF CONTENTS

FIGURES

TABLES

ACRONYMS

ARI	Acute respiratory infection
ARVs	Antiretroviral
BEmONC	basic emergency obstetric and new-born care
BI	Bamako initiative
BIA	benefit incidence analysis
CC	Concentration Curve
CI	Concentration Index
CPEDMC	Central Purchasing of Essential Drugs & Medical Consumables
CRP	Consolidation and Recovery Program
DN	Diploma of Nursing `
DOMSAT	Domestic Satellite Communication System
DPL	Directorate of Pharmacy and Laboratory
EFRP	Economic and Financial Recovery Program
GAVI	Global Alliance for Vaccines and Immunization
GDP	Gross domestic product
GHE	Government Health Expenditures
GPs	general practitioner
HIV	Human Immunodeficiency Virus
HRH	human resource for health
HTH	Higher Technician of Health
ICM	International Confederation of Midwives
IMF	International Monetary Funds
LMIC	Lower middle-income country

LSMS	Living Standards Measurement Survey
MAPF	Mauritanian Association for the Promotion of the Family
MCM	Mauritanian Copper Mines
MDG	Millennium Development Goals
MHA	Moughataa Health Area
MISC	Multiple Indicator Cluster Survey
MoH	Ministry of Health
MRO	Mauritanian Ouguiyas
MSN	Medico-social nurse
MTMP	Medium-Term Master Plan
MW	Midwife
NCDs	non-communicable diseases
NGOs	Nongovernmental organization
NHA	National Health Account
NHDP	The National Health Development Plan
NSHP	National School of Public Health
OOP	Out Of Pocket
ORS	Oral Rehydration Salts
PER	Public Expenditure Review
PHF	Public Health facilities
PPAC	Plan Pluriannuel Complet
PRSP	Poverty Reduction Strategy Paper
PSHLC	The Permanent Survey on Household Living Conditions
PSLCH	The Permanent survey on the living conditions of households
RMNCHN	Reproductive, Maternal, Neonatal and Child Health and Nutrition
SBA	Skilled Birth Attendant

SNIM	Société Nationale Industrielle et Minière
SPSS	Statistical Package for the Social Sciences
SSA	Sub-Saharan Africa
TB	Tuberculosis
UHC	Universal Health Coverage
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
UQBIWB	Unified Questionnaire on Basic Indicators for Well-Being
USAID	United States Agency for International Development
VAT	Value-Added Tax
WB	World Bank
WDI	World Development Indicators
WHO	World Health Organization

Introduction, theoretical framework, research problem and its background

Introduction

Access to maternal and child health care services is an important component of universal health coverage (UHC) and closely related to achievement of health Sustainable Development Goals (SDGs) target 3.8. The National Health Policy goal of universal health coverage entails that all Mauritanian population has access to basic health care they need without suffering financial hardship as a result with emphases on maternal and child health care as a priority. Inequity in access to maternal and child health services and financial protection against catastrophic health care spending and health impoverishment payments are ones of the main issues that underline the problem facing progress toward achieving UHC. Therefore, better understanding the trends in access and equity in the utilization of health care is required to monitor health policy goal and the government commitment to redouble its efforts as count-down country for the reduction of maternal and neonatal mortality from preventable diseases.

Background of the study

Mauritania is an 80% desert country with a population estimated according to the last general population census in 2013 of 3,440,344 inhabitants spread over an area of 1,040,900 km², with an average density of 2.8 inhabitants / km² with substantial disparities between regions. The growth rate of population is 2.4%.

The World Bank classifies Mauritania as a low-middle-income country. The main economic resources are iron ore and fishery products. The oil factor has helped the economic take-off since the mid-2000s, but production has lost momentum since 2010. Other sectors, especially gold and gas production, should take the lead as the engine of growth for the near future.

The decline in external demand, together with the national political crisis in 2008, had a negative impact on the economy and made it more vulnerable to external economic crises. The global economic crisis has affected mineral exports and the tourism sector. However, real GDP growth remains constant at around 6.8% cumulative per year. In 2014 the figure of the GDP was of 3.821billion $USD.

The primary sector accounts for 15.5% of GDP in 2014. However, it uses more than a third of the labour force. Mauritania produces millet, sorghum, dates and rice. Livestock, a traditional sector of the Mauritanian economy, practiced by the rural population, is also an important area of activity.

The secondary sector accounts for 41.5% of GDP. The services sector, for its part, accounts for 43% of GDP and employs about 50% of the labor force.

Historically, Mauritania has inherited its health system from the colonial system. It was essentially curative and free. Health care was remained until very recently fully financed by the government. Following the example of many African countries, the cost recovery system was introduced in 1989. The concept of cost recovery was introduced by the Bamako Initiative in 1987. Sponsored by UNICEF and WHO and adopted by African Ministers of Health in 1987. The Bamako Initiative emerged from the recognition that, many countries - especially sub-Saharan Africa - were in a difficult situation due to lack of resources and practical strategies for program implementation, by the end of the 1980s. Many health centers were suffering from a lack of resources and supplies to function properly. As a result, health professionals often had to limit themselves to prescribing medicines that patients were forced to buy in private establishments that were not always licensed or supervised. In addition, many patients had lost confidence in inefficient and poorly equipped public health centers. In this context, community funding sought to capture a fraction of the money families spent in the informal sector and combine it with government and donor funds to energize health services and improve their quality. Each community set the criteria for exempting people with fewer resources. While countries followed different paths to implement the Bamako Initiative, they had a common goal: to provide a basic set of integrated services through revitalized health centers, which used the fees charged to users and administered the funds along with the community

However, since the introduction of cost recovery systems, a debate was held as to their impact on the poorest populations. For the people living in extreme poverty, even the low contributions seem to be exorbitant.

Financial and geographical access to the health services of a large part of the Mauritanian population has always been problematic up to date, due to the low population density (in terms of area it is 2 times larger than Spain) and Poverty, which affects more than 31% of the

population. Less than 13% of the population benefits from mandatory social coverage to cover their medical expenses. Risk pooling is characterized by many form of fragmentation such as:

- The separate health insurance schemes for specific population groups such as the obstetrical risk insurance scheme
- The separate Community Based Health Insurance" (CBHI) for some population living in some geographical areas such as the Dar Naim Mutual and Barkeiwel Mutual.
- The vertical programs that allocate resources directly to providers for specific health conditions such as free health care for HIV/AIDS, TB and malaria.
- Compulsory health insurance covering only those who are in salaried formal employment, and from whom financial contributions can be easily collected.

Health status profile shows that maternal mortality ratio (MMR) remains among the highest in the West African region, with a proportion of 580 deaths per 100,000 live births. This rate does not seem to evolve significantly in recent years. This indicator reflects not only the level of development of a country, but also the equity of such development and, above all, the quality of its health services.

Inequalities in the use of maternal health services prevent progress towards the Millennium Development Goal (MDG) number five (5) to reduce the maternal mortality rate by three-quarters between 1990 and 2015. Monitoring the equity in the use of maternal health services is important to target scarce resources to those most in need and to accelerate progress towards the Millennium Development Goal (MDG).

Theoretical Framework: Definition of health equity and its measurement

World Health Organization defines equity as "*a fair opportunity for everyone to attain their full health potential regardless of demographic, social, economic or geographic strata*"[1]. Two

[1] World Health organization. Equity definition. [Internet]. Geneva: World Health Organization; 2017; [cited 2017 Dec 8]. Available from: https://www.who.int/gender-equity-rights/understanding/equity-definition/en/

lines of thought marked the debate on equity. The first concept is known as vertical equity[2]. Its principles include that payments for health care ought to be linked to individuals' abilities-to-pay and not to the utilization of health care services. The second concept is known as horizontal equity[3] and it starts from the premise that health care ought to be distributed according to individuals' needs, rather than their abilities-to-pay. This implies that equitable health care system should offer a financial protection against catastrophic health payment, impoverished health payment and a fulfilment of individuals' health need. The above two concepts are generally labeled as "the twin principle of equity" and involve an assessment of "equity in health care finance" and "equity in health care delivery".

Our literature review on measuring health equity does not aim to be exhaustive but rather focuses on the main interesting empirical applications since 2000. Over the past few decades a growing literature has emerged on measuring inequalities in health and health care. Methods were primarily developed for use in developed countries and have been adapted to be applicable in developing countries. The literature can be subdivided into that concerned with inequalities in: (i) health and health care; and (ii) health care payments.

Regarding the inequalities in health and health care, Le Grand (1978)[4] was one of the early contributors on the measurement of inequalities in health and health care before Wagstaff et al. (1991)[5] by suggesting the use of concentration curves and indices to measure the extent of socioeconomic inequalities in the health. Starting from 1991, Wagstaff A. et al (1991)[5] proposed the concentration index as a measure of socioeconomic inequalities in health. The concentration index became widely used as the workhorse of socioeconomic inequality measurement in most of the health economics literature[6,3,7]. It is defined as "*a measure of the*

[2] Culyer, Anthony and Newhouse Joseph. Handbook of Health Economics Volume 1A. Oxford. Elsevier Science. 2000

[3] Van Ourti T., Erreygers G, and Clarke P. Measuring Equality and Equity in Health and Health Care. In: Culyer Anthony. Encyclopedia of Health economics. Amsterdam: Elsevier; 2014, Vol 2 p234-239

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[5] Wagstaff, A., Paci, P., and van Doorslaer, E. On the measurement of inequalities inhealth. Soc Sci Med. 1991; 33; 545–557

[6] Smith Peter and Glied Sherry. The Oxford Handbook of Health Economics. LONDON: Oxford University Press; 2011

[7] Wagstaff Adam and Eozenou Patrick. CATA meet IMPOV, a united approach to measuring financial protection in health. Washington DC: World Bank; 2014.

degree of income related inequality in health, where zero indicates no income related inequality and a negative value indicates a disproportionate concentration of ill-health among the poor"[8]. Its formula can be written as[9]:

$$CI=\frac{1}{n}\sum_{i=1}^{n}\left[\frac{h_i}{\bar{h}}\left(2R_1^y-1\right)\right]$$

Where h_i indicates health of individual i, $\bar{h}$ the average health of individual i, and R_1^y is the fractional rank of socioeconomic status y.

Kakwani N. et al (1997)[10] clarified the relationship between two widely used indices of health inequality, namely: the relative index of inequality (RII) and the concentration index (CI) and explained why these are superior to the other indices used in the literature. They show that the concentration index equals α_1 in OLS-regression model[6]:

$$2\sigma_{R^y}^2\ \frac{h}{\bar{h}}=\alpha_0+\alpha_1R_i^y+\varepsilon_i$$

where $\sigma_{R^y}^2$ is the variance of R_i^y , ε_i is an error term with mean zero, α_0 and α_1 , are parameters to be estimated.

They show that CI is sensitive to socioeconomic dimension of inequalities in health because its value lies between -1 to 1. A positive CI represents the pro-rich and a negative CI represents pro-poor inequality in health. Conversely, this sensitivity to the socioeconomic dimension of inequalities in health is not a property of several other indices used in the literature such as the Gini coefficient[11].

Koolman and van Doorslaer (2004)[12] measured concentration and the decomposition of concentration index for 13 countries. They show that the concentration index can be given a

[8] Fleurbaey M and Schokkaert E. Unfair Health Inequality. In: Culyer Anthony. Encyclopedia of Health economics. Amsterdam: Elsevier. 2014; Vol 3; p411-416

[9] Kjellsson G and Gerdtham U-G. Measuring Health Inequalities Using the Concentration Index Approach. In: Culyer Anthony. Encyclopedia of Health economics. Amsterdam: Elsevier. 2014; Vol 2; p240-246

[10] Kakwani, N., Wagstaff, A., Van Doorslaer, E. Socioeconomic inequalities in health: measurement, computation, and statistical inference. Journal of Econometrics. 1997; 77, 87–103.

[11] Devkota, Satis Chandra, "Inequality in health care utilization and equity: a cross-country comparision of low and middle income countries". Wayne State University Dissertations. Paper 537; 2012

[12] Van Doorslaer E, Koolman X. Explaining the differences inincome-related health inequalities across European countries.Health Economics. 2004;13; 609–628

redistribution interpretation from the richest half to the poorest part of the population to reduce the concentration index to zero. Moreover, they emphasize that the concentration index is theoretically different from a correlation coefficient as it is the result of (i) the disparity in health, assessed by the coefficient of disparity of health, (ii) the correlation coefficient of health and the fractional rank, and (iii) an almost constant.[4]

Wagstaff et al. (2003) [13] were the first contributors applying the decomposition method of the concentration index to the health sector. The decomposition methods start from a linear regression equation linking health to K factors X_{ik} such as income, education, ethnicity, demographics, and so on. The model can be written as [14]:

$$y = \alpha + \sum_k \beta_k x_k + \varepsilon$$

where $\propto$ and β_k, are coefficients and ε an error term with zero mean. After some algebra, the concentration index for y, C, can be written as follows[8]:

$$C = \sum_k \left(\beta_k \frac{\bar{x}_k}{\bar{x}_k} \right) C_k + GC_\varepsilon / \mu,$$

where μ is the mean of y, $\overline{x_k}$ is the mean of x_k, C_k is the concentration index for x_k (defined analogously to C), and GC_ε is the generalized concentration index for the error term (ε).

The equation was use[9] to decompose income-related inequality in child malnutrition in Vietnam in 1993 and 1998. They show that socioeconomic health inequality is affected by two mains factors: i) the level of the impact of the K factors on health – measured by the average elasticity of y $\left(\beta_k \frac{\bar{x}_k}{\bar{x}_k}\right) C_k$ and ii) the socioeconomic inequalities in each factors – measured by the concentration indices C_k. The residual component-captured by the last term-reflects the income-related inequality in health that is not explained by systematic variation in the regressors by income, which should approach zero for a well-specified model.[6]

[13] Wagstaff A, van Doorslaer E, Watanabe N. On decomposing the causes of health sector inequalities with an application to malnutrition inequalities in Vietnam. J Econ. 2003;112; 207–223.

[14] O'Donnell Owen, van Doorslaer Eddy, Wagstaff Adam and Lindelow Magnus. Analyzing Health Equity Using Household Survey Data, A Guide to Techniques and Their Implementation. Washington DC: World Bank; 2008.

Benefit Incidence Analysis (BIA) methodology has been historically used to analyze public health system expenditure and performance in terms of equity. The World Bank has lead most of the BIA studies in developing countries and has focused mostly on the distribution of benefits (or subsidies) from government spending on health and education.[15,16,17] It has also been more widely applied in recent years in the context of universal health coverage to measure the overall equity and assessing whether government spending is progressive through the distribution of health service benefits.[18] The only study that was conducted in Mauritania in 2003[19] and whose data relates to 2000 concluded that public health expenditures were regressive and favor the rich at all level of health system.

Three assumptions and methods are general used to measure the robustness of benefit incidence analysis: i) Constant Unit Cost Assumption, BIA standard; ii) Proportional cost assumption and iii) Linear Cost Assumption. The choice of the method depends on whether we think that the cost incurred by the government when offering a given health service is: a) the same for all individuals; b) proportional to the fees paid by the individuals or c) made of a minimum fixed cost that increases at the same rate as the individual fees. The choice directly affects the computation of the subsidy since it amounts to the difference between public cost of care and fees paid by the individual.[13] The application of these three methods gave us a similar result. To be able to compare our study with the 2003 study, we chose to retain the Constant Unit Cost Assumption. The standard assumption is made when imputing subsidies to individuals is done while the unit costs are considered constant across units of utilization and are considered the same for everyone[20].

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[15] Demery, Lionel, Shiyan Chao, René Bernier and Kalpana Mehra. 'The Incidence of Social Spending in Ghana.' Washington DC: World Bank; 1995

[16] Van de Walle, Dominique. 'Assessing the Welfare Impacts of Public Spending,' World Development. 1998; 26(3);365-379

[17] Castro-Leal, Dayton J., Demery L. and Mehra K. Public spending on health care in Africa do the poor benefit? Bull World Health Organ. 2000; 78; 66–74

[18] Jahangir J, Sayem A, Mary M, et al. Benefit incidence analysis of healthcare in Bangladesh - Equity matters for universal health coverage. Health Policy and Planning. 2016;1-7

[19] Coulombe Harold. Benefit Incidence Analysis of Public Spending in Mauritania: The Case of the Education and Health Sectors. [L'analyse de l'incidence des dépenses publiques en Mauritanie : le cas des secteurs de l'éducation et la santé]. Nouakchott: Mauritanian Center for Policy Analysis; 2004

[20] Wagstaff Adam. Benefit Incidence Analysis: Are Government Health Expenditures More Pro-rich than We think? Washington DC: World Bank; 2010

The unit cost for subsector k (C_k) can be calculated as follows[21]:

$$C_k = \frac{S_k + F_k}{\sum_i q_{ki}} \qquad \text{EQUATION 1}$$

where S_k is the sum of aggregate subsidies of individual i receives from subsector k (e.g. hospital inpatient care) and F_k are the sum of aggregate of the fees paid by individual i to providers in subsector k. The unit cost for subsector k (C_k) equals the sum of these two aggregates divided by the aggregate number of utilization units of subsector k ($\sum_i q_{ki}$).

The concentration index uses to measure how subsidies vary with household income. A positive value of which implies a pro-rich distribution, and a negative value of which suggests a pro-poor distribution. The concentration index of subsidies to subsector k, CI_{sk} , can be expressed in terms of the concentration indices for utilization, CI_{qk}, and fees, CI_{Fk}. The concentration index for costs is a weighted average of the concentration indices of subsidies and fees and can be calculated as follows[20]:

$$CI_{sk} = \frac{C_k}{S_k} CI_{qk} - \frac{F_k}{S_k} CI_{Fk} \qquad \text{EQUATION 2}$$

According to the standard BIA, government spending looks less pro-rich if the better off pay higher fees for a given number of units of utilization. Moreover, subsidies could turn out to be pro-poor if fees are sufficiently disproportionately concentrated among the better off, even if utilization is higher among them.[19]

Regarding the inequalities in health care payments, the literature on health care financing in developing countries focused more on the extent of catastrophic health payments and impoverishing consequences of out-of-pocket payments using different methodologies[13,22] adapted to the context marked by the dominance of out-of-pocket payments and the lack of prepayment and risk pooling mechanisms, such as tax and health insurance.

Berki (1986) [23]was the first who examine catastrophic health expenditure. According to him,

[21] Wagstaff Adam, Bilger Marcel, Sajaia Zurab and Lokshin Michael. Streamlined analysis with ADePT software: Health Equity and Financial Protection. Washington: World Bank; 2011

[22]Hoang Van Minh, Hung Nguyen-Viet, Nguyen Hoang Thanh, Jui-Chen Yang. Assessing willingness to pay for improved sanitation in rural Vietnam. Environ Health Prev Med. 2013; 18(4): 275–284

[23] Berki S. A look at catastrophic medical expenses and the poor. Health Affairs, 1986; 5(4); 138-145

catastrophic expenditure occurs when it constitutes a large part of a household budget and affects its ability to maintain the normal standard of living. Russell (1996)[24] relates catastrophic health expenditure to a household's ability to pay and focused on the opportunity cost of healthcare expenditure to that household concerned. [25]

Wagstaff et al.[13] measured the incidence and extent of catastrophic health expenditure in Vietnam using proportion of the total expenditure in a household. Their work were the workhorses of empirical work on financial protection in health. They defined OOP health expenditures as catastrophic if they exceed some fraction of household income or total expenditure. They argue that, if a household spends a large share of its budget on healthcare, he should sacrifice other basic goods and services. Xu et al (2007)[26] outlined that catastrophic health expenditure is particularly related to household's nonfood consumption or household's capacity to pay. They set a threshold equal or exceed of 40% percent of nonfood expenditure as catastrophic health expenditure threshold.

Impoverishment due to OOP health payments occurs when households who are non-poor are pushed into poverty after the payment for healthcare services. Van Doorslaer et al. (2007) examined the impoverishing impact of OOP payments for healthcare in 11 Asian countries and found that OOP expenditures exacerbated the extent of poverty. Poverty estimates after controlling for OOP health expenditures were much higher than the conventional estimates, ranging from an additional 1.2% of the population in Vietnam to 3.8% in Bangladesh.

Wagstaff et al. (2017) [27] updates Xu et al.2003[28] study. They estimate the global incidence of catastrophic spending to be 10.7% in 2010. According their finding, catastrophic spending has

[24] Russell, S., 1996. Ability to pay for health care: Concepts and evidence. Health Policy Plann.1996;11(3); 219-237

[25] Mettle et al. Catalogistico Discriminant Analysis: A Methodology for Analyzing Catastrophic Spending on Health in Statistically Under-Developed Countries. Research Journal of Mathematics and Statistics. 2014; 6(2);16-22

[26] Xu K, David BE, Guido C, et al. Protecting Households from Catastrophic Health Spending. Moving away from out-of-pocket health care payments to prepayment mechanisms is the key to reducing financial catastrophe. Health Affairs. 2007; 26(4); 972–983

[27] Wagstaff A, Gabriela F, Justine H, et al. Progress on catastrophic health spending in 133 countries: a retrospective observational study. Lancet Glob Health. 2018; 6(2);169-179

[28] Xu K, Evans DB, Kawabata K, et al. Household catastrophic health expenditure: a multicountry analysis. Lancet. 2003; 362;111-117

been increasing in half of the studied countries, including in countries implementing UHC reforms. They show that catastrophic incidence is lower in countries with a high share of prepaid health spending and is higher in low- and middle- income countries that devote a large share of GDP to health and in high-income countries that rely heavily on social insurance.

The present study is based on the approach proposed by Wagstaff and van Doorslaer (2003)[29], O'Donnel et al (2008)[14] statistical techniques, Wagstaff et al (2011)[21] and ADePT software[30] to measure the catastrophic health expenditure and impoverishment health payment as well as equity in health care.

O'Donnel et al (2008)[14] define *catastrophic expenditure* head count as the share of households where the ratio of health expenditure to total expenditure (or nonfood expenditure) exceeded a specific threshold. Considering T_i as the OOP health expenditures for household i, x_i as the total expenditure for household i, and f(x) as food expenditure, a household incurred catastrophic payments if T_i/x_i, or $x_i/(x_i - f(x))$exceeds a specified threshold, z[31].The head count is given by the following equation[14]:

$$H = \frac{1}{N}\sum_{i=1}^{N} E_i$$

where H households with health care expenditure shares that exceed the threshold z, N is the sample size and E is an indicator equal to 1 if OOP payments of a household i as a proportion of its consumption expenditure (total or nonfood) are greater than the threshold, and zero otherwise. The head count estimates the proportion of households that have OOP payments above the chosen threshold.

Wagstaff and van Doorslaer (2003)[29] proposed methods to measure *impoverishing health payment* and adjust poverty measures based on household expenditure net of OOP spending on healthcare. They argue that spending on health care is a response to a basic need that is not

[29] Wagstaff A van Doorslaer E. Catastrophe and impoverishment in paying for health care: with applications to Vietnam 1993–1998. Health Econ. 2003 ; 12 ; 921-934

[30] World Bank. ADePT: Software Platform for Automated Economic Analysis. Version 6 of ADePT Software platform for applied economic analysis. Washington DC: World Bank; 2011

[31] Kimani D and Maina T. Catastrophic Health Expenditures and Impoverishment in Kenya. Washington, DC: Futures Group, Health Policy Project; 2015

adequately reflected in the poverty line. The poverty head count, which is the proportion of households living below the poverty line measures of poverty, are as follows:

Allow that x_i be total per capita household expenditure and indicate whether the household is poor, p_i^{gross} is gross poverty head count where[14]:

$p_i^{gross} = 1$ if $x_i < PL$ and 0 otherwise, and

$p_i^{net} = 1$ if $(x_i - OOP < PL)$ and 0 otherwise,

Gross and net of health payments poverty headcount head count ratio is

$$H^{gross} = \frac{\sum_{i=1}^{N} s_i p_i^{gross}}{\sum_{i=1}^{N} s_i} \quad \text{and}$$

$$H^{net} = \frac{\sum_{i=1}^{N} s_i p_i^{net}}{\sum_{i=1}^{N} s_i}$$

The difference between the relevant poverty measures before and after paying for healthcare is given as:

$$P^H = H^{net} - H^{gross}$$

The equation represents the difference between the poverty head count before and after paying for healthcare, which is the poverty impact (impoverishment) due to OOP expenditures or impoverishment head count.

However, the difference between poverty estimates derived from household gross consumption and net of OOP payments for health care may be interpreted as a rough approximation of the impoverishing effect of such payments if it satisfies two conditions: (i) OOP payments are completely nondiscretionary and (ii) total household consumption are fixed[29].

The literature review entails that research in health equity, health service coverage and financial protection is increasing and being used to support national health policy and planning processes.

Several studies have used the approaches proposed to measure the incidence and extent of catastrophic OOP health expenditures. [14,28,29] The major part of the conducted studies has been

taken place in Asia and Latin America, but a few were done in sub-Saharan African countries[32]. In Mauritania, a general lack of reliable data has limited the number and scope of such studies. The Living Standards Measurement Survey 2014 dataset, and Multi Indicators Cluster surveys (2007, 2011 and 2015) provide an opportunity to apply well established analytic techniques to assess the equity of health care financing and the inequalities in healthcare utilization in Mauritania. The timing is opportune given the reform of health care to move forward universal health coverage and achievement of sustainable development goals in Mauritania and the need for the policy debate to draw on a good evidence-base.

Study objective and methodology The goals of this study are to investigate and measure the equity in the utilization of maternal and child health care, financial protection and government health spending benefit incidence. Therefore, equity measurement theory and research on financial protection are discussed in precedent section as the starting point for general framework.

The research tries to answer the following questions:

- Is maternal and child health care service utilization equitably distributed in the sense that people in equal need receive similar amounts of health care services irrespective of their income or socioeconomic status? Has equity in access to and maternal and child health care utilization improved since 2007?
- Who benefits from health care subsidies? Are health sector subsidies more equally distributed over the last fifteen years?
- What are catastrophic payments and how can they be measured? How far do health care payments push households impoverish?

The research data come from a series of household surveys known as Multiple Indicator Cluster Surveys (MICS) carried out by the National office for statistics with technical support from the UNICEF in 2007, 2011 and 2015. The MICS sample is a random sample, stratified to two

[32] Kimani DN, Mercy G. Mugo, Urbanus M. Kioko. Catastrophic Health Expenditures and Impoverishment in Kenya. European Scientific journal, 2016 ; 12(15); 435-452

degrees and is representative of the national, regional, and district levels. A total of 39645 women and 28,888 men are included in the three surveys, which obtained data by means of face-to-face interviews and rely on self-report.

The variables of maternal and child health services are: contraceptive prevalence, antenatal visits, skilled birth attendance, postnatal visits and child completely vaccinated. Equity measures are calculated through concentration curves, concentration indices, and incidence analysis of public expenditure benefits. Horizontal inequity is measured through inequality in the utilization of maternal health care in relation to socio-economic determinants such as income, place of residence, education level and ethnicity. The standardization of the needs is carried out using linear regression model, following the methodology of O'Donnell et al(2008).

Concentration index is commonly used as a summary measure for socio-economic-related inequality in health or healthcare utilization. It indicates the extent to which a health indicator is concentrated among the poor or the rich. Given that a population is ranked by increasing consumption. In the case in which there is no socio-economic-related inequality the concentration index is zero. It has a negative value when the health indicator is concentrated among the poorer individuals and a positive value when the health indicator is concentrated among the richer individuals.

Concentration index (CI) is derived from the Concentration Curve (CC). It measures inequality in the distribution of a health variable in relation to a socio-economic rank attached to each individual. The decomposition methods express socio-economic health inequality as a weighted sum of the socio-economic inequalities in these factors. It provides a useful means of analysing determinants of health inequality. Decomposition by groupings was the leading approach to quantifying how the socio-economic determinants affect income inequality (Kakwani, 1980). Wagstaff et al. (2003) incorporated CI with a linear regression framework and demonstrated that the CI is additively decomposable into the contributions of individual determinants to socio-economic health inequality (Wagstaff et al., 2003) where socio-economic health inequality is a weighted sum of the socio-economic inequalities in these determinants/factors. The share of inequality that remains after the standardization variables are considered can be interpreted as a measure of inequity. This method has been developed in linear models in which

the response is assumed to be continuous and to follow a normal distribution.[33] Epidemiologists use the terms "direct" or "indirect" standardization to adjust observed variables for group differences in standardization variables.

Total inequality = justifiable inequality + unjustifiable inequality. In our example age is used as variable for the standardization.

Total inequality = age + (income + education +place of residence + number of living children +ethnicity)

The benefit incidence study follows O'Donnell et al. (2008 and 2011) methods.[14,21] The distribution of health benefits was estimated using concentration indices, concentration curves, the dominance tests and the Kakwani indices. The concentration index measures inequality and offers a summary measure of absolute progressivity of the subsidy. It ranges from -1 and 1. A negative value suggests that the health benefit is concentrated among the poor, while a positive value suggests that the health benefit is concentrated among the rich.[34]

The Kakwani index is the twice the area between a concentration curve and the Lorenz curve. It measures the progressivity.[14] Its value ranges from –2 to 1. It is negative (positive) if the concentration curve dominates (is dominated by) the Lorenz curve. In the case in which the concentration lies on top of the Lorenz curve, the Kakwani index is zero.[14]

Outpatients visits Data and out of pocket payment come from Permanent Survey on Household Living Conditions 2014 which is nationally representative Survey. The survey gathers information on various aspects of household welfare, including consumption, income, housing, access to facilities, education, health, migration, employment, access to credit. The PSHLC2014 is based on the well-known QUIBB (Unified Questionnaire on Basic Indicators for Well-Being) method, both in social indicators and expenditure / household income. It was

[33] Yuejen ZHAO. Decomposition of concentration index using generalized linear model: analysis of socio-economic determinants of health inequality in the northern territory of Australia [Internet]. Regional and Sectorial Economic Studies, Euro-American Association of Economic Development Studies. Santiago de Compostela: University of Santiago de Compostela; 2018 [cited 2018 July 16]; Available from: http://www.usc.es/economet/journals2/eers/eers13112.pdf

[34] Mills Anne. Public Health in Resource Poor Settings. In: Culyer Anthony. Encyclopedia of Health economics. Amsterdam: Elsevier. 2014; Vol 3; p194-203

completed in two passes. The QUIBB is a "package", designed to collect key information to measure the access, use and satisfaction of the populations of the main economic and social services.

Public health spending data come from Ministry of Finances 2014[134] and Ministry of Health data.

The constant unit cost assumption was applied, which assumes that the unit costs are constant across units of utilization and are the same for everyone. We used WHO-CHOICE MODEL[35] for the cost unit. The model was updated to reflect 2014 price levels.

The analysis of catastrophic health care payments follows the approach by O'Donnell et al. (2008) which defines health spending as "catastrophic" if it exceeds some fraction or threshold of total expenditure, or of total non-food expenditure, in a given period. Incidence of Catastrophe health spending is measured using various thresholds to demonstrate the sensitivity of catastrophic measures. Catastrophic health expenditures are defined as health care payments that exceed a predetermined percentage of total household expenditure or non-food expenditures. When total expenditure is used as the denominator, the threshold used is 25 per cent. When non-food expenditures are used as the denominator, the threshold used is 40 per cent. The justification is that these thresholds are ones of the indicators of sustainable development goal for catastrophic expenditures. Moreover, theses thresholds represent an approximate threshold during which the household is forced to sacrifice other basic needs, sell productive assets, incur debts, or become poor (Russell 1996).[24] A regression analysis was conducted to explore variables associated with catastrophic health expenditure.

Statement of the problem

As Mauritania plans to move toward universal health coverage, empirical studies are therefore required to assess the overall pattern of inequality in access and utilization of health care services, the distribution of the burden of the existing health care financing mechanisms,

[35] World health Organization. CHOosing Interventions that are Cost Effective (WHO-CHOICE) [Internet]. World Health Organization; 2018 [cited 2018 December 15]; Accessed December 15, 2018 from https://www.who.int/choice/country/country_specific/en/

particularly of pocket (OOP) payments and the distribution of the benefit from government health spending.

Scope and Limitations of the study

Our research focuses on the problem of health inequality in the utilization of maternal and child health care services in Mauritania. We focus on this group for several reasons. First, slow progress in reducing maternal and infant mortality despite being a priority in health policy. Second, to draw on a good evidence-base.

The lack of data on inpatient care utilization in the Permanent Survey on the Living Conditions of Householdhas (PSLCH) limited the scope of the benefit incidence analysis to the outpatient care only. Outpatient visits are reported for the two weeks preceding the survey interview. So, we standardize on the recall period using k=26 for services reported over a 2-week period.

PSLCH estimates that the poverty line is 169445 ouguiyas in real terms per year or the equivalent of 3.6 USD per day.

Multi Indicators Cluster surveys (MICS) Data on the utilization of contraception methods are collected only from married women. This is in line with the national policy on family planning that limits the use of contraceptive methods for the birth space only. This implies that the unmarried users of contraceptives are not counted in the survey and their needs are not considered. This might be a limitation of MICS surveys.

The questionnaires of MICS survey evolved over time with the addition of modules that were not available in the previous version of the survey which makes the comparison a little difficult sometimes. This is the case for prenatal consultation 4, for example, whose data were not available in 2007.

Finally, the preparation of the study in parallel with a professional life was a major challenge.

Chapter I: Socio-economic context of the country

Mauritania, is in West Africa in the Sahelo-Saharan zone, between Maghreb and Sub-Saharan Africa. The country has a vast territory of more than 1 million km^2 and very low density. It has borders with Senegal to the south, Mali to the south and east, Algeria to the northeast and Morocco to the north. To the west, the Atlantic Ocean forms a 700-km long coastline, (See Figure 1

FIGURE 1: MAURITANIA MAP

The country is 80% desert, and arable land does not exceed 0.2% of the total territory. Mauritania has only one permanent watercourse: The Senegal River, which is a natural border with Senegal.

In terms of climate and vegetation, broadly, Mauritania can be divided into three major natural

regions[36(p21,22)] :

- The valley of the Senegal River has a humid climate. It is an agricultural region (rice, fruit, etc.). It is characterized by annual rainfall of up to 500 mm;
- A Sahelian zone, south of a line from Nouakchott to Néma, is an area of pastures where livestock and support rain-fed vegetation are practiced; annual rainfall of 100 to 300 mm.
- An immense Saharan zone, to the north of this line, where precipitations, mostly irregular, vary between 50 and 100 mm annually. Water points are infrequent outside a few oases where the implantation of large palm groves has favoured the establishment of agglomerations of significant size.

The road network consists only of 7000 km of bitumen roads and 700 Km of railway linking Zouerat to Nouadhibou. Two regional capitals (Nouadhibou and Zouerat) are regularly connected by air to Nouakchott. There are three international airports, four port complexes and an autonomous telecommunications center connected to the ARAB SAT and INTEL SAT satellites. All wilayas are connected to the capital and to the outside through the DOMSAT network. Incomplete road and communication systems generated important problems and impact on economy, health and nutrition status.

Administratively, the country is divided into 15 wilayas subdivided into 55 Moughataas and 218 communes, respectively led by Walis, Hakems and mayors.

Population and fertility

Evolution of the population

Since the country's independence in 1960, Mauritania had undergone important transformations from a traditionally nomadic society to become a country characterized by a higher pace of urbanization. The population increased from 1,864,236 in 1988 to 3,537,368

[36]Ministry of Health. Evaluation report of the first phase of the NHDP (2012-2015). [Rapport d'évaluation de la première phase du PNDS (2012-2015)]. Nouakchott : Ministry of Heath ; 2016

inhabitants in 2013. The population experienced a growth rate of 2.77% between 2000 and 2013. It has been multiplied by 1.89 since 1988 and will continue to increase by nearly 100 000 Per year.

The high growth of population is the result of a rapid decline in mortality due to improved health conditions and the high fertility rates. The evolution of the population of Mauritania presents a regional disparity considering the comparative advantages according to the wilaya. Indeed, the wilayas can be classified into several groups:

- The wilayas with high growth rates: Nouakchott (4.36%), Inchiri (4.32%), Nouadhibou (3.57%), Hodh Chargui (3.43%) and Guidimagha (3.28%);
- Wilayas with average growth rates: Hodh Gharbi (2.63%), Gorgol (2.62%), Assaba (2.39%);
- The wilayas with very low growth: Tagant (0.44%), Trarza (0.14%) and Adrar (-0.84%).

The first group is characterized by strong population migrations due to an attraction linked to economic activity; This is the case of the Inchiri, which is home to the Tasiast and MCM mining site, Nouadhibou with the concentration of fishing activities and the recent creation of the Free Zone; While the wilaya of Hodh Chargui contains the site of the Malian refugees with nearly 47,000 people. To these wilayas is added the political capital Nouakchott which absorbs more than a quarter of the population of the country (27,1%).

The Mauritanian population has a very low density of 3.4 inhabitants per square kilometre. These national average hides regional disparities. The wilayas located in the river region have the highest densities after the Nouakchott zone. These are the wilayas of Guidimagha and Gorgol, which have an exceptional situation, with a density of 25.9 inhabitants per km² and 24.7 inhabitants per km² respectively. Brakna and Assaba have a much lower density (9.2 and 8.9 inhabitants / km² respectively), while the wilayas in the desert area (Tiris-Zemour, Inchiri, Tagant, Adrar) are the least densely populated, with a density of less than 1 inhabitant / km².

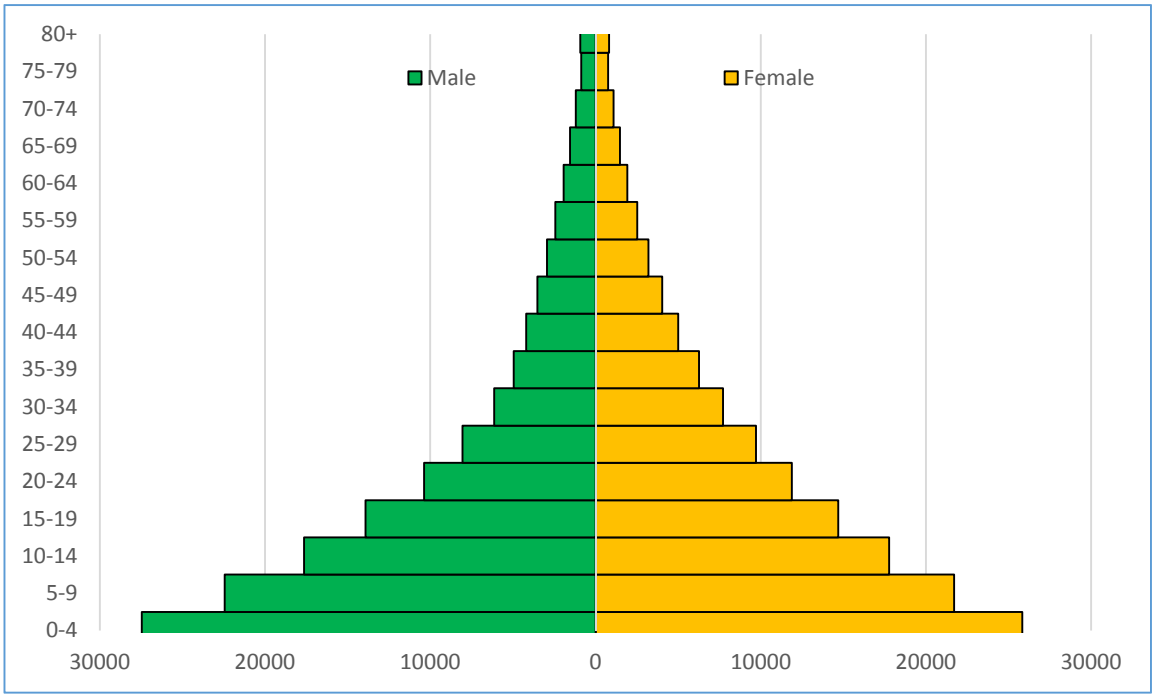
The urban population amounts to 1,710,103 inhabitants and represents 48.3% of the country's total population with large regional disparities. The city of Nouakchott alone accounts for more than half of the urban population (56%), while it accounts for 76.6% of the population of the main cities. The rate of urbanization varies from 95.5% in Nouadhibou to 15.4% in Hodh

Gharbi. The cities with population more than 32,000 inhabitants are six main cities (Nouakchott, Kiffa, Kaedi, Rosso, Nouadhibou and Zouerate), which together account for 73.1% of the urban population in 2013.

Structure by sex and age

In 2013, the population consists of 1,794,294 women (50.7 per cent) and 1,743,074 men (49.3 per cent) with a sex ratio of 97 men per 100 women. The figure below shows the population structure by sex and age.

FIGURE 2 AGE STRUCTURE OF THE MAURITANIAN POPULATION IN 2013



The Figure 2 shows that Mauritanian population is characterized by its youth: more than 30% of the population is under 10 years old, while the under-15 age group represents 44.2% of the population, the 15-59 age group represents 50.2% and the population aged 60 and over only 5.6%. The average age is 22 for the country. The average age is 23 years in urban areas, 21 years in rural areas and 23 years in nomads.

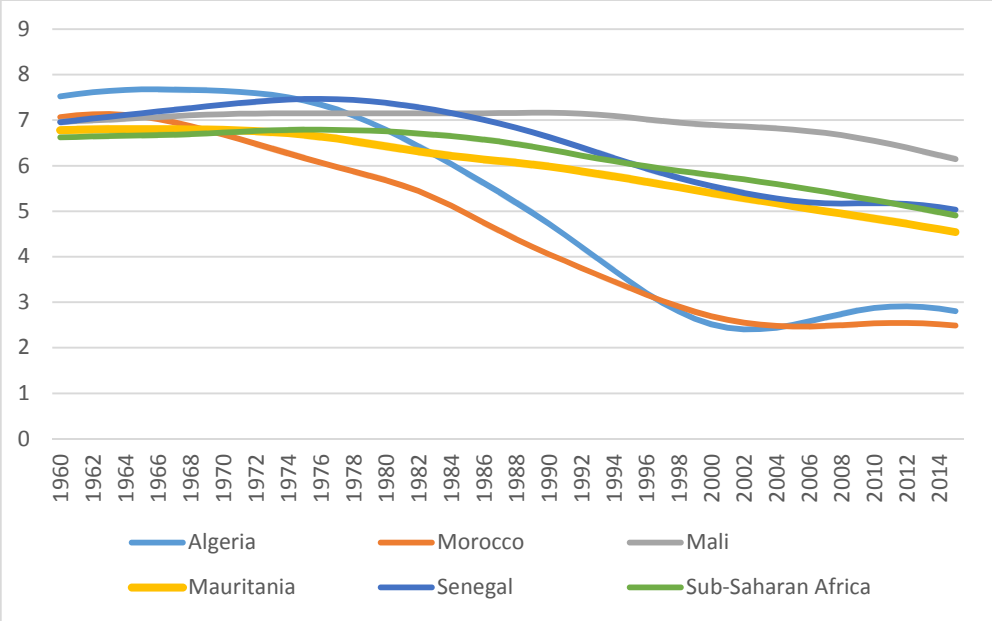
In the last three censuses (1988, 2000 and 2013), the population structure remained stable even though the elderly population (60 years and over) fall from 6.3% to 5.6%. This stability is felt

more in young ages and in active ages, reflecting strong social demand and the need for massive job creation. The under-15 population dependency ratio is 85.2% and 7.5% for those aged 65 and over, a total of 92.7%.[37(p15)]

Fertility

The Fertility rate, is the average number of children that a woman aged 15-49 at the end of her fertile life would have had. In Mauritania, the fertility remains high, as shown in figure below.

FIGURE 3 FERTILITY RATE OVER TIME AND VIS-À-VIS OF THE NEIGHBOUR COUNTRIES [38]



In terms of fertility rates, Mauritania is doing better than Mali and Senegal, and the level of fertility is even below the average for sub-Saharan Africa. However, this rate stays very high and still far from the level recorded in its neighbours in the north: Morocco and Algeria.

[37] Ministry of Economy and Finance. Report of the training workshop on measuring the demographic dividend in Mauritania. [Rapport de l'atelier de formation sur la mesure du dividende démographique en Mauritanie]. Nouakchott : Ministry of Economy and Finance ; 2016.

[38] The World Bank. World Development Indicators[Internet]. Washington, D.C.: The World Bank: 2018 [cited 2018 July 16]; Available from. http://data.worldbank.org/data-catalog/world-development-indicators

High fertility means that women are more often exposed to the risk of maternal death. It is also reflected in the low prevalence of modern contraceptive methods.

Progress in fertility related indicators has been minimal over the past decades. The greatest degree of progress can be seen in the modern contraceptive prevalence rate, which rose from 5 percent in 2000 to 15.6 percent in 2015 (Table 1). Mirroring the stagnant fertility rate, the age at first pregnancy and age at first marriage still high despite a downward trend. It is suggested that high teenage pregnancy (15.6 percent), lower access to contraceptives methods, low levels of urbanization, and lower prioritization of family planning programs by the government are all reasons for persistently high fertility levels.[39] Furthermore, as Table 1 shows, unmet contraceptive need has risen from 31 percent in 2011 to 34.1 percent in 2015, despite an increase in the contraceptive prevalence rate.

TABLE 1 FERTILITY-RELATED INDICATORS IN MAURITANIA: 2000, 2007, 2011 AND 2015[40,41,42, 43]

	2000	2007	2011	2015
Fertility rate (children per woman)	4.7	n. a	4.8	5.1
Early pregnancy before the age of 15	n. a	n. a	23.6%	15.6%
Early marriage: % of women aged 15-	32 %	19%	15%	13%
Contraceptive prevalence in married	5%	8%	10%	15.6%
Unmet contraceptive need (percent)	n. a	n. a	31%	34.7%

[39] Okwero P et al. Fiscal Space for Health in Uganda. Washington DC: World Bank; 2010

[40] National Office of Statistics. Demographic and Health Survey Mauritania 2000-2001. [Enquête Démographique et de Santé Mauritanie 2000-2001]. Nouakchott: National Office of Statistics; 2001

[41] National Office of Statistics. *Multiple Indicator Cluster Survey (MICS) 2007. [Enquête par Grappes à Indicateurs Multiples (MICS) 2007]*. Nouakchott : National Office of Statistics; 2007

[42] National Office of Statistics. *Multiple Indicator Cluster Survey (MICS) 2011. [Enquête par Grappes à Indicateurs (MICS) 2011]*. Nouakchott : National Office of Statistics; 2014

[43] National Office of Statistics. *Multiple Indicator Cluster Survey (MICS) 2015. [Enquête par Grappes à Indicateurs (MICS) 2015]*. Nouakchott : National Office of Statistics; 2016

The national average of fertility rate hides a disparity between wilayas as shown in Table 2 below.

TABLE 2. FERTILITY RATE BY WILAYA (REGION)[43]

Wilaya	Total fertility rate
Hodh Chargui	5.5
Hodh Gharbi	5.7
Assaba	5.7
Gorgol	6.4
Brakna	5.7
Trarza	4.4
Adrar	(*)
Nouadhibou	(*)
Tagant	(*)
Guidimagha	6.6
Tiris-Zemour	(*)
Inchiri	(*)
Nouakchott	4.1
National	5.1

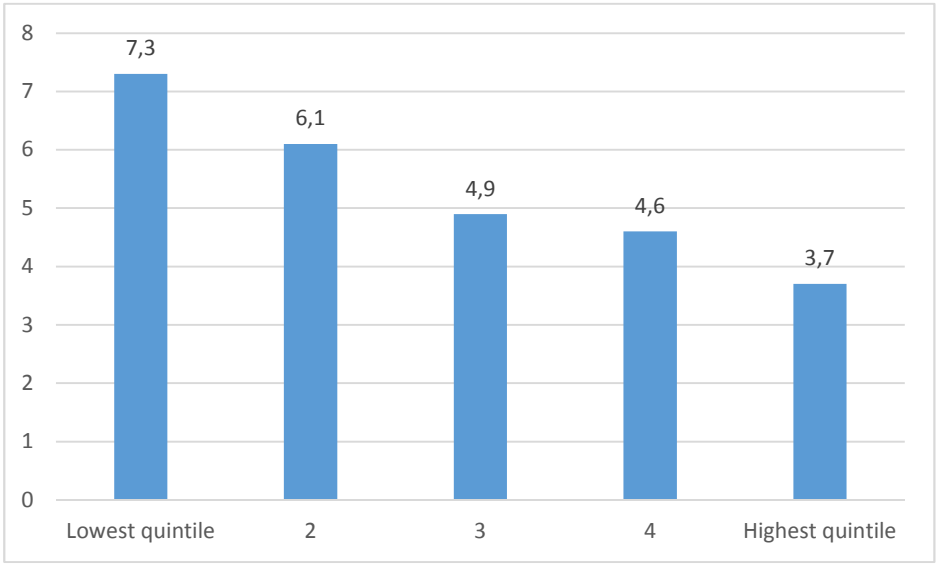
The highest rate is observed at the level of Gorgol 6.4 children per woman and the lowest rate was observed in Nouakchott with 4.1 children per woman.

The level of education of women also plays an important role. MICS survey (2015 edition) indicates that the average number of children per woman decreases with the increase in

educational attainment. Women who have reached secondary level or above have an average of 3.5 children, compared to 5.5 for primary and 6.1 for those who have never attended school.

The fertility rate varies consequently according to the household economic status. In 2015 the highest fertility rate was observed among the poorest quintile (7.3) while the lowest rate was observed among the richest quintile (3.7) as shown in Figure 4.

FIGURE 4. FERTILITY RATE BY SOCIO-ECONOMIC PROFILE [43]



High fertility strains resources of poor families, reducing available incomes to feed, educate, and provide health care to children. Equally, many characteristics of poverty contribute to high fertility—high infant mortality, lack of education for women, too little family income to devote to children.

Recent Economic Trends

Economy overview

Mauritania's economy is dominated by natural resources, such as iron ore, gold, copper, gypsum, phosphate rock, crude oil, natural gas and agriculture. However, half the population still depends on agriculture and livestock for a livelihood, even though many nomads and subsistence farmers were forced into the cities by recurrent droughts in the 1970s, 1980s and 2012.

The country is the second largest producer of iron ore in Africa after South Africa. The sector is dominated by three major companies operating mines in production phase: the state company Société National Industrielle et Minière (SNIM) which runs the iron ore mines at Zouerate; the Mauritanian Copper Mines (MCM) with main operations at Akjoujt; and TASIAST Mauritanie Limited with important gold exploration and extraction activities. Phosphate reserves are also significant and, if developed, could transform the resource sector of the country.[44(p6)]

The nation's ocean front is among the richest fishing areas in the world, and fishing accounts for about 25% of budget revenues, but over-exploitation by foreigners threatens this key source of revenue.

Mauritania's irrigated area holds the potential to boost both productivity and farm incomes by orders and size, while livestock rearing is also capable of at least doubling productivity. The mains drawbacks in the agriculture sector are the lack of good irrigation systems, not only waters and canals, but also rural roads to transport inputs (seeds, fertilizers, pesticides) and crops to enable the marketing of final products promptly. The performance of the sector also suffers from the lack of inputs, technical and productivity skills, and sanitary standards.[45(p5)]

[44] International Monetary Fund. Islamic Republic of Mauritania selected issues paper. International Monetary Fund Country Report No15/36. Washington DC: International Monetary Fund; 2015

[45] World Bank. Mauritania policy options to enhance private sector development, Country economic Memorandum. Washington DC: World Bank; 2010

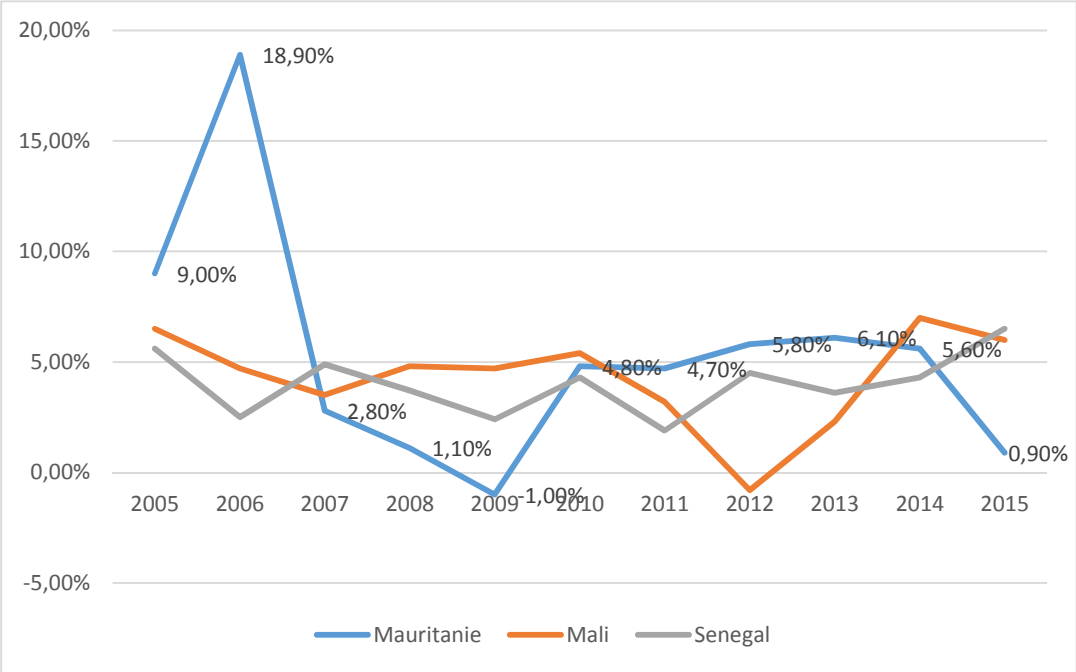
Mauritania's incomes from iron and fisheries were significant for their duration and size, while agriculture growth was limited. The reliance on incomes from iron exploitation and fisheries may have contributed to the neglect of other sectors, including agriculture.

The main challenge for Mauritanian economy include its recurring droughts, dependence on foreign aid and investment, and insecurity in neighbouring Mali, as well as significant shortages of infrastructure, institutional ability, and human capital.

The economic growth

Mauritania has reached a strong but a volatile GDP growth in recent years and has recently been classified as a lower middle-income country (LMIC), with a GDP per capita of US$ 1380 in 2014. Economic growth, averaging 4.69 percent annually over the decade to 2014 (Figure 5). This is like the sub-Saharan and neighbour's countries such as Senegal and Mali over the same period. Poverty was halved between 2000 and 2010.

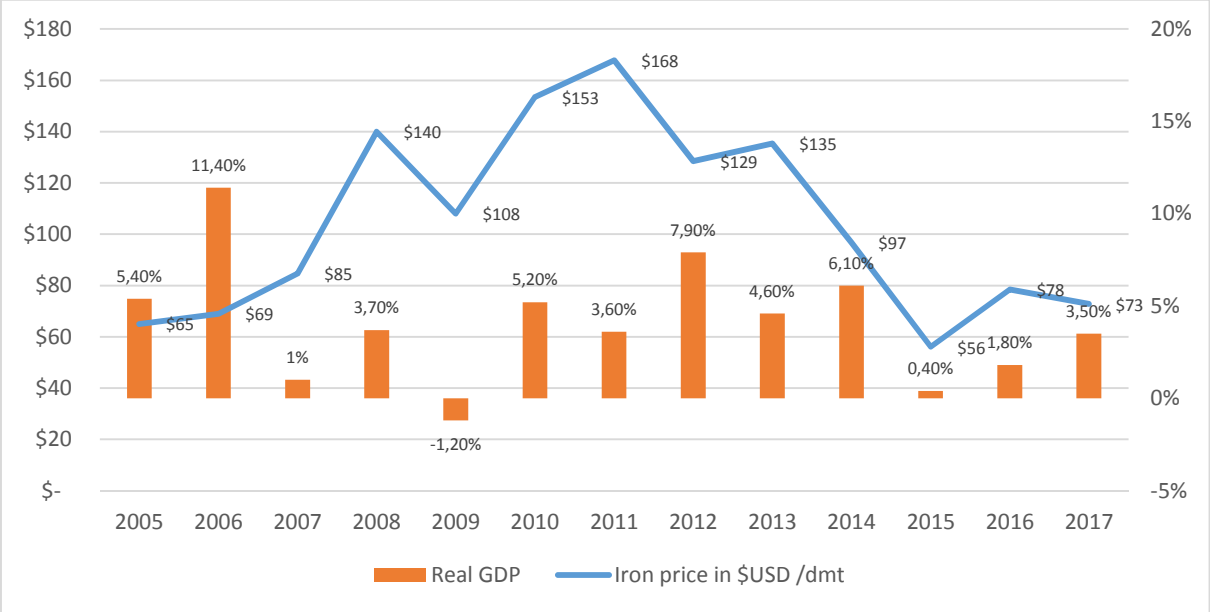
FIGURE 5: MAURITANIA GDP GROWTH VIS-À-VIS NEIGHBOUR COUNTRIES[46]



[46] International Monetary Fund. World Economic Outlook (April 2017). Washington: International Monetary Fund; 2017.

In 2006, the sharp rise in GDP growth was due to the start of the Chinguity oil field. The growth was reversed abruptly in 2007 due to unexpected difficulties related to the geology of the new field. However, two gold mines helped to support growth. Overall, the economic growth rates are high except for the years 2007 to 2009. The year 2009 was particularly difficult with a negative growth rate, due to the drop-in oil production, and the political instability that followed the Coup d'Etat in August 2008. After showing resilient to the end of the commodity super-cycle in 2014, GDP growth in 2015 declined to 0.4%[47] "on the back of a negative terms of trade shock and a drop-in mining and oil production of 15.7% and 11.0%, respectively".[48(p1)]Year-on-year Growth performance was close to the average for neighbour countries such as Mali and Senegal, and represented a noticeable improvement over the 1990s, when annual growth averaged only 2.7%.

FIGURE 6: REAL GDP GROWTH AND GLOBAL IRON ORE, 2007-2017[49,50,51,52,47]



[47] Central Bank of Mauritania. *Annual report 2017. [Rapport annuel 2017]*. Nouakchott. Central Bank of Mauritania; 2018

[48] World Bank. Islamic Republic of Mauritania Public Expenditure Review Surfing the wave: public spending during the commodity super- cycle and beyond. Washington: World Bank; 2016

[49] Central Bank of Mauritania. *Annual report 2014. [Rapport annuel 2014]*. Nouakchott. Central Bank of Mauritania; 2015

[50] Central Bank of Mauritania. *Annual report 2010. [Rapport annuel 2010]*. Central Bank of Mauritania; 2011

[51] Central Bank of Mauritania. *Annual report 2008. [Rapport annuel 2008]*. Central Bank of Mauritania; 2009

[52] Central Bank of Mauritania. *Annual report 2006. [Rapport annuel 2006]*. Nouakchott. Central Bank of Mauritania ; 2007

High international commodity prices drove the GDP. The increasing prices of commodities, as shown in Figure 6, has led to an increase in the value of mineral exports from US$ 883 million to US$ 2.1 billion in 2013[5(p7)], albeit the stagnant mining production. Extractive industry represented, on average, 82% of exports, exposing the economy to price fluctuation in international commodity markets. The contribution of extractives to government revenue is smaller than their share in exports. Receipts from minerals and petroleum represented, on average, 25% of GDP, and 23% of domestic revenue.

Economic growth is one of the most important long-term sources of additional fiscal space for health in all countries. Commonly, there is a very strong correlation between income per capita and health spending per capita. For Mauritania's long-term aspirations to achieve universal health coverage, rapid economic growth is crucial. The IMF forecasts 4.13 percent real GDP growth through 2022. However, there are some risks to this outlook[46]. The re-emergence of political unrest, which culminated with the coup of August 2008 as in 2005 and the decline in the Iron prices in the international market would slowing growth and decreasing revenues and public expenditures.

However, the opportunity to translate economic growth into higher spending is limited by volatility of government revenues and the priority given to health sector. Domestic revenues have been volatile in the past five years. Between 2009 and 2015, domestic revenues fluctuated between 20.4 and 31.2 percent of GDP, rising sharply in 2012 as exports prices spiked and improvements in tax administration boosted collection rates (Table 3).

Fiscal Accounts

Tax is the largest source of revenue in Mauritania. Fiscal revenues have constantly improved between 2009 and 2013. It consists primarily of taxes on goods and services (50.3 percent) and income taxes (32.5 percent). Taxes on goods and services are linked to the development in the extractives sector as they encompass both a unique tax and a value-added tax (VAT) on the imports of the National Mining Company (Société National Industrielle et Minière de Mauritanie; SNIM), and a tax related to petroleum products. Non-tax revenues averaged 8.4 percent of GDP, including receipts from the fisheries and mining sectors along with dividends from public enterprises such as SNIM and the telecom company, Mauritel. Finally, revenues

from the petroleum industry average 1.4 percent of GDP and include both direct taxes on oil companies and all types of royalties and fees.

TABLE 3 DECOMPOSITION OF BUDGET REVENUES BY SELECTED CATEGORIES, AS PERCENTAGE OF GDP 2009–15 [48(P,9)]

Revenue categories	2009	2010	2011	2012	2013	2014	2015	Average
Revenue excluding grants	20.4	21.1	22.1	25.6	31.2	27.5	26.2	24.9
Tax revenue	11.1	13.0	12.8	17.3	16.7	18.3	16.8	15.1
Taxes on income and profits	3.6	3.6	3.8	5.6	5.6	6.4	5.9	4.9
Taxes on goods and services	5.6	6.6	7.0	9.3	8.4	9.0	7.5	7.6
Taxes on international trade	1.5	1.5	1.6	2.0	2.0	2.1	2.4	1.9
Other tax revenues	0.4	1.3	0.5	0.3	0.7	0.8	1.1	0.7
Non-tax revenues	7.9	6.9	7.6	6.9	13.2	7.6	8.4	8.4
Fishing licenses	4.3	3.5	2.6	0.6	4.0	2.1	1.4	2.6
Dividends from SOEs	1.9	1.1	2.3	4.3	3.3	3.6	1.0	2.5
Petroleum Revenues	1.4	1.1	1.6	1.5	1.3	1.6	1.1	1.4
Grants	0.2	0.8	0.5	0.5	1.6	0.8	1.8	0.9
Total Revenue	**20.7**	**21.9**	**22.6**	**26.2**	**32.8**	**28.4**	**28.0**	**25.8**

Grants registered a drastic reduction in 2013 after the emergency drought response of 2012 and represented about 0.9 percent of GDP.

Overall, Mauritania has shown a low record in maintaining fiscal discipline. The General budget deficit and debt indicators have worsened during the last decade, consequently to burdens on scarce public resources due to the instability of global commodity prices (Table 4).

TABLE 4: FISCAL TRENDS COMPARED WITH NEIGHBOUR'S COUNTRIES[53]

Indicator	2007	2008	2009	2010	2011	2012	2013	2014	2015	Mali 2015	Senegal 2015
General government revenue	23.66	21.30	20.65	21.89	22.31	30.00	24.92	26.06	29.33	19.11	25.08
General government total expenditure	25.45	25.59	23.72	22.47	22.30	27.70	25.75	29.45	32.74	20.93	29.87
Overall budget deficit	-1.79	-4.28	-3.07	-0.58	0.01	2.29	-0.83	-3.38	-3.40	-1.82	-4.79
General government gross debt Percent of	73.42	77.88	89.69	80.59	71.62	73.53	70.58	80.36	98.36	30.91	56.91

A sharp decline in iron ore prices in 2014-2015 took away half of exports, put pressure on reserves, widened the fiscal deficit up to -3.40 % of GDP in 2015 compared to 0.01 in 2011. It also affected General government gross debt which rose from 70.58% of GDP in 2013 to 98.36% in 2015.

Analysis of poverty

Over the last fifteen (15) years, the fight against poverty has been a major concern of the government and their technical and financial partners. The development of Poverty Reduction Strategy Papers 2001-2015 (PRSP) and its three action plans (PRSP I 2001-2004, PRSP II 2006-2010 and PRSP III 2011-2015) is part of this framework. The PRSP was the reference document for the country's economic and social development policy. It presents the long-term national poverty reduction strategy and by considering the multidimensional nature of the phenomenon. The main axes of this strategy are four:

- The first axis aims at accelerating economic growth, improving the competitiveness of the economy and reducing its dependence on exogenous factors.
- The second axis aims to promote sectors that directly benefit the poor and areas of their concentration to reduce inequalities and improve resources.

[53] World Bank. Indicators [Internet]. Washington DC: World Bank; 2018[cited 2018 July 16]; Available from: https://data.worldbank.org/indicator/GC.REV.XGRT.GD.ZS?locations=MR

- The third axis focuses on human resource development and access to essential infrastructure.
- The fourth axis seeks to promote genuine institutional development supported by good governance and the full participation of all actors in the fight against poverty.

PRSP assessment report (2001-2015) shows that at the end of the implementation of the PRSP, progress has been made in the areas of access to drinking water, access to energy and construction of road infrastructure. However, the direct impacts attributable to PRSP activities were difficult to measure, in the absence of specific monitoring and evaluation tools. The many planned activities were not always carried out while at the same time important activities were carried out even though they were not planned. This reflects a lack of ownership of the implementation process of the different PRSP action plans by the various stakeholders, but also the effectiveness of the management process and the reporting tools of the various activities carried out. The gap between programming and the achievement of activities shows a weakness in the PRSP as a main tool for programming and implementing public policies.[54(p202)]

The minimal impact of productive sectors (especially mining and industrial sectors) on employment has limited the outcome of the fight against poverty and kept the economy heavily dependent on the outside world. Even though the public finances have improved since 2006, particularly since 2010, thanks to an unprecedented increase in the prices of raw materials for exports but also using external borrowing (the outstanding external public debt rose from 2.124 Billion in 2007 to 2.23 in 2010 and to 3.32 in 2013).

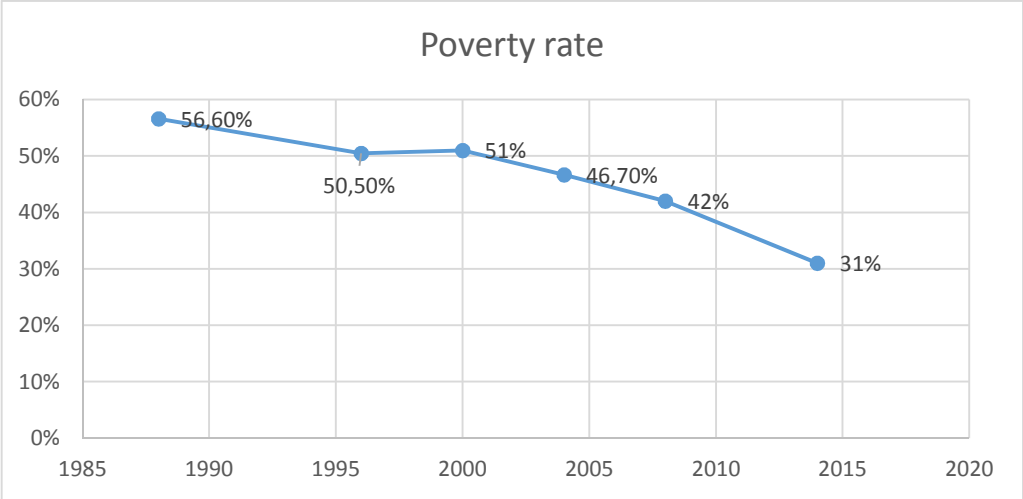
Trends in Poverty over time in Mauritania

According to various permanent surveys on household living conditions (PSHLC), poverty has continued to decline. 51 per cent in 2000, 46.7 per cent in 2004 and 42 per cent in 2008, a reduction of 9 per cent in 8 years and thus an average annual regression rate of about 1.1 per cent. The downward trend accelerated in the past six years to 31% in 2014 (Figure 7), a reduction of 11% and an average annual decline of 1.8%.[18(p42)] Despite this significant decline

[54] Ministry of Economic Affairs and Development. *Overall evaluation report of the PRSP 2001-2015. [Rapport d'évaluation globale Du CSLP 2001-2015].* Nouakchott: Ministry of Economic Affairs and Development; 2015

in the poverty rate, the performance did not meet the targets set by Poverty Reduction Strategy Papers, which predicts a rate of 25% by 2015. Similarly, the accomplished rate also does not meet the MDG target, which also forecasts a poverty rate in the range of 28% in 2015.

FIGURE 7 TRENDS OF POVERTY IN MAURITANIA 1988-2015



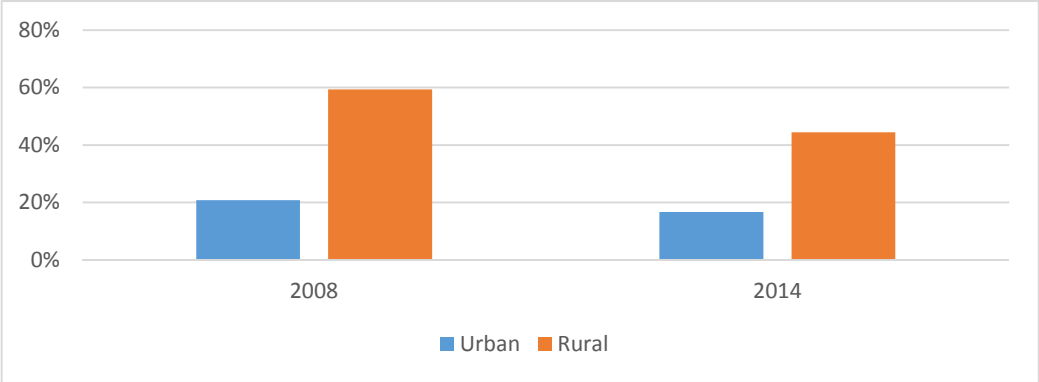
Poverty in Urban and rural areas in Mauritania

The percentage of people living below the poverty line in rural areas is 44.4%, compared with 16.7% in urban areas. Poverty in rural areas is not only more extensive in terms of numbers than in urban areas, but also the situation of the rural poor is more severe than in urban areas. Between 2008 and 2014 poverty rate falls from 20.8% in urban area to 16%. While the poverty rate falls in rural area from 57% to 44%. The average annual rate of poverty reduction was 2.5% in rural areas compared to only 0.7% in urban areas.

FIGURE 8. POVERTY RATE ACCORDING TO THE PLACE OF RESIDENCE (2008-2014)[55,56]

[55] National Office of Statistics. *Report of the 2008 Permanent Survey of Household Living Conditions. [Rapport de l'Enquête permanente sur les conditions de vie des ménages 2008]*. Nouakchott : National Office of Statistics; 2009

[56] National Office of Statistics. *Report of the 2014 Permanent Survey of Household Living Conditions. [*Rapport de l'Enquête permanente sur les conditions de vie des ménages 2014*]*. Nouakchott : National Office of Statistics; 2015



The average annual rate of poverty reduction in rural areas by 2.5% is due the fundamental changes in rural areas which led to increase in production, productivity, prices, and income in rural workers, particularly in the irrigated and mechanized sector and in livestock. Between 2008 and 2014 the agricultural output has increased. The drivers of these changes have been industrialized and irrigated agriculture. Livestock production and prices have also increased remarkably.[57(p9)]

Spatial Disparities in Poverty

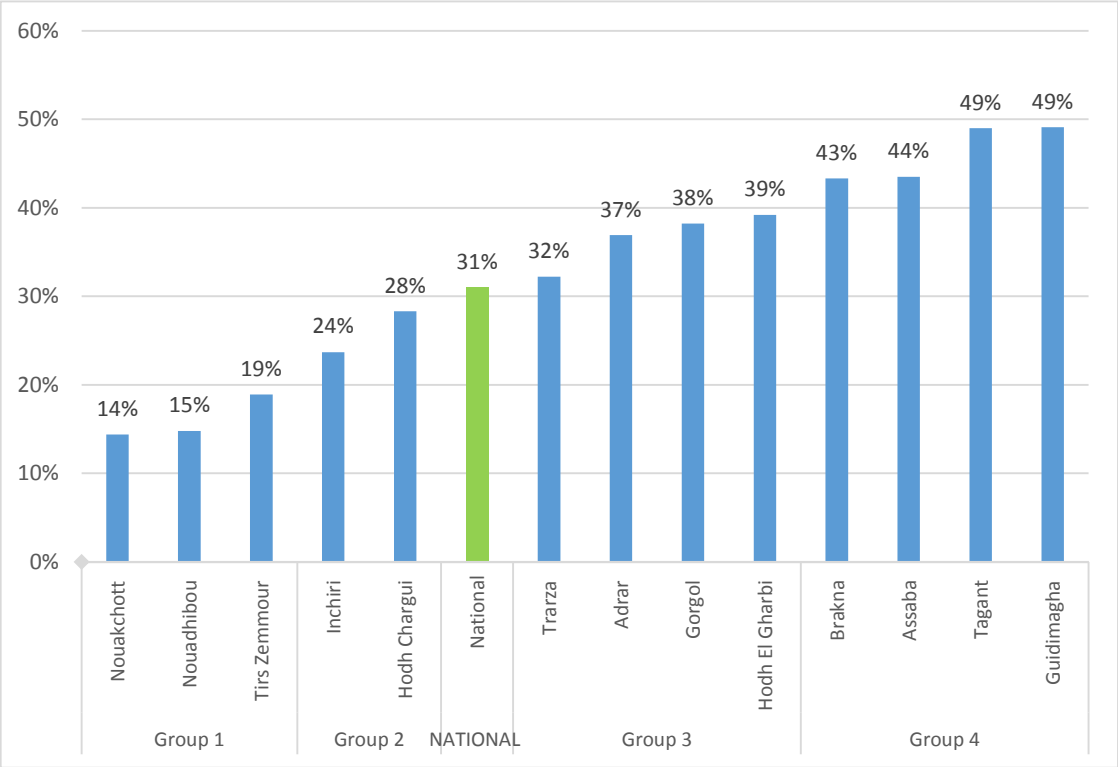
Figure 9 shows that the poverty rate varies between regions (Wilayas). The poorest regions of the country are Guidimagha, Assaba, Tagant and Brakna. The lowest rates of poverty are seen in Nouakchott, Nouadhibou and Tiris-Zemour. In general, poverty affects all regions. However, the regions can be divided into four main groups according to the intensity of poverty.

1. The region where the poverty rate is less than 20%: Tiris-Zemour, Nouadhibou and Nouakchott represent this group. About 15.3% of the poor in the country live in these regions. The wilayas of this group constitute an economic, industrial, administrative, intellectual, and cultural center. They enjoy the advantages of a long uneven development at the expense of the rest of the country.
2. Regions where the poverty rate is between 20% and 30%: Hodh Chargui and Inchiri represent this group which makes up 11.3% of all poor in the country.

[57] World Bank. Poverty Dynamics and Social Mobility 2008-2014. Washington: World Bank; 2016

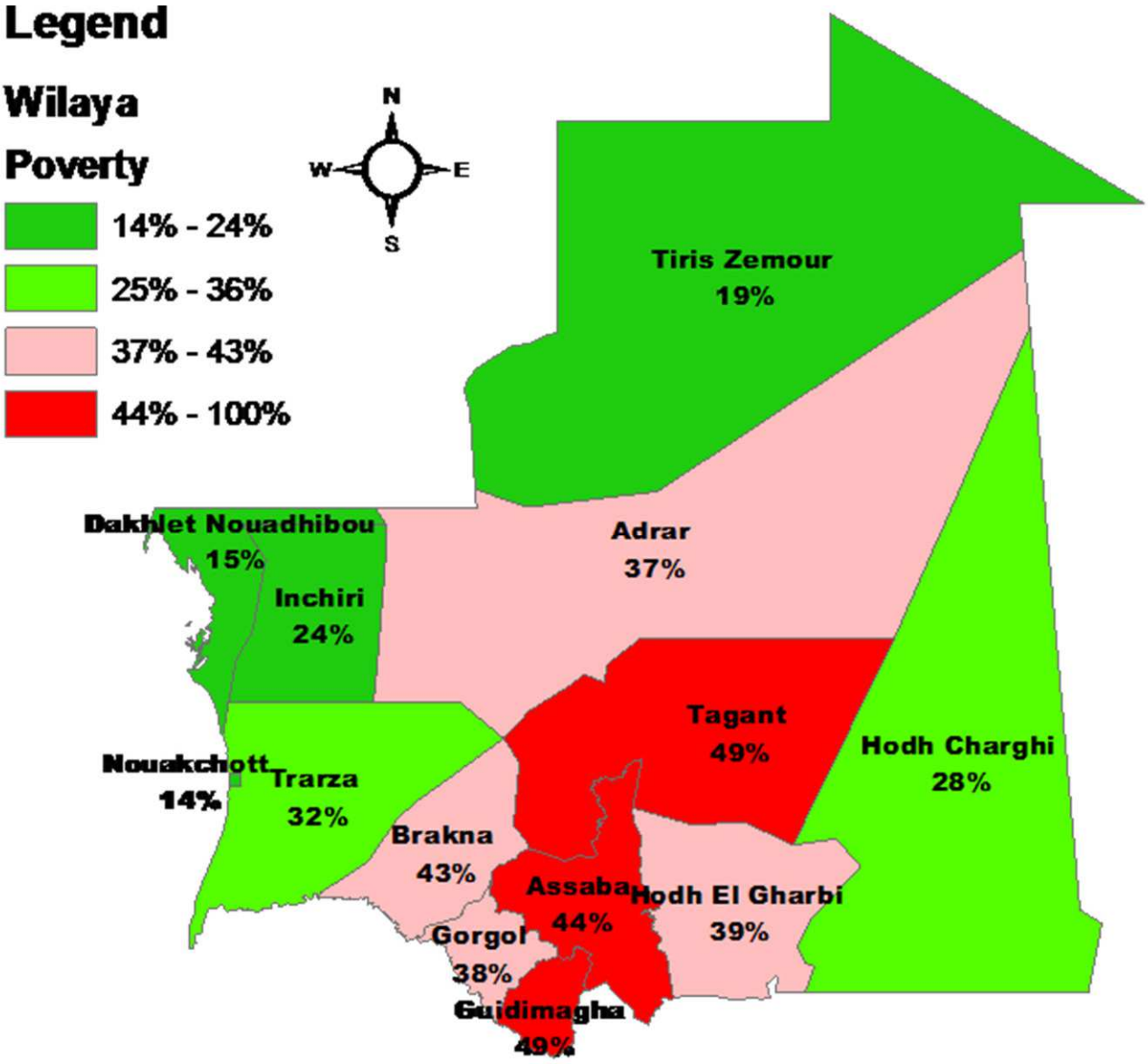
3. The regions with poverty rate ranging from 30% to 40%. This group include Hodh Gharbi, Gorgol, Adrar and Trarza. It forms 32% of the poor in the country. These regions have a high incidence of poverty: Hodh Gharbi (39%), Gorgol (38%), Adrar (37%) and Trarza (32%).
4. The poorest regions of the country are Guidimagha and Tagant, Assaba and Brakna. This group is home to 41.4% of the country's poor. The poverty rate exceeds 40% for each one of the wilayas' of this group as indicated in Figure 9.

FIGURE 9. DISPARITY OF POVERTY BY WILAYA



Overall, poverty is more pronounced in the rural regions in the south with a poverty rate up to 40%, while the northern and coastal regions have a poverty rate less than 20%, as indicated in the Figure 10 below.

FIGURE 10. POVERTY MAP BY WILAYA



Chapter II: MAURITANIA HEALTH SECTOR OVERVIEW

NATIONAL HEALTH POLICY ORIENTATIONS

The formulation of health policies was not a frequent practice in Mauritania until recently. Health sector was merely a by-product of overall economic development plan.[58(p14)] Health policy was a pious wish and not followed by action. So, it was only from 1992 onwards that a primary plan for health was born.

In this section we review the history of health policy development in Mauritania and its links with economic development which is the basic mechanism of social policies that often implicitly included health.

The fourth plan (1981-1985)

In the 1980s, the government of Mauritania adopted a fourth economic and social development plan for the period 1981-1985. The health part of the 4th plan (1981-1985) was the first attempt to outline a national health policy towards meeting the needs of most of the population, with a focus on prevention and primary health care. The main goals of the Fourth Plan were:

1. Increase health coverage to 60% of the population by 1985;
2. Give priority to prevention;
3. Generalizing primary health care;
4. Pay attention to "mother / child" groups, rural and disadvantaged groups;

The forth plan has adopted the Primary health care dictated by declaration of Alma-Ata 1978. the Primary health care had been defined as essential health care universally accessible to all individuals and families in the community in ways that are acceptable to them, with full participation, and affordable cost. Moreover, the declaration of Alma-Ata consider the primary health care as an integral part of health system as well as the overall social and economic

[58] World Bank. *Health and Population Project Evaluation Report. [Rapport d'évaluation du projet santé et population]*. Washington DC : World Bank; 1991

development and includes : i) direct medical action such as vaccination against major infectious endemic diseases: diphtheria, tumour, tetanus, measles, polio and tuberculosis, prevention and control of parasitic diseases by elimination vectors at the community level, provision of essential medicines: prenatal care, delivery assistance; ii) Promotion of good dietary and nutritional conditions; iii) indirect actions, which fall within the overall social domain rather than specifically health (population education in health, hygiene and disease control; Drinking water supply and environmental sanitation; family planning).[59(p56)]

Alma-Ata declaration is based on six principles[60(p9)]:

1. Essential care: the technical quality of health care services must be recognized and adapted to the health needs previously defined.

2. Social acceptance: emphasizing the need for recognition of social and cultural identity, according to the principle that one cannot make the happiness of someone despite himself.

3. Accessibility of care: this is due to development policies whose goal is to reduce social and geographical inequalities with at least equal access to health care for all.

4. Community participation: the community should take care of its health problems by taking part in the organization, execution and monitoring of the health care system. "Health" becomes the responsibility of everyone.

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[59] CANTRELLE P., et BARBIERI M. *Health Policy and Population[Internet]. [Politique de santé et population]*. 2018 [cited 2018 July 16]; Available from: http://www.politique-africaine.com/numeros/pdf/044051.pdf

[60] Ould Cheibany Aly. State of the health system of the city of Nouakchott (capital of Mauritania), in January 1994 (hospital, pharmaceutical and biomedical infrastructures) Critical and hypotheses of optimization of this potential within the framework of Primary and secondary health care coverage in the 2000s, Nouakchott district and and a backcountry region: example of Hodh Gharbi (Aioun el Atrouss) [PhD thesis]. [Etat du système de santé de la cite de Nouakchott (Capitale de Mauritanie), en janvier 1994 (infrastructures hospitalières, pharmaceutiques et biomédicales) Critiques et hypothèses d'optimisation de ce potentiel dans le cadre de la prise en charges des soins de santé primaires et secondaires à l'horizons 2000, du district de Nouakchott et d'une arrière région du pays : exemple du Hodh Gharbi (Aioun el Atrouss)]. Lyon : Université de Claude Bernard-Lyon 1; 1997

5. The cost of care: it must be considered since most of populations have very low incomes. It is essential to study seriously the cost of care to obtain the best results for minimal expenses.

6. Economic development of communities: health is no longer considered isolated but must be part of the economic and social development of communities. In a context where inadequate resources cause most diseases, it is illusory to try to change the situation by attaching importance to the health aspect only. Just as it is illusory to hope for any economic development without attaching importance to health problems by apprehending their cost, which must be assumed at the macro and microeconomic levels.

The Economic and Financial Recovery Program (EFRP 1985-1988)

The health part of Economic and Financial Recovery Program (EFRP **1985-1988)** called for an increase in health share in government budget. The program recommended the financial contribution of the population in health expenditure while at the same time encouraging the development of the private sector and greater donor contribution.

These guidelines reflected in:

1. The creation of mass preventive medicine;

2. The extension of primary health care;

3. Pay attention to sanitation, hygiene, and health education;

4. Optimizing the performance of health facilities by rehabilitating and allocating adequate resources;

5. Improvement of administrative management abilities;

Since the early 1980s, the Fourth Health Plan (1981-1985) and the Economic and Financial Recovery Program (PREF) 1985-1988 had tried to provide primary care and preventive to

many people as possible. They were oriented towards the extension of health services through rehabilitation and basic health care equipment projects. Due to the lack of enough resources to meet the targets and the inadequate management capacity of the administration, the results were below government expectations. The planned investment for (EFRP) 1985-1988 amount was MRO 684 million for new projects. The disbursement during this period was MRO 63 million, i.e. 9% of the forecast amount. The gap between projections and achievements is due to the lack of project monitoring and the lack of funding for some projects, because of the dependence of these projects on external financing.[61(p18)]

The Consolidation and Recovery Program (CRP 1989-1991),

The Consolidation and Recovery Program (CRP 1989-1991), while adopting the main orientations of the EFRP, focuses on three main aims:

1. The extension of health coverage to reach 50% in 1991;
2. Increasing the well-being of the most vulnerable populations;
3. Improving the planning, management and supervision abilities of the Ministry of Health and Social Affairs;

As part of its economic reform program for 1989-91, the health part of the Consolidation and Recovery Program (CRP) focused on improving access to health care as well as the quality of health care. Under this program, the Ministry of health has taken steps to improve the performance, the organization and management of health sector. These initiatives, which are set out in a medium-term health plan (1991-94) published in April 1991, emphasised on the following interventions: (i) operationalize decentralization; (Ii) mobilizing resources for regional health systems; (Iii) strengthening support and planning capacity at the central level; And (iv) establishing an essential medicines program. These interventions are supposed to achieve two main goals which, constitute the medium-term orientation of the sector: (i)

[61] Ministry of Economy and Finance. *Implementation Report on the Economic and Financial Recovery Program 1988-1995. [Bilan d'exécution du programme redressement économique et Financier 1988-1995].* Nouakchott : Ministry of Economy and Finance ; [date unknown]

achieving the financial stability of the sector; And (ii) improving the quality and effectiveness of services.

Medium-Term Master Plan "MTMP 1991-1995"

The Medium-Term Preliminary Master Plan 1991-1995 proposed to organize and develop the socio-sanitary system. The objectives of MTMP are : 1) develop a policy for the prevention of major diseases and disabilities; (2) extend the health coverage of the population in particular towards the mother and the child; 3) improve the quality of health and social services provided to the population; (4) making affordable medicines available; 5) increase the financial resources needed to achieve the social objective: "health for all Mauritanians"; Through the optimization of the use of existing financial resources, the increase the financial resources devoted to health, the development of the financial contribution of the populations through the generalization of the cost recovery system and; (6) Strengthen the organizational and managerial capacities of health and social services system.[62(p25)]

Cost Recovery system refers to the practice of setting up and collecting user fees for health services. The concept of user fees was born in the 1980s. It was adopted during the meeting of African Ministers of Health in Bamako in 1987 (37th WHO Regional Committee). The Bamako Initiative or cost recovery system by user fees was implemented in Mauritania in the context of the Medium-Term Preliminary Master Plan 1991-1995.

The Cost Recovery system allows the sale of essential drugs at all levels of the health pyramid, the income generated by this sale being dedicated to the renewal of essential drugs, to the improvement of health structures and the motivation of health personnel. It should be noted that before the introduction of the cost recovery system, health care services were free of charge.

One of the main objective of cost recovery system was to involve the populations in health management through the management committees to develop the Community participation in

[62] Ministry of Health and Social Affairs. Preliminary Mid-Term Master Plan 1991-1994. [Plan Directeur Préliminaire à Moyen Terme 1991-1994]. Nouakchott: Ministry of Health and Social Affairs; 1991

health development. However, implementation of the system through the introduction of pricing systems is complex. It needs not only a trade-off between efficiency and equity, but also the availability of managerial capacities and up-to-date information analysis, skills that communities or administrations do not really have. It would therefore be necessary to integrate these constraints and develop the skills needed at both the national and regional levels.[63(p83)]

Strengthening the quality and use of services is severely penalized by the lack of skilled personnel, the outdated and breakdown of equipment, and the lack of integration and comprehensive care. Moreover, the system works on a purely curative basis. Preventive interventions appear to be marginal. It is perceptible that in implementing the BI in Mauritania, attention has been focused more on the financial aspects than on the quality of care, which was one of the main goals cost recovery system. The system attracts more health-care workers to engage in curative activities that are beneficial while preventive activities such as (vaccination, prenatal consultations, etc.) have experienced a remarkable decrease.

Several efforts to mobilize significant resources have been undertaken. However, these efforts have had insignificant impact on the health situation of the population for multiple reasons including:

- lack of a national primary plan;
- lack of a legal framework;
- lack of a consistent drug replenishment policy;
- lack of effective membership and community participation;
- lack of coordination, monitoring and centralized monitoring.

[63] Ministry of Health and Social Affairs. Study on the cost recovery system. [Etude sur le système de recouvrement des couts]. Nouakchott : Ministry of Health and Social Affairs; [date unknown]

The 1998-2002 Master Plan

The Master Plan is the statement of the health and social policy of the Government of Mauritania during the period 1998-2002, as well as the statement of the orientations underlying its development, implementation, and evaluation during the same period. The priorities of this plan, which are part of the overall objective of "Health for all Mauritanians by the year 2000", called for additional resources, clarification of the regulatory framework, institutional support for development partners and a real social mobilization so that health is everyone's business. Six main strategies underlie this plan:

1. Strengthening health coverage, quality and use of health services
2. Improving the performance of the health and social system
3. Reduce morbidity and mortality associated with major diseases
4. Strengthening social action
5. Ensure adequate financing of the health and social system.
6. Creating a supportive environment for health

The 1998-2002 Master Plan and its operational framework are the result of extensive consultation and endorsement by many stakeholders, including the donors. The program is comprehensive and forward-looking, appropriately identifying sector priorities and addressing issues of service delivery, quality, efficiency and equity. Mechanisms for mobilizing funds and general funding problems are also considered. The Ministry of Health and Social Affairs framework is defined: it is responsible for the development of sector policy, funding, monitoring and regulation, while health care is the responsibility of a network of decentralized services. Private provision of care, including the use of traditional medicine, is also envisaged. The harmonization of multiple donor projects within a global sectorial approach under Ministry of Health and Social Affairs gradually reduce the duplication of effort between co-existing donor-initiated projects and build local capacity for planning and management of health services.

National health policy 2006-2015

The national health policy was developed based on the guidelines of the Poverty Reduction Strategy Papers. Six main axes underlie this policy:

1. Improved access to quality health services.
2. Disease Control: In the control of endemic epidemics (Malaria, HIV / AIDS, Tuberculosis, Hepatitis, Malnutrition, Vaccine Preventable Diseases, Parasitosis and Childhood Diarrhoea, Schistosomiasis, Acute Respiratory Infections, Blindness, Diseases with epidemic potential, Cardiovascular diseases, Cancers, Road accidents, Mental diseases, Diabetes, Oral disorders,).
3. Adequate financing of the health system.
4. Implementation of targeted social action.
5. Evaluation of health system performance.
6. Strengthening the performance of the sector.

In 2012, the national health policy was operationalized by a health development plan covering the period 2012-2015 in its first phase and up to 2020 for its second phase.

The National Health Development Plan 2012-2020 (NHDP)

The National Health Development Plan (NHDP) aims to meet the challenges of a national situation marked by (i) high mortality and morbidity, especially among the most vulnerable groups (including the mother-child couple), (ii) insufficient coverage of services (iii) an inefficient and inequitable health supply, and (iv) an environment characterized by significant obstacles and constraints hindering the development of the sector and opportunities not considered in sector.

NHDP 2012-2020 is based on the Poverty Reduction Strategic Paper III guidelines and the vision of the national health policy and focus on the implementation of high-impact interventions to reduce significantly mortality and morbidity, among the most vulnerable

(mother and child). To this end, five main axes have been defined: (i) Reduction of maternal and neonatal mortality, (ii) Reduction of under-five mortality, (iii) Control of major communicable diseases, including neglected tropical diseases, and (iv) Control of non-infectious diseases transmissible, including road traffic accidents; (v) The fifth cross-cutting axis, aims to strengthen the health system with a view to support the implementation of universal access to essential health services.

Indicators of inputs, processes, outcomes, and impacts identified in the sectorial diagnosis was to assess the levels of progress achieved and to implement corrective measures. The overall cost of plan is about MRO 316 Billion, of which 70% supposed to be supported by the government. The latter is committed to increase the share of the health budget of total government budget from 4 per cent currently to 8 per cent in 2015 and to 14 per cent by 2020.

Implementation of the NHDP expect a significant reduction in mortality and morbidity rates by 2015 and 2020, in particular[64(p12)]:

- Reduce maternal mortality from to 400 per 100.000 live birth in 2015 and to 220 per 100.000 live birth by 2020;
- Reduce neonatal mortality to 22 per 1000 in 2015 and to less than 10 per 1000 by 2020;
- Reduce infant mortality to 38 per 1000 in 2015 and to 16 per 1000 by 2020;
- Reduce under-five mortality to 58 per 1000 in 2015 and to 30 per 1000 by 2020;
- Reduce the incidence of HIV to 2.6 per 10,000 in 2015 and to 1.2 per 10.000 by 2020;
- Reduce the incidence of malaria from 17.5% to 11% in 2015 and to 9% by 2020;
- Reduce the prevalence of tuberculosis from 86 per 100.000 currently to 60 per 100.000 in 2015 and to 25 per 100.000 by 2020;
- Reduce the prevalence of hypertension (among 16-64-year olds), from 39% to 35% in 2015 and to 30% by 2020;

[64] Ministry of Health. *The National Health Development Plan 2012-2020. [Plan National de Développement Sanitaire 2012-2020]*. Nouakchott : Ministry of Health; 2012

- Reduce the prevalence of diabetes (among 16-64-year olds), from 6% to 5% in 2015 and to 3.5% by 2020.

Organization of the Health Care System

This section presents a brief overview of the organization of health care system in Mauritania, heath infrastructure, resources humans for health and essential drugs.

Health system Structure

The major players of health system are the Ministry of Health and para-public organizations, and the private sector, which includes private for-profit and NGO facilities. The public health system is pyramidal. It consists of three levels: the first is the operational or peripheral level, the secondary level, and the tertiary level. In addition to the public system, there is a private care system, located mainly in large urban centers (Nouakchott and Nouadhibou) which has seen a real increase in recent years.

The operational peripheral level forms the basis of the pyramid and corresponds to public health services at the level of Moughataa. Each Moughataa is composed of at least one health center, several health posts located in the communes, the capitals of rural communities or the relatively populated villages. Moughataa public health services are under the responsibility of a chief medical officer, who also manages Health Center of the Moughataa. It should be noted that Health Centers correspond to District Hospitals in WHO terminology.[65(p10)] In support of this level, several hundred basic health units (BHUs) were installed in some villages, far from health posts and centers (beyond a radius of 10 km). Since the mid-1990s, most of these UBS have been closed, due to the lack of community health staff and midwives.[66(p8)] The decree No. 178-2016[67(p5)], setting up the organization of regional health facilities, introduced a new

[65] Ministry of Health and Prevention of Senegal. Mapping and Comprehensive Assessment of Essential Medicines Supply and Distribution Systems and Other Health Products in Senegal. [Cartographie et évaluation approfondie Des systèmes d'approvisionnement et de Distribution des médicaments essentiels et Autres produits de santé au Sénégal]. Dakar : Ministry of Health and Prevention of Senegal ; 2009

[66] Ministry of Health. Health map. [Carte sanitaire]. Ministry of Health. Nouakchott : Ministry of Health ; 2014

[67] Ministry of Health. Decree No. 178-2016 / MoH repealing and replacing Decree No. 140/2000 of 17 December 2000 establishing the organization of regional health units. [Décret N° 178-2016/MS abrogeant et remplaçant le décret N° 140/2000 du 17 décembre 2000 fixant l'organisation des formations sanitaires

concept, which is the health area. The latter defined as health areas within the Moughataa according to geographical criteria. Each area covers an area of 10 km radius on average. A nurse runs it. It includes one or more health posts and basic health units.

The intermediate level includes two types of hospitals in the regional capitals or Moughataa (i) Moughataa hospitals still limited in number and called to cover the most populated Moughataa; (ii) Regional hospitals, most of them have administrative and financial autonomy.

The tertiary level represents the reference at the national level includes general hospitals and specialized hospitals. The tertiary level is concentrated in Nouakchott, with four types of public institutions of reference:

- General hospitals are four: National Hospital, Sheikh Zayed Hospital, Friendship Hospital and Military Hospital.
- The specialized hospitals are five: The Neuropsychiatric Center, The National Center for Cardiovascular Diseases, the National Oncology Center, the Maternal and Child Center and the National Center for Functional Orthopaedics and Rehabilitation
- Three specialized reference institutions: The National Blood Transfusion Center, the National Institute of Public Health Research and the National Laboratory for Quality Control of Medicines.
- Training institutions, numbering four: The National School of Public Health in Nouakchott, the School of Public Health in Kiffa, the School of Public Health in Néma and the School of Public Health in Sélibaby

The decree of 10 January 2015 organized the national health system. It setup the responsibilities of the Minister of Health and the organization of the central administration of the Ministry.[68] At the level of the administration and at the level of the health structures, this organization is pyramidal. Thus, for the Administration, the Minister and his Cabinet are at the

régionales]. Nouakchott : Ministry of Health; 2016

[68] Ministry of Health. Decree N ° 88-2015 / PM, fixing the attributions of the Ministry of Health and the organization of the central administration of its department. [Décret N° 88-2015/PM, fixant les attributions du Ministère de la santé et l'organisation de l'administration centrale de son département]. Nouakchott : Ministry of Health ; 2015

top of the pyramid, followed by the Central Directorates, the Regional Directorates, and finally the Moughataa at the periphery:

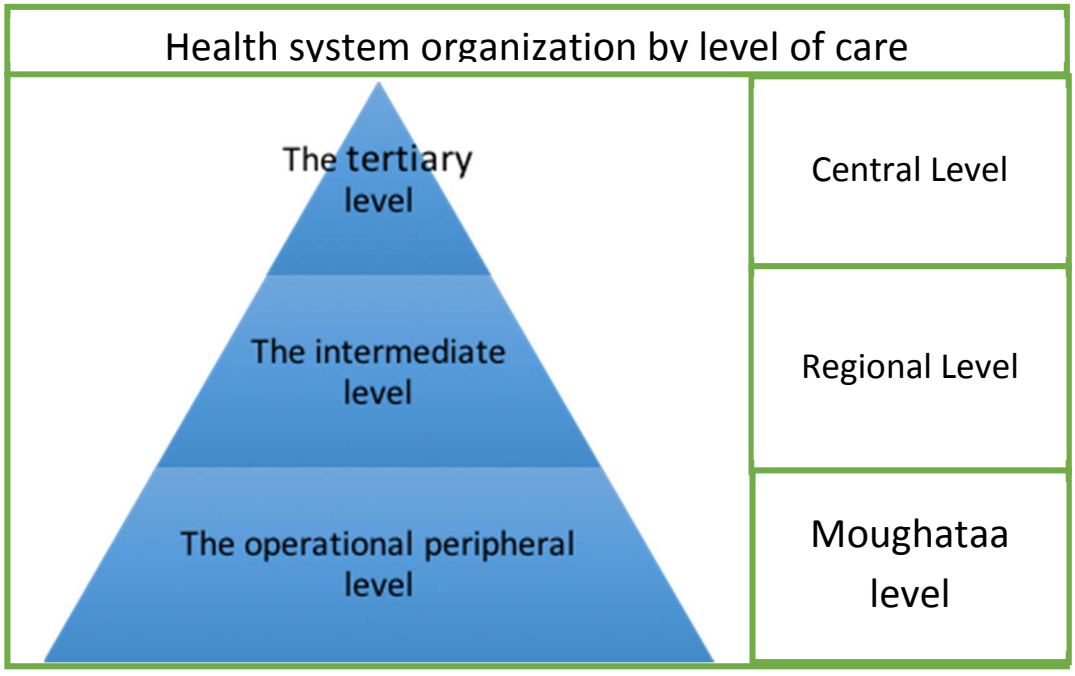
At the central level, the central entities of the Ministry of Health, i.e. the directorates, departments, divisions and coordination programs, ensure leadership and supervise the intermediate level. The central directorates are divided into divisions. Their prerogatives are the formulation of health policies, resource allocation, control and regulation of lower level structures, technical and strategic support to regions, and coordination of action by international partners.

At the regional level, the regional health directorates, with the regional teams coordinating and monitoring the operational level structures. They are responsible for the implementation of the national health policy in the region.

At Moughataa level, The Moughataa Health Area (MHA) is headed by a chief medical officer who, ensures the execution of the health development of the Moughataa. The MHA teams ensure daily activity and implementation of health programs.

The figure below illustrates the pyramidal organization of the health system.

FIGURE 11. ORGANIZATION OF THE HEALTH SYSTEM.



There are many public health program coordination units responsible for monitoring, coordinating and following up the specific actions of these programs.

On the other hand, there are (i) military health services and (ii) well-developed labour health services, especially around the main mining companies.

Health infrastructures

In terms of health infrastructures, the health pyramid is reflected in the availability of basic health care at the health post, secondary care at the health center and regional level at the regional hospital. The restoration, renovation and construction of new infrastructure is a fundamental part of the current National Health Development Plan NHDP 2012-2020.[64] (p84) The NHDP provides the construction of 200 new health posts, 48 new health center's and rehabilitations of 22 hospitals.

Low health coverage and spatial disparities

The health sector suffers from a deficit in infrastructure and equipment that meets national building standards. The health infrastructures map shows that half health centers (49%) and 46 % of health post buildings do not comply with the Ministry of Health's standards. Only 39% of health centers and 20% health post have the recommended complete equipment's.[66] (p13-14)

Maintenance capacity at the Ministry of Health level is still low. This is due to the non-application of standards, the lack of maintenance units at different levels of the health system and the lack of integration of costs into the Government's and Donor's investment projects.

Population dispersal, distance to reach the health center (i.e. more than 5 km or more than an hour's walk) and natural obstacles in a predominantly rural area limit access to health services. The Permanent survey on the living conditions of households PSLCH 2014 points out that in rural areas, the distance to reach a health service is a problem for 64% of household compared with 16% in urban areas.

The distribution of health structures on the national territory shows a clear inequality between the different regions of the country in regard of needs. The bulks of health facilities are in the

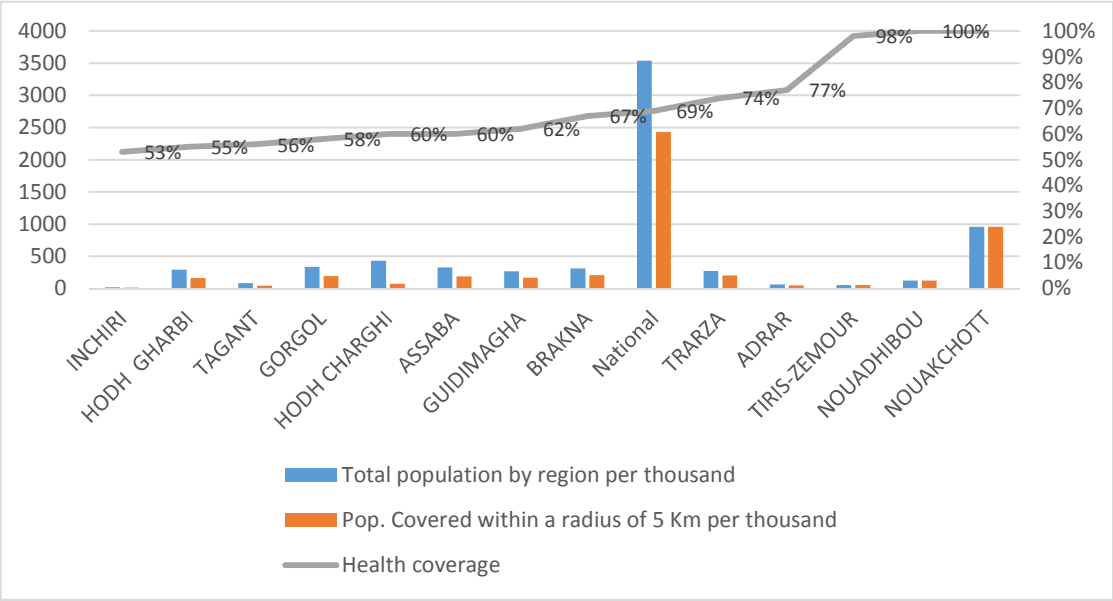
city of Nouakchott where (23%) all public health facilities, three-quarters of the private clinic (76%) and more than a third of the hospitals are in this city (see Table 5).

TABLE 5 DISTRIBUTION OF HEALTH FACILITIES BY REGION [66]

	Number of public hospitals	Number of health centers	Number of health posts	Number of clinics	Number of dental offices	Number of surgeries	Number of pharmacies
Hodh chargui	1	9	124	1	0	1	42
Hodh gharbi	1	7	62	0	3	5	58
Assaba	1	5	82	1	2	14	56
Gorgol	1	5	53	0	0	0	13
Brakna	1	11	78	1	0	0	44
Trarza	2	7	91	1	2	0	37
Adrar	2	4	27	0	1	2	9
Nouadhibou	1	8	2	3	6	7	42
Tagant	1	4	24	0	0	0	13
Guididimagha	1	5	40	1	1	1	7
Tiris-zemour	1	4	1	2	2	1	9
Inchiri	1	2	4	1	0	1	9
Nouakchott	9	19	32	18	60	78	597
Total	**23**	**90**	**620**	**29**	**77**	**110**	**936**

Access to health care can be defined in a variety of ways. In its most narrow sense, it refers to geographic accessibility. In Mauritania, inequality in the distribution of health care facilities across the country is one of the main barriers to health care access. The national health policy defines the geographic accessibility as distance within five km from nearest health facility. Regarding to this definition, the data available in Figure 12 shows that at the national level, about 69% of the population have access to health facilities within a radius of less than 5 KM. In other words, about the third of the population (31%) must march more than 5 km to reach the nearest health facilities. We also note a huge disparity in access to health care across the different regions of the country. The lowest rate of access was recorded in the Inchiri region where only about the half of the population (53%) had access to health facilities. Eight out of thirteen regions of the country have an accessibility rate less than the national average. However, the capital Nouakchott, the economic capital Nouadhibou and the industrial city of Zouerate have a high accessibility rate which varies between 98% and 100%.

FIGURE 12 COVERAGE WITHIN 5KM



Low operational capacity of health facilities at all levels to carry out interventions

According to the Service Availability and Readiness Assessment (SARA) 2016, 55% of health facilities have an average operational capacity to offer services according to standards (human resources for health (HRH) trained, availability Inputs, existence of protocols, data sheets, equipment, materials).[69(p17)]

32% of health facilities have the capabilities for diagnostic and only 5% have all the trace elements to carry out the essential diagnoses.

The average availability of standard precautionary measures for infection prevention is about 71% and that of essential drugs is 26%. Nearly one-third of health facilities provide family planning services (67%). Across the country, 12% of health facilities (hospitals, health center and health post) provide basic emergency obstetric and new-born care (BEmONC).

[69] Ministry of Health. Service Availability and Readiness Assessment survey 2016. [Indice de disponibilité et de capacité opérationnelle des services de santé 2016]. Nouakchott : Ministry of Health; 2017

Immunization services are available in 65% of the health facilities. Almost all health centers and 89% of public hospitals offer immunization services. While 43% of health posts and 88% of private health facilities do not offer immunization services.

As for malaria management, 90% of the health facilities offer diagnostic and treatment services, but these health facilities have on average only 4 of the 9 tracer elements, an average operational capacity score is 46%.

According to the same survey, 24% of the health facilities have tuberculosis services. The average operational capacity score is 46% (6/12 trace elements). No health facilities have all 12 trace elements. Operational capacity is significantly higher in the public (50%) than in the private sector (19%).

In addition, just over one-third of hospitals (38%) have advanced diagnostic services with an average diagnostic availability index of only 6% at the national level.

Moreover, about 39 % of health facilities do not have the essential accommodations and comforts and 17% do not have essential equipment's such as scales for adult or child, light source, thermometer, etc. This implies that they are not offered better conditions of exercise satisfactory. [69(p4-6)]

Health Manpower.

An unequal spatial distribution of the human resources for health

The human resources responsible for running health care facilities are unequally distributed between the different levels of health pyramid and by regions. These resources are broken down into:

- Medical staff (568), of whom only 34% are in-country, the remainder being shared between national centers and institutes located in Nouakchott;
- Paramedical personnel (2332) inequitably distributed among the different regions, 41% of them in Nouakchott.

The table below shows the distribution of health personal by status and by region

TABLE 6. RESOURCES HUMAN FOR HEALTH BY STATUS AND BY REGION

Region	Population	Number of specialists	Number of GPs	Number of nurses	Number of midwives	Total	doctors, nurses and midwives per 10 000 population
Hodh chargui	430668	3	19	237	18	277	6.43
Hodh gharbi	294109	4	7	135	11	157	5.34
Assaba	325897	21	11	145	10	187	5.74
Gorgol	335917	5	6	85	21	117	3.48
Brakna	312277	2	9	110	27	148	4.74
Trarza	272773	12	19	202	25	258	9.46
Adrar	62658	4	5	61	5	75	11.97
Nouadhibou	123779	7	20	78	24	129	10.42
Tagant	80962	3	4	35	5	47	5.81
Guidimagha	267029	10	6	80	10	106	3.97
Tiris-zemour	53261	4	9	27	10	50	9.39
Inchiri	19639	2	2	10	2	16	8.15
Nouakchott	958399	252	122	689	270	1333	13.91
Total	**3537368**	**329**	**239**	**1894**	**438**	**2900**	**8.20**

The regional distribution of the health personal shows that around 46% of them are concentrated at the Nouakchott level, which represents only 27% of the population. On the other hand, the Gorgol, Guidimagha and Brakna are particularly deficient regarding the size of their population.

67% of midwives, 79% of the specialists, 59% of general practitioners and 40% of nurses are positioned in Nouakchott or Nouadhibou. The wilayas of Hodh Chargui and Gorgol are for their part largely devoid of specialist and midwives.

The wilayas of Guidimagha, Gorgol, Hodh Gharbi, Brakna, Assaba, Hodh Chargui and Tagant suffer from a shortage of doctors. All these wilayas are below the WHO standards (1/10,000 hbts). For the nurses, a concentration of staff is observed in the regions of Nouakchott, Hodh Chargui or Trarza to the detriment of the regions of Guidimagha and Gorgol. There is a large

shortage of staff in rural areas. Difficult working conditions in rural areas and socio-cultural factors greatly complicate the assignment or redeployment in these areas without specific accompanying measures.

No region meets the minimum threshold of 23 doctors, nurses and midwives per 10 000 inhabitants that was established by WHO as necessary to deliver essential maternal and child health services.

The qualitative shortcomings and the production of human resources for health.

The qualitative inadequacy of human resource for health concerns all medical and paramedical functions. It can be explained by several factors, such as the weak initial training of staff, dysfunction in recruitment and assignments, managerial deficits, inadequate technical platforms for good practice, demotivation of agents due to difficult working conditions, lack of career plans.

The initial training of medical and paramedical personnel in Mauritania consists of five public health schools:

- The National School of Public Health of Nouakchott (ENSP of Nouakchott), created in 1966;
- The School of Public Health of Néma (ESP de Néma) created in 2011;
- The School of Public Health of Kiffa (ESP of Kiffa) created in 2009;
- Rosso Public Health School (Rosso ESP), created in 2011;
- The School of Public Health of Sélibaby (ESP of Sélibaby) created in 2011.

The 5 health schools have an overall capacity of 2,190 places, supervised by 171 trainers, of which only 50 permanent staff (less than 30%), including 32 permanent trainers at the Nouakchott school and 18 Distributed among the 4 other schools.

The table below present the main characteristics of these five schools, from the point of view of training capacities, the number of graduates and teachers:

TABLE 7. MAIN CHARACTERISTICS HEALTH SCHOOLS[70(P13-14)]

School	Creation Date	Accommodation capacity	Student enrolment (F Initial) 2015-2016	Number of graduates (F Initial) 2016	Number of permanent teachers	Number of teaching staff
ENSP de Nouakchott	1966	660	458	437	32	29
ESP de Néma	2011	320	160	65	4	28
ESP de Kiffa	2009	330	274	113	6	24
ESP de Rosso	2011	465	286	172	4	11
ESP de Sélibaby	2011	415	181	104	4	29
Total		**2 190**	**1 359**	**891**	**50**	**121**

Over the past 3 years (2014, 2015 and 2016), the 5 health schools have graduated a total of 2,338 students, including 1,612 Medical Nursing (68.9%), 454 nursing State (19.5%) And 272 midwives (11.6%).[70(p13)]

The training in these schools is organized into four curricula, each corresponding to a level of qualification.

The nursing level is the subject of two courses. The first, which lasts two years, recruits students who have obtained the certificate of end of the first cycle of secondary school by competitive examination and leads to the Medico-social nurse (MSN). The second, which lasts three years, also recruits students with a scientific baccalaureate and enters the Diploma of Nursing (DN) or Midwife (MW). The senior health technicians are trained according to a two-year curriculum or midwifery and leads to the diploma of Higher Technician of Health (HTH). Most paramedical specialties are concerned by this training, in particular that of Higher Technician of Genecology and Obstetrics.

[70] Ministry of Economy and Finance. Diagnostic report of health schools in Mauritania and action plan for strengthening their capacities. [Rapport de diagnostic des écoles de santé en Mauritanie et plan d'action pour le renforcement de leurs capacités]. Nouakchott : Ministry of Economy and Finance ; 2016

On a quantitative level, the schools welcomed almost 1200 students in the diploma course for the 2011-2012 school year.

This flow of graduated students shows a very low diversification of specialties and a high concentration on 3 profiles (MSN, DN, MW).

The table below shows the number of graduates per school:

TABLE 8 THE NUMBER OF GRADUATES PER SCHOOL[70](14)

	2014			2015			2016			TOTAL		
	MW	DN	MSN	MW	DN	MSN	MW	DN	MSN	MW	DN	MSN
ENSP de	66	96	200	55	40	205	41	81	315	162	217	720
ESP de Néma	10	17	34	0	15	24	10	17	38	20	49	96
ESP de Kiffa	9	32	80	9	20	74	14	31	68	32	83	222
ESP de Rosso	11	13	107	17	23	126	19	18	135	47	54	368
ESP de Sélibaby	11	13	50	0	16	74	0	22	82	11	51	206
					Total graduates of last 3 years					**272**	**454**	**1612**

With an annual flow of graduated students of no more than 900 staff, in all specialities combined, the training capacity remains very insufficient in relation to needs. Indeed, the projection of the needs for nursing and midwifery staff from 2006 onwards shows an increasing trend from one year to the next, from 1,256 units in 2006 to 7,390 units in 2010. However, recruitment capacity is only 590 units. The cumulative deficit is therefore 5,544.[71(p18)]

Alongside this quantitative inadequacy, the quality of training in these schools remains low. This observation is unanimously highlighted by the various studies carried out by the MoH, in particular those which led to the preparation of the Master Plan for Continuing Education for Health Personnel and the Strategic Plan for Human Resources Development.

[71] Ministry of Health. Assessment of the needs of training schools and training sites of midwifery care in Mauritania. [Evaluation des besoins des écoles de formation et des sites de stage de la pratique des soins sage-femme en Mauritanie]. Nouakchott : Ministry of Health ; 2014

The causes of these deficiencies are manifold and are linked to the quality of the infrastructures (premises and equipment), the qualification of trainers, the inadequacy of programs and accompanying tools, inadequate practical training and inadequacy Between training and employment.

At the level of infrastructures, the National School of Public Health (NSHP) has premises that were built in the 80s more or less conform to standards. These premises are limited to 3 amphitheatres of 60 places, 6 classrooms of 30 places and 2 small rooms of practical work, so that its theoretical capacity is 376 pedagogic places. However, the number of students continuing their training in 2012-2013 at this school would be 730 trainees. To cope with this situation, the school's management has set up a rotation system which considerably limits the actual time spent on learning.

The School of Public Health in Kiffa (SPH) has built a pedagogical block in 2011 of four classrooms of 60 places each, in addition to two rooms of 30 places and three practical training rooms of 20 places each, bringing its capacity to Theoretical reception with 300 seats. In 2012 - 2013, the SPH of Kiffa welcomes 184 students of all specialities combined.

Project of construction for the schools of Rosso, Néma and Sélibaby is underway. In the meantime, they are temporarily housed in unsuitable buildings.

At the organizational and administrative level, the 4 schools have different modes of operation despite having the same missions and objectives and despite the common status. There is no coordination at national level. Financial resources for training remain insufficient for quality training.

Midwives have very little presence in the teaching teams of regional health schools, particularly in the implementation of theoretical and clinical programs and follow-up. This situation has negative implications for the quality of midwifery training, with reference to the International Confederation of Midwives (ICM) Standards.

Essential Drugs

Mauritania imports all its needs for medicines. The pharmaceutical supplies are provided by two distribution channels:

- The private sector, which consists of eighteen (18) importing companies acting as wholesalers and Four-hundred (400) private pharmaceutical retail structures. The private sector is constantly evolving and playing an increasingly important role in the availability and distribution of the drug. Although the public and private sectors are closely interwoven for cyclical, purely commercial and financial reasons, the absence of technical complementarity prevents an interesting synergistic effect.
- The public sector, which is organized around the Central Purchasing of Essential Drugs & Medical Consumables (CPEDMC) which imports essential generic drugs (most of them comes from European Union). CPEDMC is the main supplier of Public Health facilities (PHF) in the country through regional depots. The health facilities come to pick up the products at the regional depots. Cost recovery based on the principle of the Bamako Initiative is applied. CPEDMC has the obligation to provide hospitals and other health facilities of 75% and 100% respectively of their needs. Therefore, it has almost the monopoly on the distribution of pharmaceutical products in public health facilities. Otherwise, antiretroviral (ARVs), anti-tuberculosis drugs and contraceptive products are free and theirs costs are supported by governments and international partners.
- Active and well-organized illicit market, supplied by clandestine imports and sometimes diversions from the two legal sectors. WHO suggest that "more than 30% of the medicines sold are not registered" [72(p40)] which opens the door to counterfeit drugs.

In 2015, medicines account for 28% of global health spending in Mauritania and 1.33% of GDP. Medecines financing is mainly provided by households, either directly in the private and public sectors through the cost recovery system, or indirectly through mandatory or voluntary contribution systems.

The pharmaceutical regulatory framework is largely based on French regulations. Medicinal product manufactured industrially must be the subject of a marketing authorization issued by

[72] FARGIER, MARIE PAULE. Analysis of the pharmaceutical sector in Mauritania. [Analyse du secteur pharmaceutique en Mauritanie]. Nouakchott : World Health Organization ; 2011

the Minister of Health before it is imported, marketed or distributed. This authorization is issued by the Minister of Health, on the proposal of the National Commission for Medicines. The latter is a technical advisory body whose purpose is to give its opinion on the decisions concerning marketing authorizations. It also has an advisory role to the competent authorities in matters of National Pharmaceutical Policy. The authorization is renewable every 5 years.

Overall, the pharmaceutical regulatory framework encountering difficulties of application because of institutional weakness and insufficient resources. human, technical and financial resources available to the Directorate of Pharmacy and Medicine (DPM) in charge of the administration of the sector.

The 2411 decree have established the maximum margin applicable. The wholesale margin is set at 12% for specialties and generics and the retail margin is 29%. The pharmaceutical regulatory framework practices the free setting price and indirect regulation at the level of private sector level. Thus, very large differences in medicines prices are observed in pharmacies across the country. The medicines may become unaffordable to the patient; which raises the problem of financial inaccessibility. For example, some drugs in pharmacies are sold[73(p114)]:

- Amoxicillin 500 mg hard capsules, box of 10 sold at the price varying from 300 to 1000 MRO,
- Paracetamol 500 mg tablets, box of 20, sold at the price varying from 300 to 900 MRO,
- Amoxicillin + clavulanic acid 500/125 mg, box of 12, sold at the price varying from 1400 to 1800 MRO

The Public health system does not yet guarantee the availability of medicines, vaccines and essential supplies at all levels and at affordable prices. Tertiary hospitals are not integrated into the public supply system, which results in the financial inaccessibility of the services provided by these structures. [73(p5)]

[73] World Health Organization. WHO Country Cooperation Strategy 2009 - 2013: Mauritania. [Stratégie de coopération de l'OMS avec les pays 2009 – 2013 : Mauritanie]. Brazzaville : WHO Regional Office for Africa ; 2009

Disease Burden

The burden of diseases in Mauritania is high, with communicable diseases still prevailing. Communicable, maternal, perinatal and nutritional conditions account for 61% of total deaths in all ages. Cardiovascular diseases, injuries, tuberculosis and malaria are among the most important. Increasingly, the country is confronted with the "double burden of disease" due to non-communicable diseases (NCDs). NCDs are estimated to account for 32% of all deaths (WHO NCD).

Communicable diseases overview

Acute respiratory infection (ARI)

Acute respiratory infection: is one of the major public health problem in Mauritania, contributing to 29% of total outpatient attendance at the level of health center and health poste[74(p52)]. It is the leading cause of death in children under-five, contributing to 16% of all deaths in this age group in 2013[75].

Multiple Indicator Cluster Survey (MICS 6) survey shows that only 34 per cent of children aged 0-59 months with symptoms of ARI were taken to a qualified provider, mainly in the public sector (33 per cent). Treatment is more frequent in urban areas (46%) compared to rural areas (24%). Treatment is higher among the children of the richest quintile (48%) compared to children living in the poorest quintile (18%) and increases with the level of education of the mother.[43 (p87)]

Diarrheal diseases

Diarrheal disease is the reason of 1 in 9 child deaths worldwide, making diarrhoea the second leading cause of death among children under the age of five[76(p1)]. Most diarrhoea-related deaths

[74] Ministry of Health. *Health Statistics Yearbook 2015. [Annuaire des statistiques sanitaires 2015]*. Nouakchott : Ministry of Health ; 2016

[75] World Health Organization. Mauritania: WHO statistical profile. Geneva: World Health Organization; 2015

[76] Centers for Disease Control and Prevention. Diarrhea: Common Illness, Global Killer [Internet]. Atlanta :

are due to dehydration and the loss of large amounts of water and body electrolytes in the liquid stools. Treatment of diarrhoea - either oral rehydration salts (ORS) or a home-prepared recommended drink - can prevent many of these deaths. In addition, it has been shown that the supply of zinc supplements can reduce the duration and severity of the disease as well as the risk of future episodes in the next two or three months. Preventing dehydration and malnutrition by increasing water intake and by continuing to feed the child are also important strategies for the management of diarrhoea.

In Mauritania, the prevalence of diarrhoea is particularly high in children aged 12-23 months (25%). Significant variations in the prevalence of diarrhoea are observed in relation to regions, maternal education and the level of economic well-being of the household. Indeed, while in Nouadhibou, only 5 percent of children had diarrhoea, this proportion reaches a maximum of 34-35 percent in Guidimagha and Gorgol. Moreover, the MICS 6 survey shows that the prevalence of diarrhoea is high when the mother has no education (24%), and low when she has a higher education (12%). Furthermore, the prevalence of diarrhoea decreases with income from 22 per cent for the first quintile to 11 per cent for the fifth quintile. [43(p77)]

Tuberculosis

Global TB reports 2015 shows that the mortality, incidence and prevalence of tuberculosis had declined between 2000 and 2015. The incidence rate has decreased from over 250 in 2000 to 107 per 100,000 populations in 2015 and the mortality rate has fallen from 60 to 21 per 100,000 over the same period.[77(p1)]

For tuberculosis control, DOTS Strategy is being implemented in the country with 100% DOTs coverage. This is in line with the new Global Stop TB Strategy. The treatment success rate is 85%. However, more than 21 % of TB patients in the country are Drug-resistant TB care.

Centers for Disease Control and Prevention ; 2017 [cited 2017 Nov 26]. Available from: https://www.cdc.gov/healthywater/pdf/global/programs/globaldiarrhea508c.pdf

[77] World Health Organization. Mauritania tuberculosis profile. Geneva: World Health Organization; 2016

Malaria

Malaria has become a major public health problem in Mauritania since the 1990s, with an average of 181,000 cases per year and 2,233,066 persons at risk during 1995–2012[78(p1)]. It is one of the major public health problem, contributing to 17% of total outpatient attendance and more than 73% of inpatient at the level of health center and health post.[74(p52)]

Non-communicable diseases overview

In Mauritania 32% of total deaths occur due to non-communicable diseases NCDs (WHO NCD)[79]. Non-communicable diseases are on the rise in Mauritania particularly in the urban areas. According to 2015 WHO data, the total number of deaths due to non-communicable diseases is 2800 among males and 2900 among females. The disease specific age-standardized death rate per 100, 000 for four main NCDs is presented in Table 9.

[78] Lekweiry K. M., Ould Ahmedou Salem M. S., Basco Leonardo, Briolant S., Hafid J., Ould Mohamed Salem Boukhary Ali. Malaria in Mauritania: retrospective and prospective overview. Malar J.; 2015

[79] World Health Organization. Mauritania profile, Mortality and burden of disease: no communicable diseases[Internet]. Geneva: Wold Health Organization; 2014 [cited 2018 July 16]; Available from: http://www.who.int/nmh/countries/mrt_en.pdf?ua=1

TABLE 9. THE DISEASE SPECIFIC AGE-STANDARDIZED DEATH RATE FOR FOUR MAIN NCDS IN MAURITANIA[80]

	2000	2012
All Causes	1381.70	1257.60
Communicable diseases	720.5	619.1
Non- communicable diseases	569.8	555.1
Injuries	91.4	83.4
Malignant neoplasms(CANCER)		66.1
Cardiovascular diseases		262.6
Chronic Respiratory diseases		32.1
Diabetes mellitus		40

Declines in death rates from communicable diseases, together with population aging, leads to a higher incidence and prevalence of NCDs, such as cancers, cardiovascular diseases and chronic respiratory disease as shown in Table 10.

TABLE 10 DISTRIBUTION OF YEARS OF LIFE LOST BY MAJOR CAUSE GROUP (%)[80]

cause group	2000	2012
Communicable	76%	61%
Non- communicable diseases	16%	31%
Injuries	8%	8%

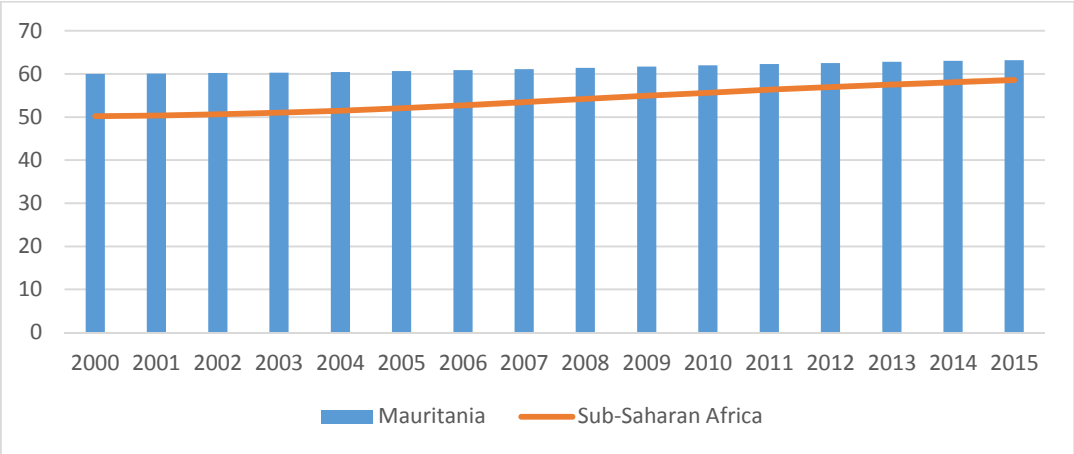
[80] World Health Organization. Mauritania Factsheets of Health Statistics 2016. Geneva: World Health Organization; 2016

Health outcomes

life expectancy

Life expectancy at birth indicates the number of years a new-born infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life. From 1960 to 2015, Mauritania has experienced an increase in life expectancy at birth of about 20 years for both sexes. In 2015, the average life expectancy at birth was 63.2 years. Mauritania occupy 163th position with respect to the ranking of 198 countries.

FIGURE 13. LIFE EXPECTANCY AT BIRTH, TOTAL (YEARS)[81]



Maternal and infant mortality

The emphasis on maternal and child health in national health policy is well reflected in the position of these interventions as the main axes of national health policy, national health development plan 2012-2020 and the commitment to achieve Untied Nation Millennium Development related Goals (MDGs). This section focuses on maternal and child mortality as revealing indicators of health outcome of the population in general.

[81] World Bank. Health Nutrition and Population Statistics Database [Internet]. Washington DC: World Bank; 2017 [cited 2017 Nov 17]. Available from: https://datacatalog.worldbank.org/dataset/health-nutrition-and-population-statistics

Maternal mortality

Maternal mortality is a particularly revealing indicator of women's status, women's access to health care and how the health system responds to their needs. It is therefore important to have information on the levels of maternal mortality, not only because they inform about the risks related to pregnancy and childbirth, but also because they provide information on the health of women, and indirectly, their economic and social situation. The maternal mortality ratio expresses the number of maternal deaths by the number of live births during the year.

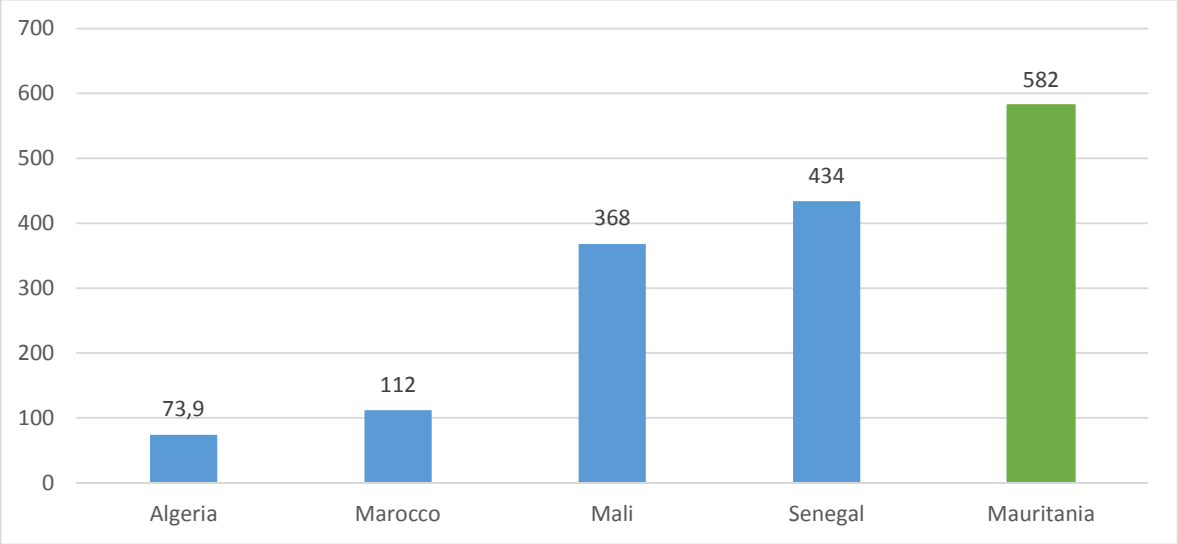
Maternal morbidity and mortality is a major health problem in sub-Saharan African countries. In Mauritania, maternal mortality ratio is among the highest in the sub-region as 580 women per 100,000 live births (Figure 14). Many women suffer from maternal morbidity because of pregnancy-related disabilities due to complications of childbirth such as infections, eclampsia, slow labour, and ruptured uterus. Pregnant women also have a higher susceptibility to infectious or metabolic disorders such as malaria or diabetes, and nutritional deficiencies such as anaemia than no pregnant women. Barriers to access to maternal health care services are particularly important and include lack of transport, misdistribution of health facilities and limited cash resources for women.

In Mauritania, Safe Motherhood programs have been initiated since 1988, however maternal mortality continues to be high. Maternal health care is not equitably distributed in-country. When health care is available, barriers such as inadequate transport services, lack of access to cash, decision making within the household, and cultural factors limit their use in times of emergency.[82(p3,4)]

Figure 14 shows mortality rate in comparison with neighbour countries. It indicates that maternal mortality is very low in Algeria and Morocco compared to Mauritania, Senegal and Mali. The statistics here are comparable, considering the years of the maternal mortality estimate (range of about 3 years between periods) and the estimation methods used.

[82] Levin Ann, McEuen Mark, Dymatraczenko Tania, Ssengooba Freddie, Mangani Ronald and Van Dyck Gerry. Costs of Maternal Health Care Services in Three Anglophone African Countries 22. Maryland: Partnerships for Health Reform Project; 2000.

FIGURE 14 TRENDS IN MATERNAL MORTALITY IN SOME COUNTRIES IN THE SUB-REGION (DEATHS PER 100,000 LIVE BIRTHS)

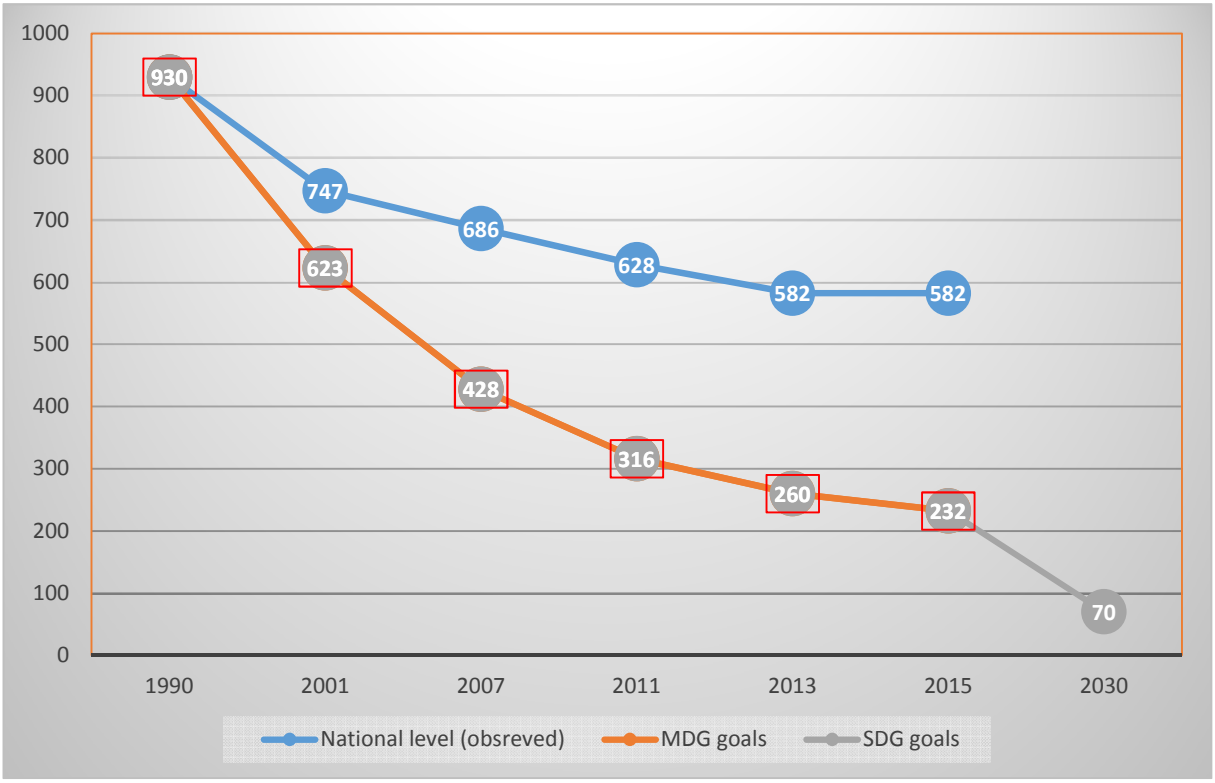


Maternal mortality ratio in Mauritania is also far from MDGs 5 Goal, which aims to reduce its value between 1990 and 2015 by three-quarters (3/4). Figure 15 shows that this ratio has declined significantly since the 1990s when it was in the range of 930 maternal deaths per 100,000 live births. .[83(p22)]

Mauritania has not been able to reach MDGs 5 targets. Moreover, if the current trend remains unchanged the country will not be able to achieve health targets for sustainable development goals SDG 3 which aims to reduce the global maternal mortality ratio to less than 70 per 100 000 live births, by 2030 (see Figure 15)

[83] National Office of Statistics. General Census of Population and Housing 2013: mortality. [Recensement Général de la Population et de l'Habitat 2013 : mortalité]. Nouakchott : National Office of Statistics; 2015.

FIGURE 15 TRENDS IN MATERNAL MORTALITY, THE REAL RATE IN RELATION TO THE MDGS AND SDG TARGETS (DEATHS PER 100,000 LIVE BIRTHS)[4,5,6,7]



Analysis of maternal mortality by age group reveals an excess mortality of teenage mothers with 1.18 maternal deaths per 1000 live births. This result indicates a higher risk of maternal death for mothers under 20 years of age. In addition, this risk is still high for mothers in the 40-49 age group with a ratio of more than 1.42 maternal deaths per 1000 live births. On the other hand, mothers between the ages of 20 and 29 are less exposed to the phenomenon with fewer than 0.85 maternal deaths per 1000 live births.[42(p130)]

Even though the reduction of maternal and neonatal mortality is the priority of the 2012-2020 National Health Development Plan (NHDP), this maternal mortality rate remains high and reveals that about 840 women die each year in Mauritania for reasons related to pregnancy.

In the Declaration of Population Policy of Mauritania, revised in 2012, several major actions of the Government were stipulated, including:

- Establishment of the coordination unit for the implementation of the plan to accelerate the Millennium Development Goals on maternal and child health;
- Strengthening human resources in Reproductive Health through the redeployment of specialists in regions;
- Strengthening the skills of providers, particularly in the field of obstetric care;
- Strengthening the technical platform (equipment, ambulance, blood banks, etc.);
- Facilitating accessibility of services (obstetric package, health mutual);
- Motivation of staff working in remote areas through the application of a specific premium;
- Setting up a partnership platform between the Ministry of Health and Civil Society Organizations (contractual approach);
- Institutionalization of a national week of Reproductive Health under the patronage of the First Lady.

Maternal mortality causes

The origins of maternal mortality are known: half of deliveries in the rural area and third deliveries take place at home without any medical supervision and without the assistance of qualified personnel. Research shows that the single most effective intervention to ensure safe motherhood is to ensure that a trained midwife is present during all deliveries. Means of transportation should be available to access referral services.

The Emergency Obstetric and Neonatal Needs Assessment report identified two major medical causes of maternal mortality: direct causes and indirect causes as shown in the Table 11.

TABLE 11. MATERNAL MORTALITY CAUSES[84(104)]

	Direct Causes	Indirect Causes
haemorrhage	57.14%	
Severe pre-eclampsia /	31.87%	
Severe Infection	6.59%	
Other maternal deaths due	4.40%	
Malaria		16.67%
heart Disease		11.11%
Severe anaemia		27.78%
HIV / AIDS-related		11.11%
Other indirect complications		33.33%

As has been reported in several other studies, haemorrhage remains the leading cause of maternal mortality in Mauritania, followed by eclampsia and infections.

Overall, about 73.1% of deaths are due to direct causes, which could be avoided if these patients have received appropriate care at the appropriate time. The Emergency Obstetric and Neonatal Needs Assessment report shows that haemorrhage account for 57.14% of direct causes of maternal deaths. There is a huge disparity in the distribution of deaths according to direct causes: 79% of deaths occurred in-country and 62.8% of these deaths occurred in three regions only (31.9% in Guidimagha, 18.1% in Hodh Chargui and 12.8% in Hodh Gharbi). Two of these regions do not have any Obstetric and Neonatal Emergency Care and the third region have one single Obstetric and Neonatal Emergency Care.

The risk factors related to maternal mortality are medical, surgical and gynaecological-obstetric history, age, parity and size of the woman. A pre-existing general or surgical condition, a history of abortion or stillbirth, an age too young (less than 20 years) or too advanced (over 40 years), multiparty, size less than 150 centimetres could cause a complication

[84] Ministry of Health. *Emergency Obstetric and Neonatal Care in Mauritania Needs Assessment Survey 2012. [Soins obstétricaux et néonataux d'urgence en Mauritanie enquête d'évaluation des besoins 2012]*. Nouakchott : Ministry of Health; 2011

during pregnancy or childbirth. However, the risks associated with these factors can be reduced by proper monitoring of pregnancy.

Indirect and non-medical causes of maternal mortality

Medical causes are the most visible part of the multidimensional problem of maternal mortality. It is often the logistical or health service-related factors that determine whether a pregnant woman or a child with complication will live or die.

In Mauritania, as in most developing countries, health services are concentrated in urban centers, as shown above. The remoteness of health infrastructures, combined with the scarcity of means of transport and the poor state of communication, constitute a set of factors impeding access to health services. Distance and lack of equipment of the health facilities often oblige the evacuation of the patients. The Emergency Obstetric and Neonatal Needs Assessment report shows that the average distance between the Health Center/ health post and the nearest facility offering obstetric surgery is 126 KM[84(p32)]; thus, the maternal mortality rate increases with distance travelled.

Moreover, early marriage and childbearing are common. The traditional cultural behaviour promotes early marriages, which explains why age at first marriage remains very low. These practices involve many risks for women, particularly those related to a very young age (under 20 years of age) or advanced age (over 40 years).

Additionally, there is a link between women's educational attainment and maternal mortality. Studies show that the number of children is an inverse function of the number of years of schooling and age at marriage. Lack of education also limits the power and autonomy a woman can have within the household. Uneducated women have less autonomy in managing their fertility and planning their families. In some communities, they must even refer to their husbands before resorting to health services.

Child Mortality

Like the other Sub-Saharan African countries, Mauritania witnessed unprecedented declines in child mortality over the past two decades. However, infant and child mortality rates are still

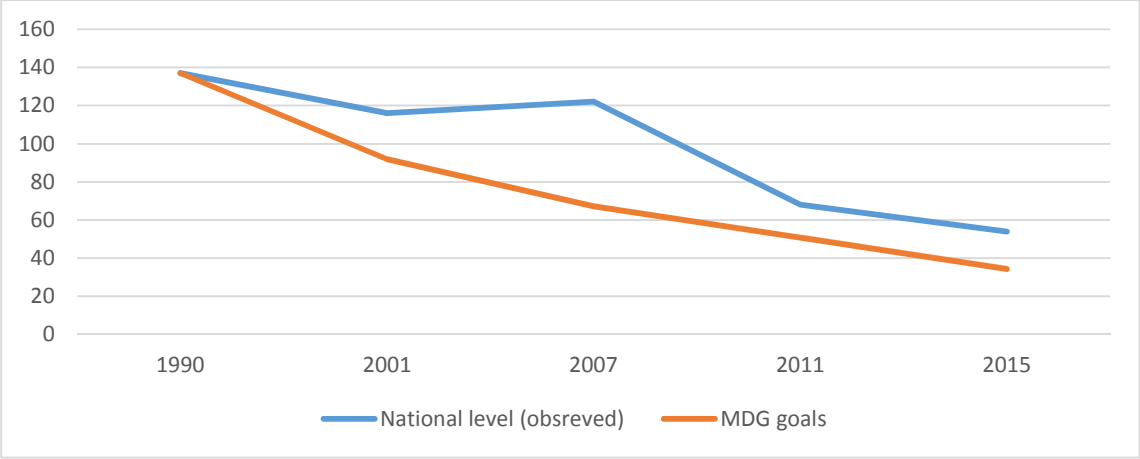
high, with 54 deaths per 1,000 children under 5 years of age, of which 43 in the first year (MICS 2015).

The levels, trends and characteristics of child mortality reflect the health, environmental, socio-economic and cultural conditions prevailing in a population. For this reason, the level of child mortality is often considered to be one of the best indicators of a country's level of development. Therefore, knowledge of child mortality is essential, not only to population specialists, but also to those responsible for the implementation of health and socio-economic development programs.

Evolution of child mortality

Overall, the trend of mortality in childhood is falling. Figure 16 presents national data from various surveys and reveals a decline in under-five mortality (between 0 and 5 years). The level fell from 137 per thousand in 1990 to about 54 per thousand in 2015. A significant decrease in mortality appears to have occurred between 2007 and 2015. Despite these gains, progress remains insufficient to reach the Millennium development goal 4.

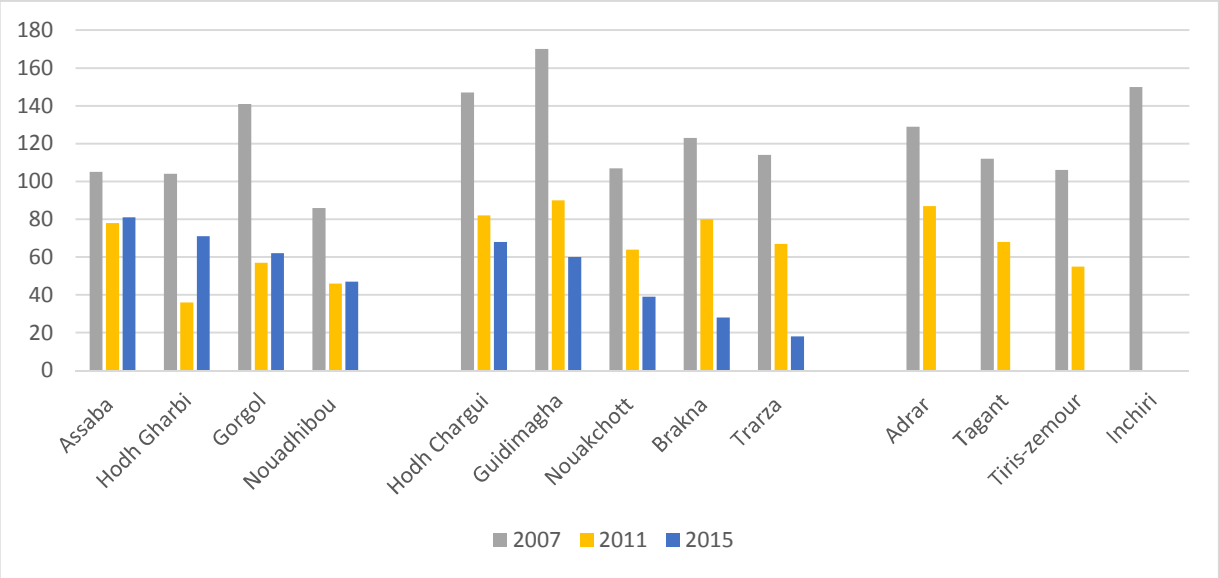
FIGURE 16. THE TREND OF MORTALITY IN CHILDHOOD[40,41,42,43]



1) Disparity in child mortality according to Wilaya

Within the country, the under-five mortality ratio varies greatly according to the place of residence: from 18 per thousand in Trarza to 81 per thousand in the Region of Assaba for the period 2015.

FIGURE 17. DIFFERENTIAL VARIATION IN CHILD MORTALITY ACCORDING TO WILAYA[41,42,43]

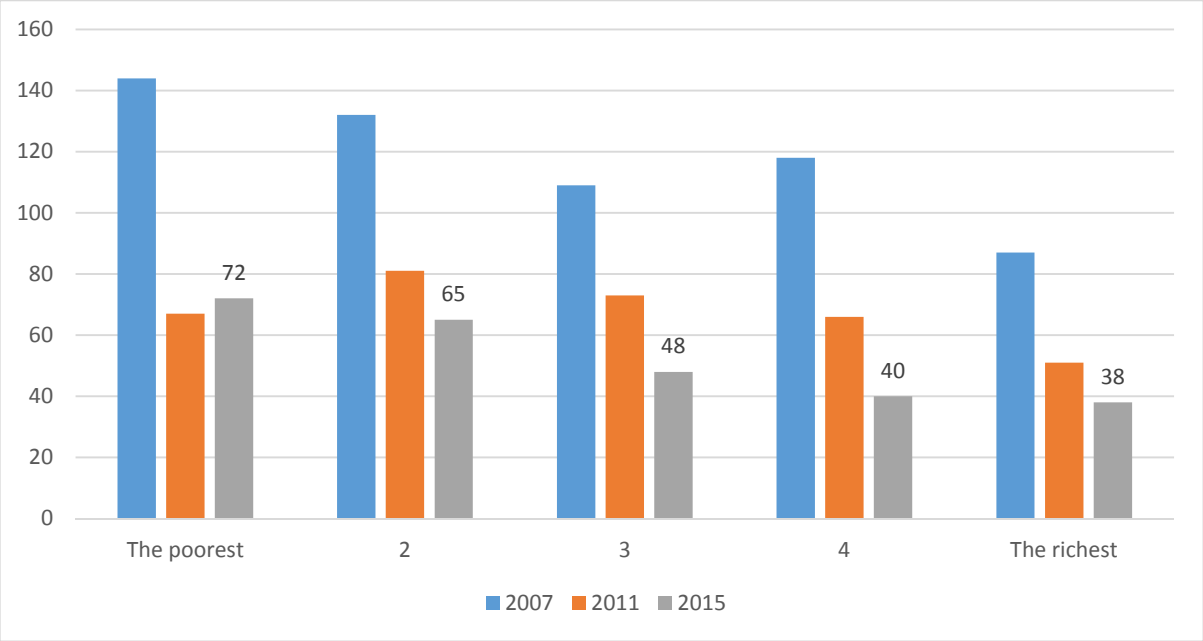


During the period 2011-2015, the under-five mortality rate has increased in 4 wilayas during the last five years, namely: Assaba (81 ‰) in 2015 against (78 ‰) in 2011, Hodh Gharbi (71 ‰) in 2015 against (36 ‰) in 2011, Gorgol (62 ‰) in 2015 against (57 ‰) in 2011 and Nouadhibou (47 ‰) in 2015 against (46 ‰) in 2011. In 2015, the highest levels are found in the wilayas of Assaba (81 ‰), Hodh Gharbi (71 ‰) and Hodh Chargui (68 ‰).

2) Disparity in child mortality according to economic status

Social status, education and social behaviour are undoubtedly variables that influence mortality levels. Child mortality is strongly related to socio-economic conditions, which partly explains its large differences according the place of residence.

FIGURE 18. DIFFERENTIAL VARIATION IN CHILD MORTALITY ACCORDING TO ECONOMIC STATUS[41,42,43]

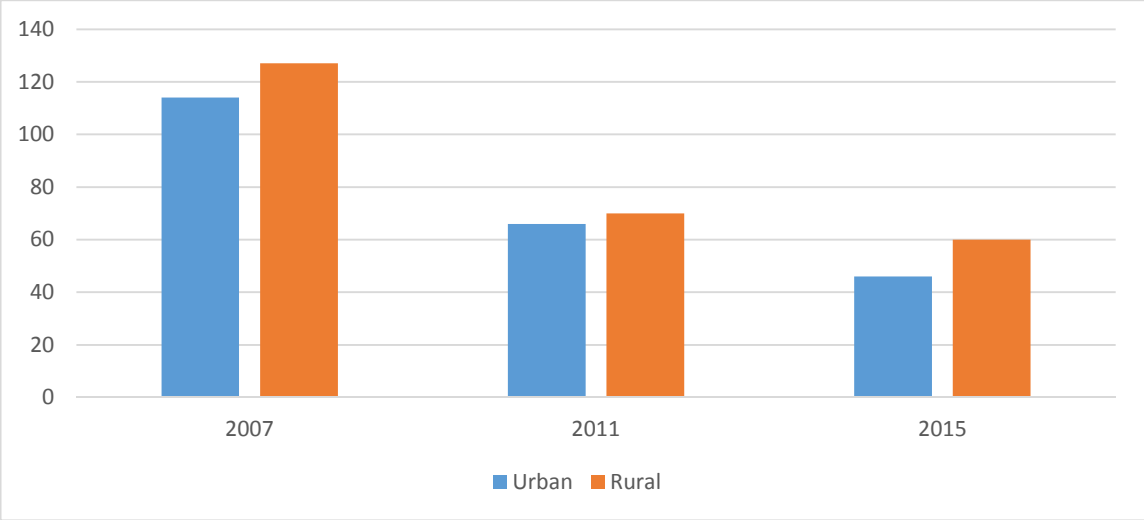


The Figure 18 shows that the living conditions of households strongly influence the risk of dying. Overall, levels are higher for children living in poorer households than for those in the richest households. Under-five mortality, although high, is significantly lower for children living in the richest households (38 ‰) and those in the fourth quintile (40 ‰) than for children living in the poorest households (72 ‰) for the period 2015. The situation of the poorest quintile worsened between 2011 and 2015, while we observe an increase in the mortality rate for the poorest population from 67 per thousand in 2011 to 72 per thousand in 2015.

3) Disparity in child mortality according to place of residence

From the point of view of the place of resident, the chances of survival of urban children are better than those of their rural area.

FIGURE 19. DIFFERENTIAL VARIATION IN CHILD MORTALITY ACCORDING TO PLACE OF RESIDENCE[41,42,43]



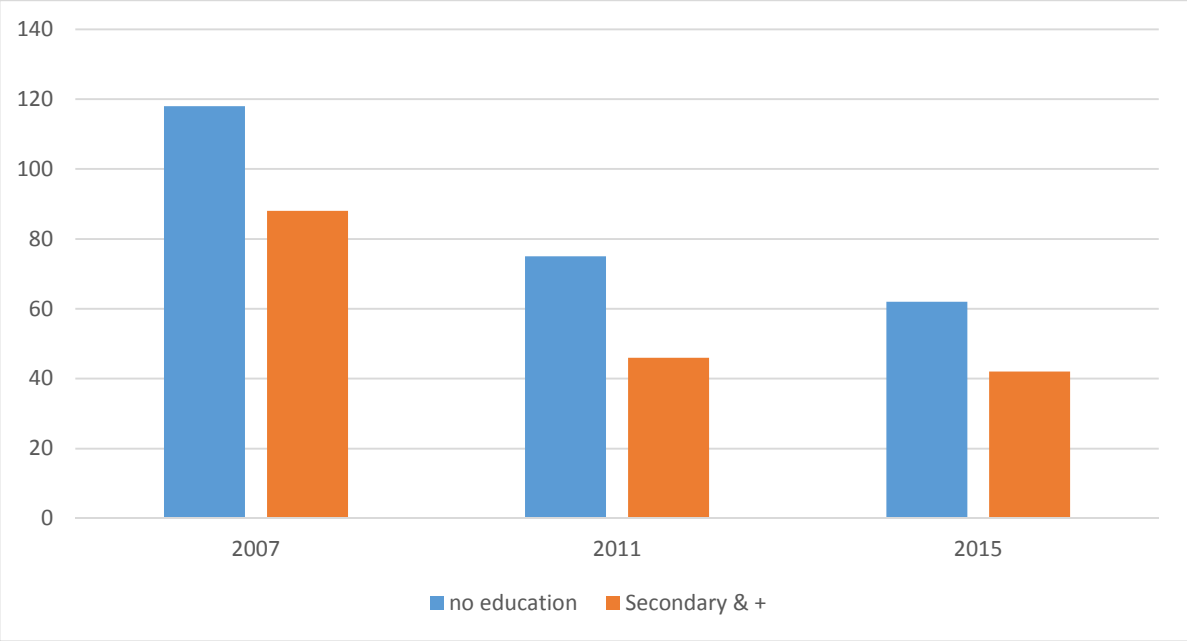
The Figure 20 confirms this trend for the period 2007 and 0215. Indeed, in 2015, 46 children out of 1000 died before the age of five years' in urban area against 60 in rural area. There are several reasons for these differences. In general, urban residents benefit from a more developed health infrastructure, have relatively more income and are often more educated and thus more likely to attend health facilities and observe the basic hygiene rules. This probably explains the lower level of child mortality in urban than in the rural.

4) Disparity in child mortality according to mother education

As a social factor, it is generally accepted that the education of parents, and particularly of the mother, is a determining factor in the level of infant mortality. With better hygiene, better knowledge of nutrition needs, willingness to use medical facilities and increased use of contraception, the behaviours of mothers with higher levels of education affect infant morbidity and mortality.

The Figure 20 shows that overall mortality decreases as the mother's educational attainment increases. In 2015, children whose mothers have secondary education have significantly lower mortality risks than those whose mother has never attended school (42‰ against 62‰).

FIGURE 20. DIFFERENTIAL VARIATION IN CHILD MORTALITY ACCORDING TO MOTHER EDUCATION[41,42,43]



The main causes of infant and child mortality are known: (i) Acute Respiratory Infections (ARI), (ii) diarrhoea, (iii) malaria, (iv) malnutrition, and (v) measles. The World Health Organization (WHO) estimates that 20% of under-five deaths—approximately two million deaths annually—could be prevented with existing vaccines.[85] In addition, many of the interventions known to save the lives of women and their new-borns depend upon the presence of a Skilled Birth Attendant (SBA).

In the next chapter we will focus on three tracer's indicators of maternal and infant-child mortality, namely, family planning, prenatal consultation 4, assisted delivery, postnatal care and vaccination. We will study the evolution of these indicators from an equity perspective.

[85] United Nations Children's Fund. Committing to Child Survival: A Promise Renewed [Internet]. New York: UNICEF's Division of Policy and Strategy; 2012 [cited 2018 July 11]; Available from : http://www.apromiserenewed.org/wp-content/uploads/2015/02/APR_Progress_Report_2012_final_web.pdf

Chapter III: EQUITY IN HEALTH CARE UTILIZATION

This chapter assesses the inequality and inequity in health care utilization along with selected indicators, for maternal and child health services. The chapter measures the inequality in the use of health services following different approaches, place of residence, socio-economic status and spatial inequality. . The present chapter is based on the approach proposed by Wagstaff and van Doorslaer (2003) , O'Donnel et al (2008)[14] statistical techniques, Wagstaff et al (2011)[21] and statistical tools such as SPPS and STATA software to measure the concentration index, concentration curve and the decomposition of the concentration index. This model has been developed using linear regression model of health in which socioeconomic status assumed to be continuous and to follow a normal distribution. This approach provides a more efficient and flexible way to quantify the contributions of the underlying determinants of health inequality in a nonlinear and multivariate context The inequity measured through the concentration index, concentration curve and the decomposition of the concentration index. These methods provide insights into the nature of inequality that can be used to inform policy design to reduce income related health inequalities. This is important to Mauritania and many other African countries with ambitious goals for improving equity in maternal and child health services.

We selected five indicators that are closely related to maternal and infant mortality: family planning, prenatal care, assisted delivery, postnatal care and the rate of completely vaccinated children. The choice of these indicators is justified by the following reasons:

- Some studies (Saifuddin Ahmed et Al (2012)) estimate that in the absence of contraceptive use the number of maternal deaths in Mauritania would be almost 815 which is higher than the current level. The percent reduction in maternal deaths attributable to contraceptive use is about 17.8%. The study estimates that increase in contraceptive prevalence rate in low income countries could further decline maternal deaths by 25% and reduce the burden on maternal.[86(p20)]
- Prenatal care plays an essential role in the monitoring of pregnancy and in preventing maternal and neonatal mortality, as it allows the timely treatment of the medical

[86] Ahmed Saifuddin. Maternal Deaths Averted by Contraceptive Use: Results from a Global Analysis of 172 countries[Internet]. Baltimore: Johns Hopkins University. 2012 [cited 2018 July 16]; Available from: http://www.jhsph.edu/departments/population-family-and-reproductive-health/_docs/faculty-in-the-news-saifuddin-july-2012.pdf

preventable causes of death. For example, the lack of prenatal care leads to untreated hypertension, which causes death and disability, or unidentified levels of malnutrition or under-nourishment.

- The origins of maternal mortality are known: half of deliveries in the rural area and third deliveries take place at home without any medical supervision and without the assistance of qualified personnel. Research shows that the single most effective intervention to ensure safe motherhood is to ensure that a trained midwife is present during all deliveries, that a means of transportation is available to access referral services, and that quality obstetric care can be provided. Many of the interventions known to save the lives of women and their new-borns depend upon the presence of a Skilled Birth Attendant (SBA).
- The World Health Organization (WHO) estimates that 20% of under-five deaths—approximately two million deaths annually—could be prevented with existing vaccines.[85]
- The priority given to these indicators in the health development plan 2012-2020 and the focus placed on equity dimension in the use of these services

Contraceptive use in Mauritania

Family planning enables people to reach the desired number of children and to determine the spacing of births. The national policy integrates family planning as priority within the framework of the National Health Development Plan (NHDP) and a national strategy for the repositioning of family planning 2014-2108 developed and implemented by the Ministry of Health through the National Program of Reproductive Health with the support of technical and financial partners. The family planning services is characterized by a very low use and a high unmet for need contraceptive method (Table 12).

TABLE 12 CONTRACEPTIVE AND UNMET NEED FOR CONTRACEPTION IN MAURITANIA (2001-2015)[40,41,42,43]

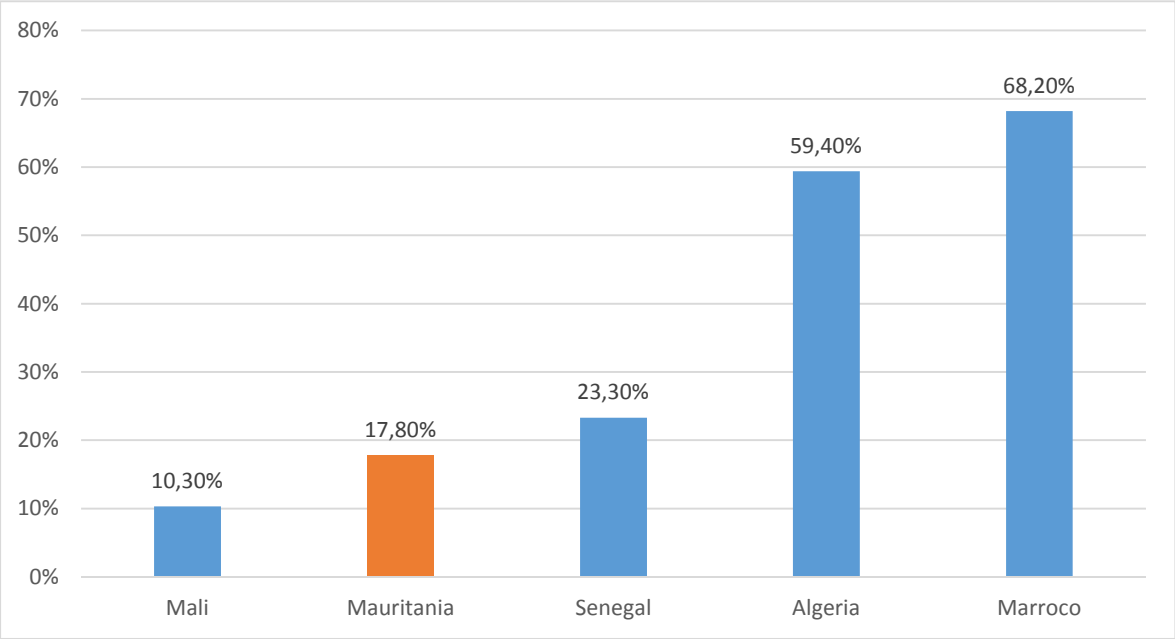
Indicators	2001	2007	2011	2015
Fertility rate	4.7	na	4.2	5.1
Family Planning prevalence	4.80%	9.30%	11.40%	17.80%
Unmet need for contraception	31.60%	n. a	31.10%	33.60%

The total fertility rate (TFR) in Mauritania has historically stagnated at persistently high levels and has increased by one child overall during the past five years, from 4.2 (2011) to 5.1 (2015). The proportion of reproductive-age married women who use a modern or traditional contraceptive method rose from 4.80%% to 17.80% between 2001 and 2015. However, the rate is still very low. The proportion of married women with an unmet need for family planning increased slightly from 31.60% to 33.60% during the same period. Overall, a third of married women (33.60% in 2015) manifests their desire to stop having children or delay their next birth. However, they are not using any method of family planning.

Remarkably, the table shows an increase in both the fertility rate and the prevalence of family planning. Naturally, the two rates should move in the opposite direction: if family planning increases, fertility should decline. Some evidence from similar countries suggest that early marriage has a direct impact on fertility. Between 2011 and 2015, the percentage of women who married before the age of fifteen has increase by 0.8 percent (14.8% in 2011 versus 15.6% in 2015). Moreover, the national family planning policy is against birth limitation. Outreach activities is limited to the promotion of birth spacing to avoid the harmful effects of close births on the mother and the child.

In neighbour countries such as Algeria, Morocco, contraceptive use is very high in comparison with Mauritania, denoting the growing acceptance of family planning in these countries. Mauritania occupies an intermediate range between Senegal and Mali.

FIGURE 21 CONTRACEPTIVE USE IN NEIGHBOURS COUNTRIES[43,87,88,89]



In Mauritania, most of reproductive-age married women do not use modern methods of contraception either because of lack of interest or because of lack of information.[90(p10)] Adolescents and youth do not have access to these services and their use is negatively perceived by providers who have the right to offer these services only to married women. Indeed, the midwives require the identity card of the husband, and the pharmacists ask for the notebook of family organization.[91(p16)] The perceptions of leaders and political decision-makers who are detrimental to the promotion of family planning remain a problem.

[87] Planning and Statistics Unit (CPS / SSDSPF), National Institute of Statistics (INSTAT) and Center for Studies and Statistical Information (INFO-STAT). Demographic and Health Survey (DHS-V) 2012-2013. [Enquête Démographique et de Santé (EDSM-V) 2012-2013]. Bamako : 2014

[88] National Agency of Statistics and Dermography. *Demographic and Continuing Health Survey (DHS-Continuous) 2015. [Enquêté Démographique et de Santé Continue (EDS-Continue) 2015].* Dakar : Agence Nationale de la Statistique et de la Démographie ; 2016

[89] United Nations. Trends in Contraceptive Use Worldwide 2015. Department of Economic and Social Affairs Population Division. New York: United Nations; 2015

[90] Ministry of Health. 2014-2018 Family Planning Repositioning Plan. [Plan de repositionnement de la planification familiale 2014-2018]. Nouakchott : Ministry of Health ; 2013

[91] United Nations Fund for Population Activities - Mauritanie. Reproductive health in Mauritania: Analysis of the legal and socio-cultural environment. [La santé de la reproduction en Mauritanie: Analyse de l'environnement juridique et socioculturel]. Nouakchott : United Nations Fund for Population Activities - Mauritanie ; 2008

Contraceptive products are dispensed free of charge in the public sector according to decree 006/2003 of 04/02/2003 and the order N° 00733 of 16/04/2003. However, the contribution of households is effective outside public providers. Family planning is supported through multiple one-off projects, most of which are implemented through externally funded projects or NGOs (UNFPA, USAID, Mauritanian Association for the Promotion of the Family (MAPF), etc.). The level of funding for family planning remains inadequate and is highly dependent on external resources. The Mauritanian government do not directly contribute to the purchase of contraceptive products; the public health system is mainly provided by United Nations Population Fund in large part and by the International Planned Parenthood Federation via the Mauritanian Association for the Promotion of the Family. From 2014, Mauritania has committed to create a budget line dedicated to the security of reproductive health products and the line will be allocated to the family planning[92].

Inequality in contraceptive use in Mauritania

Use of family planning is often influenced by socio-demographic determinants. In the following section we will measure inequality in utilization of family planning services in relations to five socio-economics determinants of contraceptive use such as: the place of residence and socio-economic status, women's education level, women's age, the number of living children and women's ethnicity.

Inequality in contraceptive use according to place of residence and poverty quintile

Place of residence influences a woman's values and can have a significant effect on contraceptive use. Women in rural areas prefer large families. Children are highly valued because they not only perpetuate the family line but also considered as economic goods that are synonymous with manpower[93(p21)], prosperity and old age security. The family planning

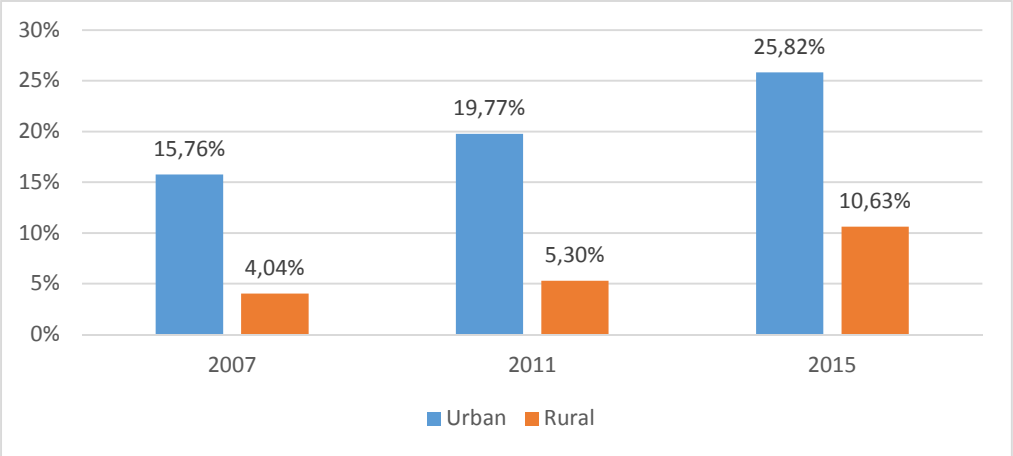
[92] International Conference on Family Planning. Statement by Mauritania on the occasion of the International Conference on Family Planning[Internet]. Déclaration de la Mauritanie a l'occasion de la conférence internationale sur la planification familiale. 2017 [cited 2017 Nov 17]. Available from: http://ec2-54-210-230-186.compute-1.amazonaws.com/wp-content/uploads/2013/11/2013_11-15_Mauritania_Commitment_Remarks_French_Original.pdf

[93] CONGO, Zakari. Contraceptive factors in Burkina Faso Analysis of data from the 1998/99 Demographic and Health Survey. Family planning in Africa. [Les facteurs de la contraception au Burkina Faso Analyse des données de l'enquête démographique et de santé de 1998/99. La planification familiale en Afrique]. Analysis documents

use is not only affected by access to modern contraceptives but also by women's interest in and motivation to regulate their fertility. Methods of contraceptive are the most widely used in the urban area because there is a better availability of services, a better information and communication network.

In Mauritania, urban women showed consistently a higher use of contraceptives methods than rural women. Despite the increase in the contraceptive use in both rural and urban area, over the last decade, a huge disparity persists between these areas, (25,82% versus 10,63%) in 2015 against (15,76% versus 4,04%) in 2007 (Figure 22).

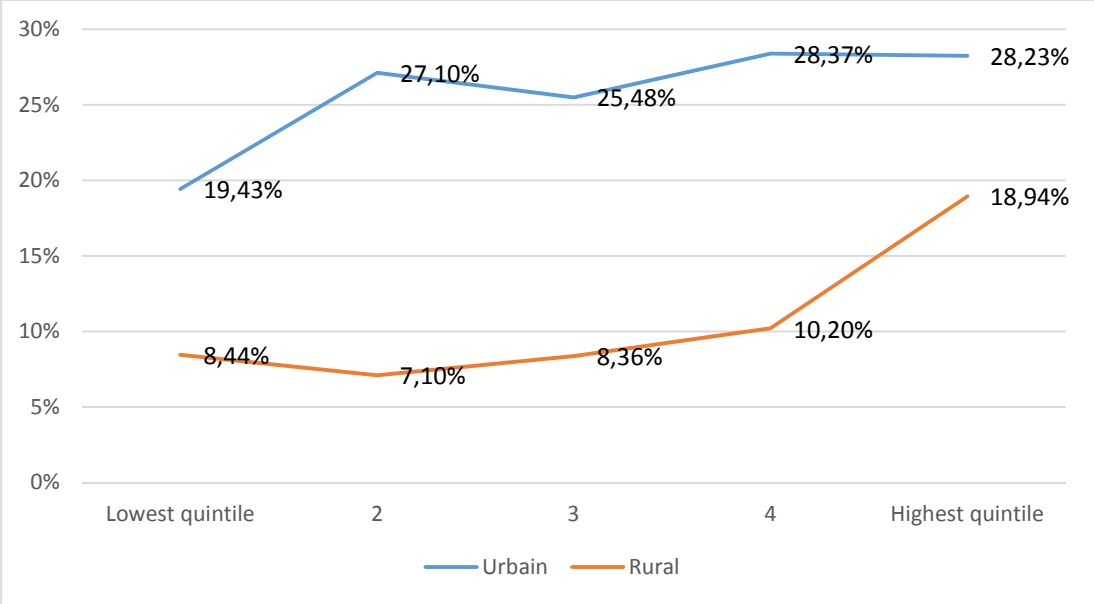
FIGURE 22. CONTRACEPTIVE USE BY PLACE OF RESIDENCE BETWEEN 2007 AND 2015[41,42,43]



The disparity between urban-rural women according to socio-economic status are striking: even the richest rural women lag the poorest women in urban (18.94% versus 19.43%) respectively (Figure 23). The cultural differences and disparity in educational and socio-economic profile, might explain the fact that rural and poorer women want more children than their urban counterparts.

n ° 5. Ouagadougou : International Group of Partners Population - Health; 2005

FIGURE 23. CONTRACEPTIVE USE BY PLACE OF RESIDENCE AND SOCIO-ECONOMIC STATUS IN 2015 [43]



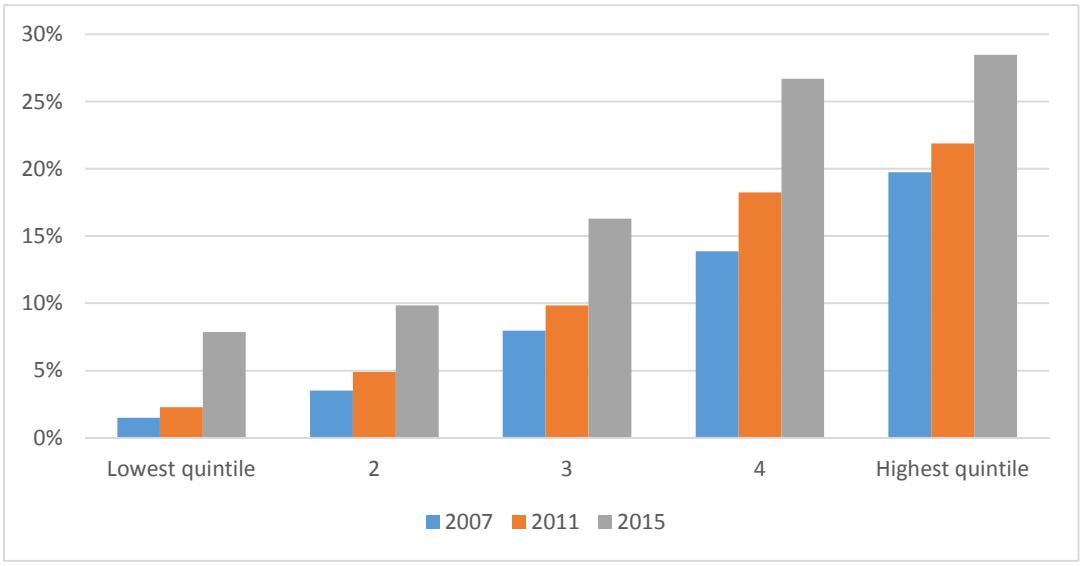
The rural population has a major problem of access to the family planning services. Nearly half (49%) of health posts, one quarter of health centers (24%) and more than one third of hospitals (39%) do not provide family planning services[69(p20)]. This is compounded by the problem of stock mismanagement at the district and delivery point levels. Indeed, the management of the supply chain in Mauritania, is characterized by dysfunctions causing serious disturbance in the availability of products at the desired time. There is mainly a stock imbalance between the central, regional and peripheral levels: the availability of essential reproductive health products at service delivery points was 0% in the first quarter of 2016 compared to 75% at the regional level and 100% at the central level.[94(p10)]

[94] Ministry of Health. Improved supply chain for RMNCHN products. [Amélioration de la chaine d'approvisionnement des produits SRMNIA]. Nouakchott : Ministry of Health; 2016.

Poverty related inequality in contraceptive use among Mauritanian women (2007-2015): are inequities narrowing or widening?

Figure 24 shows the trends in inequality in contraceptive use according to household wealth. As can be seen, Figure 24 shows a pattern of very slow narrowing of the poor-rich inequities in the use of contraceptive methods between 2007 and 2015, with contraceptive methods increasing from 1.47% to 7.86% among the poor, and from 19.75% to 28.48% among the rich. As a result, rich women were about 13 times (19,75% versus 1,49%) more likely than the urban poor to use contraceptive in 2007; the ratio dropped to 10 times (21.9% versus 2.26%) in 2011, and to 4times (28,48% versus 7,86%) in 2015. During 2007 and 2015, there was a slight improvement in the difference between the poor and the rich in the use of methods of contraceptives. Contraceptive methods increased by nearly seven percentage points among women in the lowest quintile (the poorest) against nine percentage points among women in the last quintile (the richest), resulting in twenty percentage points difference between the poor and the rich in 2015 (7.86% among the poor and 28.48% among the rich). This denotes a persistent disparity between the poor and the rich over last decade.

FIGURE 24 CONTRACEPTIVE USE BY HOUSEHOLD WEALTH 2007-2015[41,42,43]



Inequality in contraceptive use among Mauritanian women according to women's level of education (2007- 2015): are inequities narrowing or widening?

TABLE 13. EDUCATION INEQUALITY IN CONTRACEPTIVE USE[41,42,43]

Education level	2007	2011	2015
No education	4.360	7.116	12.365
Coran School/Madrasa	5.700	6.920	14.071
Primary school	11.513	13.807	21.138
Secondary school	21.876	20.282	25.442

Educated women generally differ in many ways from their less educated counterparts. overall, they are better-off, reside in urban areas, and have better access to health services. Moreover, more education is associated with smaller family size[95]. Table 13 shows that the use of contraceptive methods increases with the level of education. The gap between women who have a level of secondary school or high compared to those with no education is 13 points. Educated women are 2times more likely to use contraception than their less educated counterparts.

[95] Population Reference Bureau, Measure Communication: Is education the best contraceptive? [Internet]. Washington DC: Population Reference Bureau, Measure Communication; 2000 [cited 2018 July 16]; Available from: http://www.prb.org/pdf/IsEducat-Contracept_Eng.pdf

Inequality in contraceptive use among Mauritanian women according to women's age (2007- 2015): are inequities narrowing or widening?

TABLE 14. INEQUALITY IN CONTRACEPTIVE USE ACCORDING TO AGE [41,42,43]

Age range	2007	2011	2015
15-19	5.545	8.748	9.756
20-24	9.842	13.451	17.798
25-29	12.030	16.253	20.616
30-34	10.888	13.009	23.563
35-39	10.923	12.218	17.624
40-44	5.885	6.668	16.809

Table 14 shows that the use of contraceptive methods is less frequent among newly married young women (15-19 years of age) in three surveys (Table 14). Indeed, young newly married women are under pressure to prove that they are fertile and often rejoice at a first birth, just like their spouses and family-in-laws.

The use of contraceptive methods increases with age from 15 to 29 years of age. During this period woman reached the peak of their fertility (between 20 and 24 years). As a woman ages (35-44), her chances of conceiving decline steadily, while the risks of infertility increase significantly.

Inequality in contraceptive use among Mauritanian women according to the number of living children (2011- 2015): are inequities narrowing or widening?

TABLE 15. NUMBER OF LIVING CHILDREN INEQUALITY IN CONTRACEPTIVE US [42,43]

Number of living children	2011	2015
0	2.1	2.5
1	14.3	20.6
2	14.2	21.3
3	16.2	22.5
4+	10.3	18.5

Table 15 shows that contraceptive methods use increases with the number of children living. Indeed, as the number of children living increases, mothers wish to limit or space births. This results in an increase in the rate of contraceptive use.

Inequality in contraceptive use among Mauritanian women according to the ethnicity of women (2015): are inequities narrowing or widening?

FIGURE 25. INEQUALITY IN CONTRACEPTIVE USE ACCORDING TO THE ETHNICITY OF WOMEN [43]

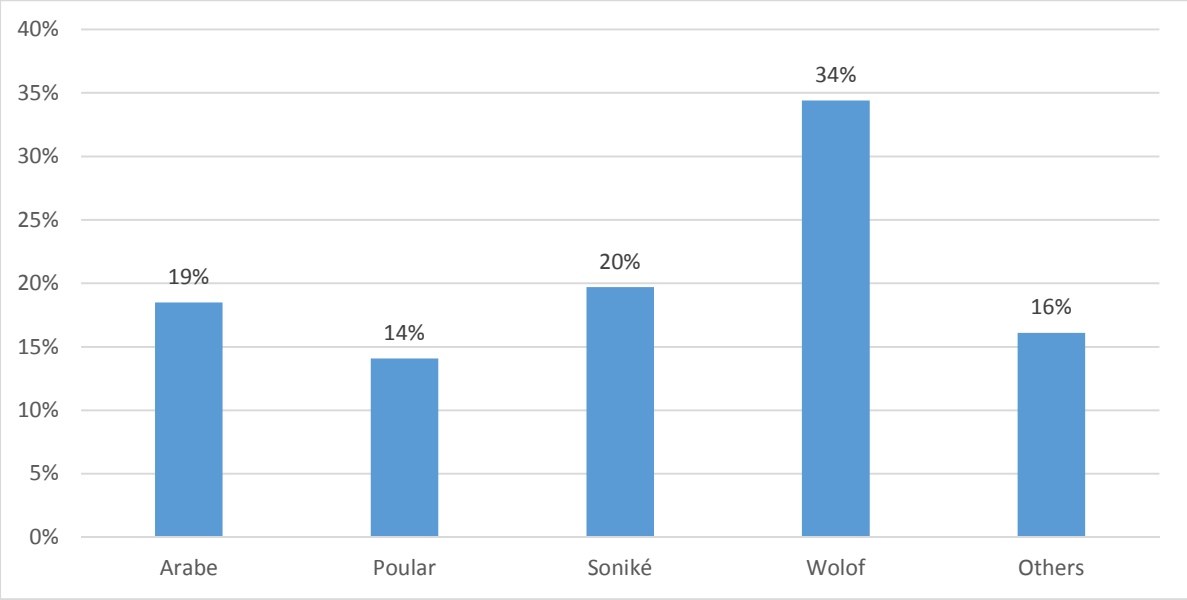
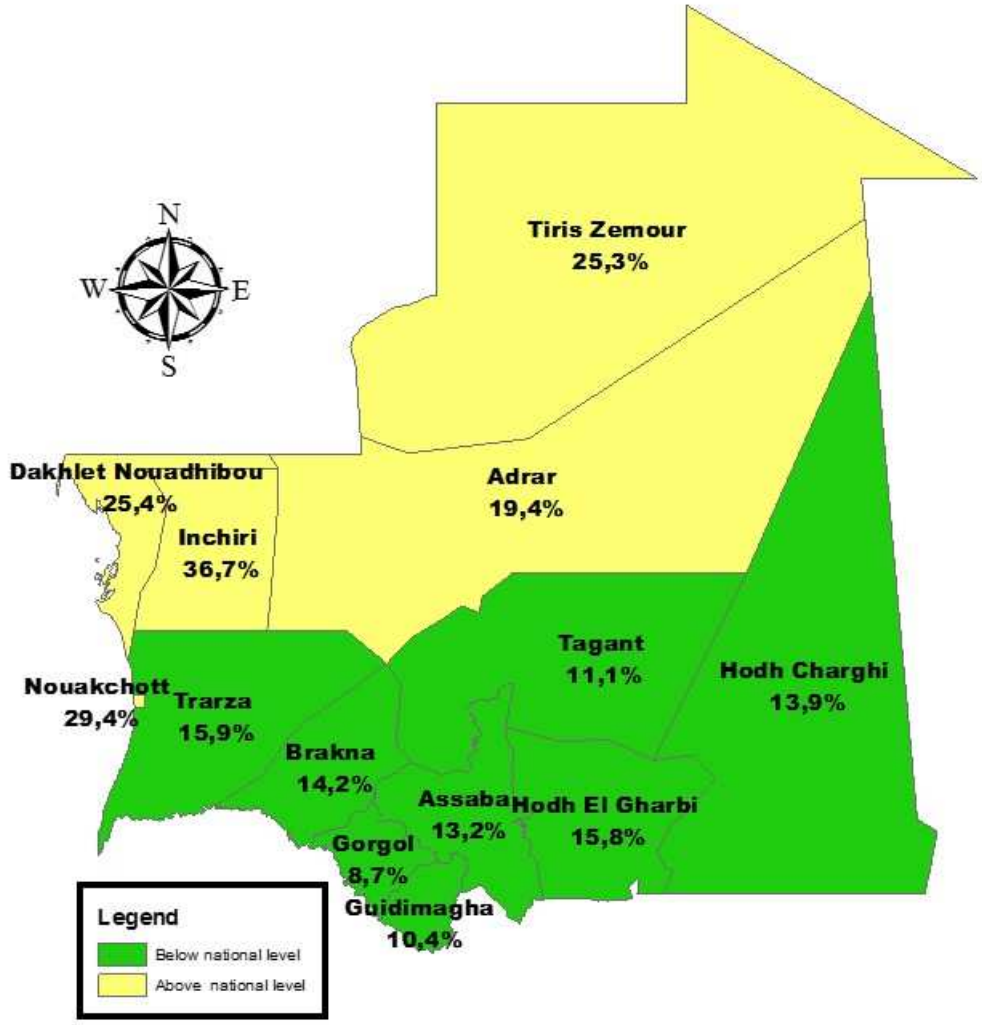


Figure 25 shows an important disparity between different ethnic groups. The highest rate contraceptive methods use was found at Wolof (34%) and the lowest rate was found at Fulani (14%). This represents 20 points of difference between the two groups. Others ethnic groups are between the two groups and their rates contraceptive prevalence vary from 19% to Arabs and 20% to Soninke.

Inequality by regions

As can be seen in Figure 24 a huge disparity is observed in the use of contraceptive methods across wilayas, especially between southern, Nouakchott and northern wilayas.

FIGURE 26 CONTRACEPTIVE USE BY REGION IN 2015 [43]



The green colour indicates prevalence of contraceptive below the national level while the yellow colour indicates a prevalence above the national level. Clearly, all the southern wilayas have recorded prevalence rate below the national level, even though 74 per cent of women of

reproductive age live in these areas[96(p13)]. The reason might be the rurality, poverty, availability and accessibility of health services in these wilayas. The Permanent Living Conditions Survey 2014 shows that rurality rate in these wilayas/regions is too high and ranges between 70% and 82%. The accessibility of health service is also a great concern, while 64% of rural area in the country took more than one hour to reach the nearest health facility. This rate varies in the southern regions from 28% in Brakna to 69% in Assaba[56(p125)]. All wilayas/regions of the south have recorded a poverty rate higher than the national average except for the Hodh Chargui region.

Concentration index and decomposition of concentration index

In the third section we will measure the inequity in contraceptive use through concentration curve, concentration index and decomposition of concentration index. Concentration curve plots the cumulative proportion of contraceptive utilization against the cumulative proportion of the population ranked by socio-economic status, starting with the lowest socio-economic position[97].

concentration index

Concentration index is commonly used as a summary measure for socio-economic-related inequality in health or healthcare utilisation.

Table 16 shows the value of concentration index for the contraceptive use calculated from the MICS 2007, 2011 and 2015.

[96] National Office of Statistics. Synthesis of the Priority Results of the General Census of Population and Housing 2013: Spatial distribution, Structure by sex and age. [Synthèse des Résultats Prioritaires du Recensement Général de la Population et de l'Habitat 2013 : Répartition spatiale, Structure par sexe et par âge]. Nouakchott: National Office of Statistics. 2014

[97] Smith Peter and Glied Sherry. The Oxford Handbook of Health Economics. LONDON: Oxford University Press; 2011.

TABLE 16. EVOLUTION OF CONCENTRATION INDEX FOR THE CONTRACEPTIVE USE BETWEEN 2007 AND 2015[41,42,43]

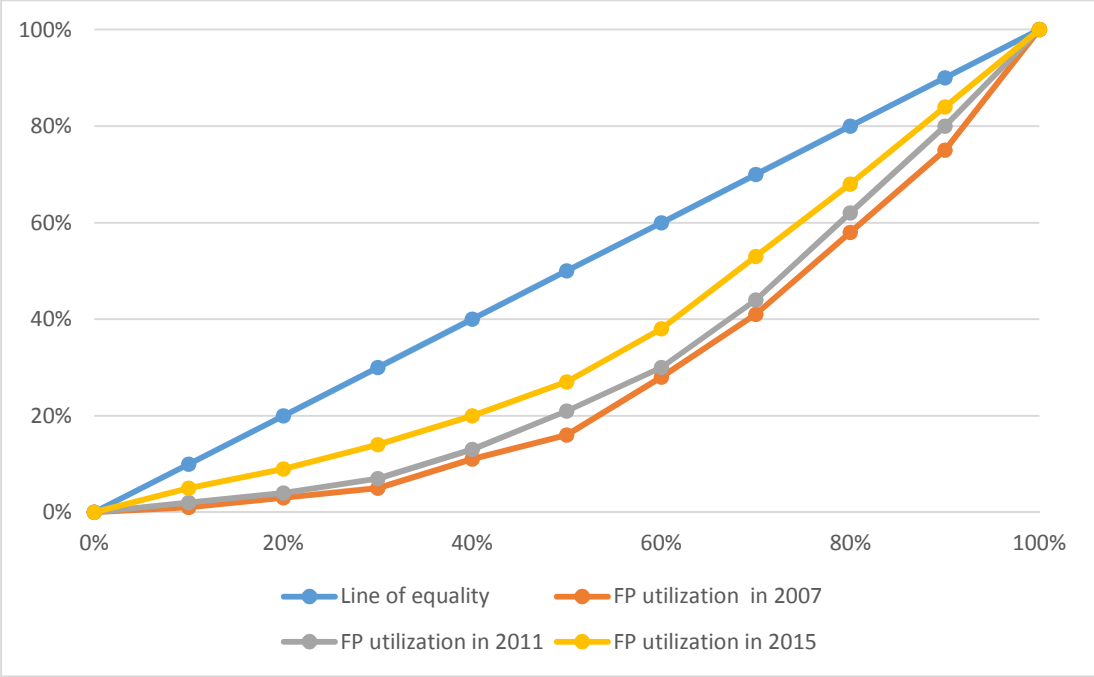
	2007	2011	2015
Standard concentration index (standard error)	0.4135 (0.0200)	0.3683(0.0176)	0.2504(0.0131)
Wagstaff norm. CI (standard error)	0.4554(0.0220)	0.4148(0.0198)	0.30171563(.0158)
Erreygers norm. CI (Standard error)	0.1521(0.0073)	0.1653(0.0079)	0.25042918(0.0089)

As can be seen, Table 16 reveals that the concentration index, Erreygers' corrected concentration index and Wagstaff 's corrected concentration index for contraceptive use has a positive value in the three surveys indicating that this indicator is concentrated among the wealthier women. The time-trend of inequities patterns measured by the concentration index show a narrowing gap in equity in the use of contraceptive methods. The concentration index has decreased from 0.41 in 2007 to 0.27 in 2015.

Concentration curve

For illustration, Concentration Curve for contraceptive use for the three MICS surveys (2007, 2011 and 2015) is shown in Figure 27 below. (see red, grey and orange lines respectively)

FIGURE 27. CONCENTRATION CURVE OF CONTRACEPTIVE USE



The concentration curve represents the cumulative share of contraceptive utilization according to the cumulative share of population, ranked by increasing consumption. The concentration curves in 2007, 2011 and 2015 lie under the 45°-line confirming that the contraceptive use is concentrated among the richest women during this period. However, between 2007 and 2015 the concentration curve moves slightly towards the equality line, indicating an improvement in equity contraceptive use. The Figure 27, shows that poorest 50% of the married women use 16% of contraceptive utilization rate in 2007, this situation was improved in 2015 where the poorest 50% of the population use 27% of contraceptive utilization rate in 2015.

Decomposition of concentration index for contraceptive use

Table 17 shows the elasticity of contraceptive use, the concentration index and the total contribution of each factor to the concentration index of contraceptive use. The factors in relation with contraceptive use are age of women, urban-rural location, region of residence, women's level of education, per capita expenditure, the ethnicity of the woman measured by language spoken and the number of living children.

The positive concentration indices for women's age, women's level of education, region of residence, per capita expenditure and the ethnicity of the woman means that if contraceptive use is correlated with these variables only, it will show a pro-rich distribution.

Inversely, negative concentration indices for ethnicity and number of living children means that if contraceptive use is correlated with these variables only, it will show a pro-poor distribution.

The contribution of each factor to concentration index show uneven trends. First, education's contribution to inequality has seen more than six-fold increase between 2007 and 2015 (0.0046 versus 0.0266) respectively. In the same trends, the contribution of Urban/rural location to inequality increased between 2007 and 2015 by 1.3 (0.0588 versus 0.079) respectively. Secondly, women's age, ethnicity and number of living children contribution in inequality remained almost unchanged between 2007 and 2015. Finally, wealth index, contribution to inequality decreased from 0.3028 in 2007 to 0.1738 in 2015. However, the wealth index, remains the main predictors of contraceptive use.

TABLE 17. DECOMPOSITION OF CONCENTRATION INDEX FOR CONTRACEPTIVE USE

	2007			2011			2015		
	Elasticities	*CI*	Contribution	*Elasticities*	*CI*	Contribution	*Elasticities*	*CI*	Contribution
Age of women	-0.8898	0.0072	-0.0064	-1.0034	0.0047	-0.0048	-0.606	0.008	-0.005
Education	0.2120	0.0218	0.0046	0.3919	0.0976	0.0382	0.277	0.0957	0.0266
Per capita expenditure	1.1352	0.2667	0.3028	0.7715	0.2618	0.2020	0.6613	0.2629	0.1738
Ethnicity	-0.1004	0.06311	-0.0063	0.0344	0.0498	0.0017	-0.1052	0.0578	0-.0060
Number of living children	1.0067	-0.0364	-0.0367	0.8676	-0.0384	-0.0333	0.7571	-0.0357	-0.0270
Urban/rural location	-0.4435	-0.1327	0.0588	-0.7688	-0.1231	0.0946	-0.5636	-0.1407	0.0793
Region/Wilaya	0.34280	0.2418	0.0828	0.3120	0.2190	0.0683	0.06262	0.248	0.0155
"Residual"			-0.00155			-0.0041			-.0052
Total			0.3980			0.3626			0.263

The contribution of all factors to inequality declined slightly from 0.3980 in 2007 to 0.3626 in 2015 but still favours the rich in the sense that contraceptive use is more concentrated among rich married women.

The large elasticity of contraceptive use with respect to wealth index factor is responsible for its large contribution to the contraceptive use concentration index. Several studies in Sub-Saharan African countries have demonstrated a large elasticity of contraceptive use with respect to wealth index factor and its major contribution in concentration index.[98]

The decomposition analysis confirms that the contraceptive use among married women in all three surveys under the study is widely affected by income. The contraceptive use is also affected by place of residence of women and the level of education to an important but lesser extent than income. On one hand, this means that income, women's level of education and place of residence (urban/rural) make contraceptive use more frequent among richer, educated and urban married women. On the other hand, women who have many living children tend to use contraceptive methods while those who do not have children tend to look for children. This variable indicates a pro-poor contribution. In addition, the woman's belonging to an ethnic group conditions her behaviour, since the cultures and habits of the ethnic group influence her. Indeed, ethnicity is a place of production and reproduction of cultural patterns that modulate the behaviours of individuals. Thus, ethnicity is a factor that shapes women's reproductive behaviour and use of contraceptive methods. The ethnicity variable shows a small contribution to the concentration index as is the case with age of women.

Antenatal visits use in Mauritania

Antenatal care can be defined as "the care provided by skilled health-care professionals to pregnant women and adolescent girls, to ensure the best health conditions for both mother and baby during pregnancy".[99(p1)] The antenatal care of include: risk identification; prevention and management of pregnancy-related or concurrent diseases; and health education and health promotion. This indicator gives information on women's use of antenatal care services at the recommended level and can be used to track trends in use. In fact, the antenatal period presents

[98] Ambel Alemayehu et al. Examining changes in maternal and child health inequalities in Ethiopia. International Journal for Equity in Health 2017; 16:152.
[99] World Health Organization. World Health Organization recommendation on antenatal care for a positive pregnancy experience. Geneva: World Health Organization; 2016.

opportunities for reaching pregnant women with interventions that can be fundamental to their health and that of their infants. Many health problems experienced by pregnant women can be prevented, detected, and treated during antenatal care visits directly through detection and treatment of pregnancy-related complications, and indirectly, through the identification of women and girls at increased risk of developing complications during labour and delivery, thus ensuring referral to an proper level of care. World Health Organization recommend at least four antenatal visits during the pregnancy.[100(p17)] The dates recommended for the realization of the 4th ANC s are:

- 1st visit = performed between the 1st and 3rd month of pregnancy
- 2nd visit = performed between the 4th - 6th month of pregnancy
- 3rd visit = performed between the 7th - 8th month of pregnancy
- 4th visit = performed during the 9th month of pregnancy

In Mauritania, women with four or more prenatal care visits increased from 16.4% in 2001 to almost 63% in 2015 which represents an increase of 3.3 per year (**¡Error! No se encuentra el origen de la referencia.**).

TABLE 18 PRENATAL CARE (4 VISITS OR MORE)[40,42,43]

Indicator	2001	2011	2015
At least 4 visits	16.4	48	63

This pre-natal coverage rate varied significantly according household characteristics.

[100] World Health Organization. Indicator compendium Interim Version World Health Statistics. Geneva: World Health Organization; 2010

Inequality in antenatal care visits (4 visits or more)

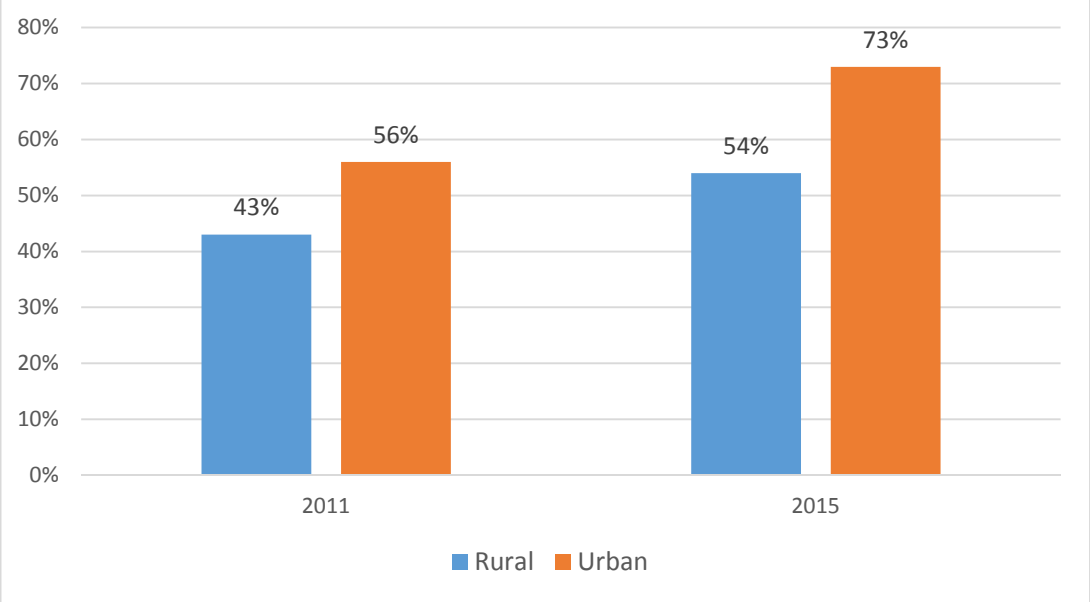
Definition of study variables

To explain differences in in antenatal care visits, key variables of interest were used to measure preventable socioeconomic related health inequalities. Those variables are urban rural location, household income, region of residence, maternal age, educational attainment, language spoken in the home as a proxy for ethnicity, and age of women.

Inequality according to place of residence

Antenatal coverage rate varied significantly according to place of residence, higher in urban than in rural areas (54% vs 43% in rural areas) in 2011 and (73% vs 56% in rural areas) in 2015. Over time, the difference between the two urban-rural location widened and increased from 11 points of difference in 2011 to more than 17 points of difference in 2015. On the other hand, it should be noted that the antenatal care visits have increased most in urban areas (73% in 2015 vs. 54% in 2011), as shown in Figure 28.

FIGURE 28 PRENATAL CARE (4 VISITS OR MORE) ACCORDING TO PLACE OF RESIDENCE[42,43]



Inequality in antenatal care visits by poverty quintile

FIGURE 29 PRENATAL CARE (4 VISITS OR MORE) BY POVERTY QUINTILE[42,43]

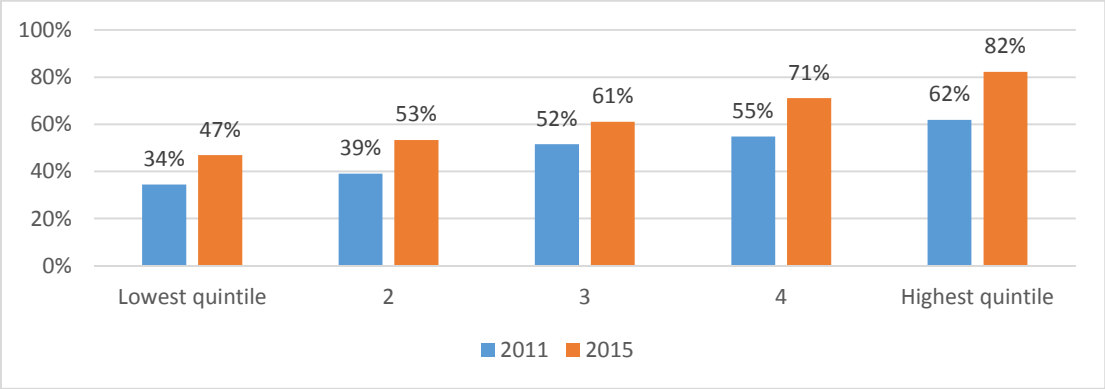


Figure 29 shows the trends and socio-economic inequality in antenatal care visits (4 visits or more) by household wealth. As can be seen, Figure 29 shows a poor-rich inequity in antenatal care visits between 2011 and 2015, with antenatal care visits increasing from 34% to 47% among the poorest quintile, and from 62% to 82% among the richest quintile. The gap between poor and rich has deepened during this period. Antenatal care visits (4 visits or more) increased by nearly thirteen percentage points among women in the lowest quintile (the poorest) against twenty percentage points among women in the last quintile (the richest), resulting in thirty-five percentage points difference between the poor and the rich in 2015 (47% among the poor and 82% among the rich). This denotes a persistent disparity between the poor and the rich over last five years.

Inequality in antenatal care visits according to the level of education of women

TABLE 19 ANTENATAL CARE VISITS (4 VISITS OR MORE) ACCORDING TO THE LEVEL OF EDUCATION OF WOMEN, AGE AND ETHNICITY OF WOMEN[42,43]

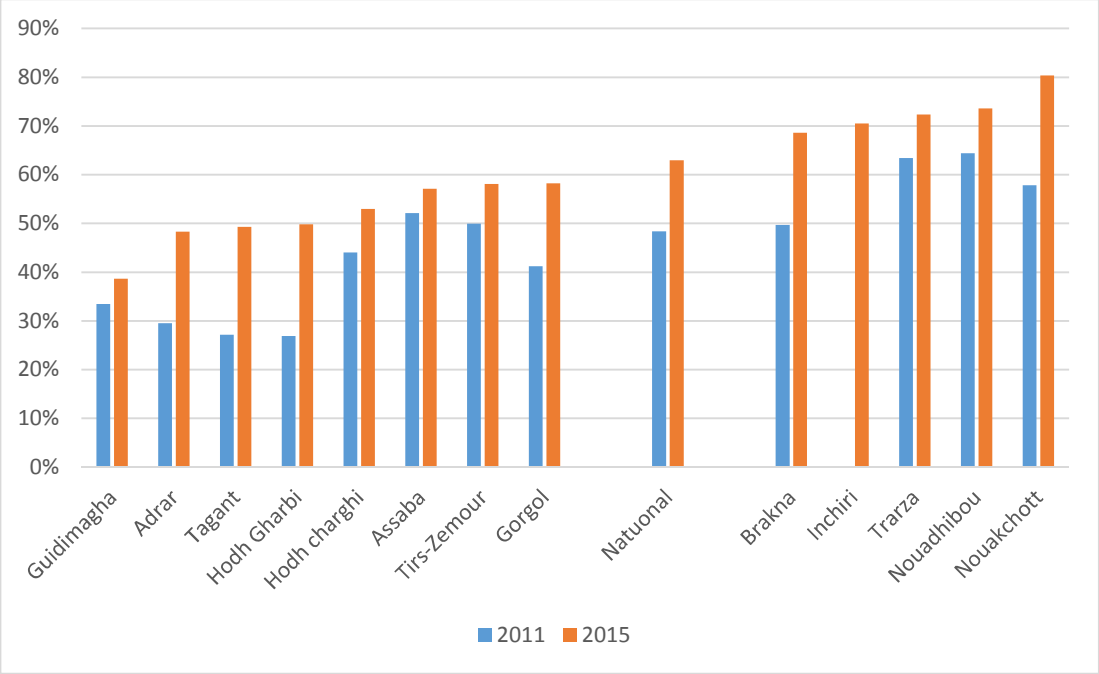
	2011	2015
Education		
No education	38,474	57,339
Coran School/Madrasa	46,911	54,297
Primary school	49,499	63,657
Secondary school	62,203	80,128
Education		
Moins de 20 ans	50%	54.33%
20-34	47.42%	61.37%
35-49	42.12%	56.85%
Ethnicity		
Arabe	47.36%	58.95%
Poular	44.07%	61.85%
Sonike	33.06%	62.35%
Wolof	65.14%	70.17%

Table 19 shows that the antenatal care visits (4 visits or more) increases with the level of education. The difference between women who have a level of secondary school or higher compared to those with no education is around 23 points. Educated women are almost 2 times more likely to use antenatal care visits (4 visits or more) than their less educated counterparts.

Teenage (under the age of 20) tends to use antenatal care less than other age range. However, Wolof shows higher rate of utilization of antenatal care than any others ethnic. This is consistent with other health care service use, education and income level across all survey.

Inequality in antenatal care visits by regions

FIGURE 30 ANTENATAL CARE VISITS (4 VISITS OR MORE) BY REGIONS[42,43]



All wilayas, experienced an increase in antenatal care visits (4 visits or more) between 2011 and 2015. However, there is a huge disparity between wilayas. At least six (6) wilayas showed a rate higher than the national average in 2011 against 5 wilayas in 2015.

The gap between wilayas widened by 6 points between 2011 and 2015. In 2011, the highest rate of antenatal care visits (4 visits or more) was recorded in Nouadhibou with 63% against the lowest rate recorded in Tagant and Hodh Gharbi (27%), which represents 36 points of difference between these wilayas. In 2015, the highest rate was recorded in Nouakchott with 82% against the lowest rate recorded in Guidimagha 39%, which represents 41 points of difference between the two wilayas.

Concentration index and decomposition of concentration index

Concentration index

Table 20 shows the value of concentration index for the contraceptive use calculated form the MICS 2011 and 2015.

TABLE 20 CONCENTRATION INDEX FOR ANTENATAL CARE VISITS (4 VISITS OR MORE) DIRECT STANDARDIZATION

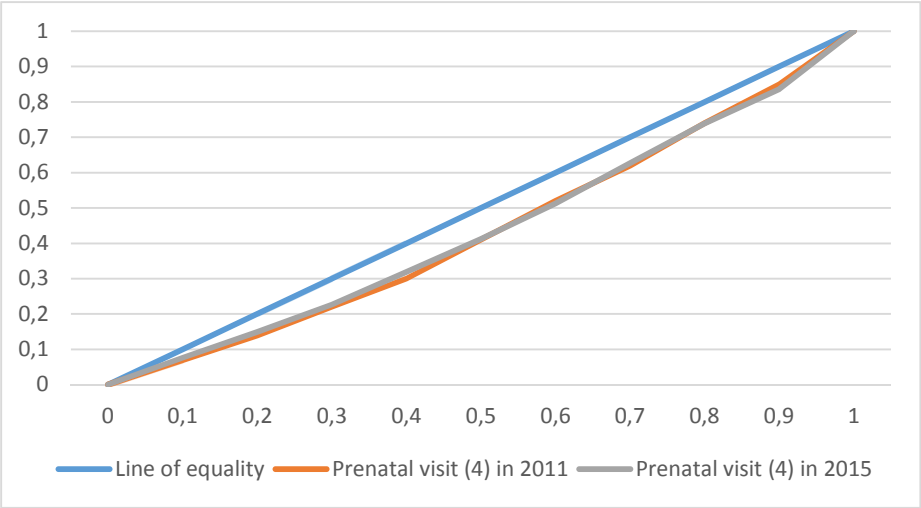
	2011	2015
Standard concentration index(standard error)	0.1219(0.0098)	0.1048(0.0070)
Wagstaff norm. CI (standard error)	0.2280(0.0184)	0.2593(0.0173)
Erreygers norm. CI (Standard error)	0.2269(0.0183)	0.2498(0.0167)

Table 20 shows that the concentration index, Erreygers' corrected concentration index and Wagstaff 's corrected concentration index for antenatal care visits (4 visits or more) has a positive value in 2011 and 2015 MICS surveys indicating that this indicator is concentrated among the wealthier women. The value of the index remains almost unchanged between the two surveys (0.1174 versus 0.1116).

Concentration curve

For illustration, Concentration Curve for antenatal care visits (4 visits or more) is shown Figure 31 below. (see red and grey lines respectively).

FIGURE 31 CONCENTRATION CURVES OF ANTENATAL CARE VISITS (4 VISITS OR MORE).



The concentration curves in 2011 and 2015 lie under the 45°-line confirming that the antenatal care visits (4 visits or more) is concentrated among the richest women during this period. The two lines overlap indicating a stagnation of the concentration index overs-time. In 2011, about 50% of the poorest the women used 41.0 % of antenatal care visits (4 visits or more). This is almost the same in 2015 where about 50% of the poorest the women used 41.2 % of antenatal care visits (4 visits or more).

Decomposition of concentration index for antenatal care visits

The positive concentration indices for women's level of education, , region of residence, per capita expenditure and the ethnicity of the woman means that if antenatal care visits is correlated with these variables only, it will show a pro-rich distribution.

Inversely, negative concentration indices for age of women at birth and urban-rural location means that if antenatal care visits is correlated with these variables only, it will show a pro-poor distribution.

The contribution of each factor to concentration index show uneven trends. First, wealth index contribution to inequality remains almost unchanged between 2011 and 2015 (0.1211 versus 0.1001) respectively. The contribution of Urban/rural location to inequality increased from (-0.0066 versus 0.0003) respectively. Secondly, women's age and education of women contribution to inequality decreased by four and two folders respectively between 2011 and 2015 (0.0007 and 0.0153 versus 0.0002 and 0.0079 respectively).

Overall, antenatal care visits (4 visits or more), in two surveys is widely affected by wealth index. The wealth index factor remains the major contributor to antenatal care visits concentration index followed by the level of education and regionof residence of women. This result was consistent with several studies in Sub-Saharan African countries.[101,102,103]

The contribution of all factors to inequality decreased very slightly from 0.1173 in 2011 to 0.1115 in 2015 but still favours the rich in the sense that antenatal care visits is more concentrated among rich married women.

[101] Tsegay Yalem et al. Determinants of antenatal and delivery care utilization in Tigray region, Ethiopia: a cross-sectional study. International Journal for Equity in Health 2013; 12:30.

[102] Mezmur Markos, Navaneetham Kannan, Letamo Gobopamang and Bariagaber Hadgu. Socioeconomic inequalities in the uptake of maternal healthcare services in Ethiopia. BMC Health Services Research. 2017; 17:367

[103] Obiyan Mary and Kumar Abhishek. Socioeconomic Inequalities in the Use of Maternal Health Care Services in Nigeria: Trends Between 1990 and 2008. Sage open; 2015: 1:11

TABLE 21 DECOMPOSITION OF CONCENTRATION INDEX FOR HEALTH CARE UTILIZATION

	2011			2015		
	Elasticities	*CI*	Contribution	*Elasticities*	*CI*	Contribution
Age of women	-.0625	-.0116	.0007	-.03904	-.00500	.00019
Education	.1597	.09595	.0153	.08337	.09500	.0079
Per capita expenditure	.44969	.2694	0.1211	.36959	.2709	0.1001
Ethnicity	-.04661	.04741	-.0022	-.0086	.05869	-.0005
Urban/rural location	.05652	-.1209	-.0068	.002917	-.13703	-.00039
Region/Wlaia	-.0486	.2199	-.0107	.01764	.2474	.00436
"Residual"			-.00003			-.00004
Total			0.1173			0.1115

Skilled Birth Attendant

Until the 1950s birth delivery at home was common worldwide. But, the concern to ensure a better management of birth delivery, resulted in shifting the place of delivery from home to hospital. This has significantly reduced maternal and infant mortality and morbidity rates in many developed countries, particularly in Europe and North America. However, in developing countries, the frequency of birth delivery at home continue to be high. Indeed, many obstacles continue to prevent pregnant women from accessing health care they need. These obstacles or delays, often referred to as the "three delays": (a) delay in seeking appropriate medical help for an obstetric emergency for reasons of cost, lack of recognition of an emergency, poor education, lack of access to information; (b) delay in reaching an appropriate facility for reasons of distance, infrastructure and transport, and; (c) delay in receiving adequate care when a facility is reached because there are shortages in staff, or because electricity, water or medical supplies are not available.

Most of maternal deaths are entirely preventable and treatable by access to emergency obstetric care, including skilled birth attendance. The presence of a skilled professional reduces the risk of complications and postpartum haemorrhage. The World Health Organization (WHO) defines a skilled attendant as an accredited health professional, such as a (midwife, doctor, or nurse), who has been educated and trained to proficiency in the skills needed to manage normal pregnancies, childbirth and the immediate postnatal period, as well as in the identification, management and referral of complications in women and new-borns.[104]

There are evidences that demonstrated the significant reduction in maternal and perinatal mortality among women who benefit from skilled birth attendants during childbirth.[105] The evidence that skilled birth attendant reduces maternal mortality comes from several clinical, historical, and epidemiological sources that indicate an association. In general, skilled birth attendants are associated with lower rates of maternal mortality.[106] Many argue that increasing

[104] Harvey Steven. Are skilled birth attendants really skilled? A measurement method, some disturbing results and a potential way forward. Bull World Health Organ. 2007 Oct; 85(10):733-820.
[105] Berhan Yifru and Berhan Asres. Skilled Health Personnel Attended Delivery as a Proxy Indicator for Maternal and Perinatal Mortality: A Systematic Review. Jimma: Jimma University, Research & Publications Office (Ethiopia); 2014
[106] Population Reference Bureau, Measure Communication. Percent of deliveries attended by skilled health personnel [Internet]. Washington, DC : Population Reference Bureau, Measure Communication ; 2018 [cited 2018 July 16]; Available from: https://www.measureevaluation.org/prh/rh_indicators/womens-health/sm/percent-of-deliveries-attended-by-skilled-health.

the proportion of deliveries with a skilled attendant is the single most critical intervention for reducing maternal mortality.

Mauritania has had a long history of maternal health initiatives, focused on increasing the percentage of deliveries attended by skilled health personal. The Safe Motherhood Initiative, launched in 1987, aimed to halve maternal mortality by the year 2000. Skilled birth attendants are also one of the key indicators to reflect progress toward the Millennium Development Goal of improving maternal health.

Like Sub-Saharan countries, Mauritania still has low maternal health indicators. Between 2001 and 2015, the proportion of women giving birth at health facility increased from 48% to 69%. Until today, home delivery remains high where one of every three women continue to deliver at home (Table 22).

TABLE 22 SKILLED BIRTH ATTENDANT 2001-2015[40,41,42,43]

	2001	2007	2011	2015
Skilled birth attendant	56.9%	60.88%	65.05%	69.27%
Home birth attendant	51.1 %	NA	31.9 %	30.1%
Place of birth	48.5%	NA	64.5%	69.3%

Overall, access and utilization of maternal health services face numerous challenges some of which are: insufficient skilled health personnel at health facilities, lack of basic and comprehensive emergency obstetrics care in many health facilities particularly in rural areas, poor infrastructure, inadequate budgetary allocations and low literacy levels among mothers as well as high poverty levels.

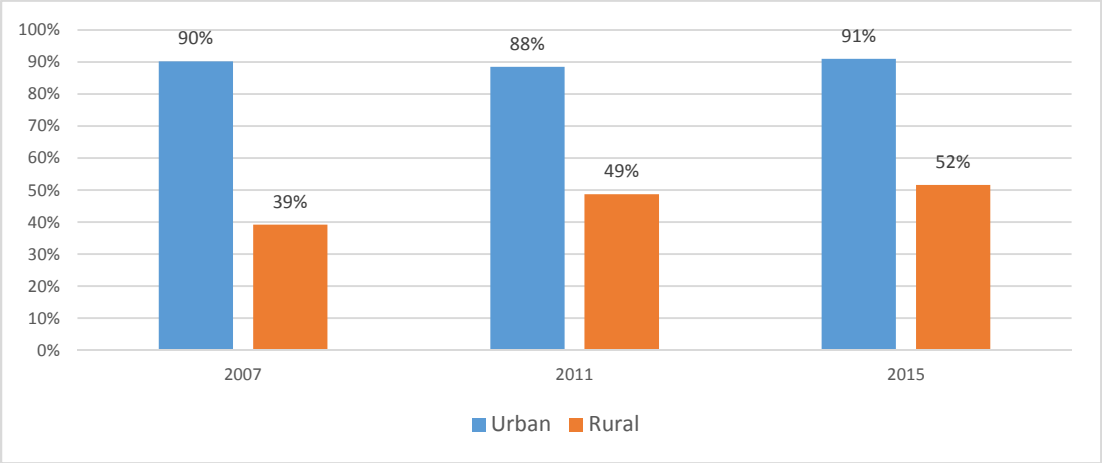
The national rate of skilled birth attendant hides a huge disparity by place of residence, income, education level, ethnics group and between wilayas.

Inequality in skilled birth attendant

Inequality according to place of residence (2007- 2015)

Figure 32 shows an improvement in skilled birth attendant rate in rural areas between 2007 and 2015 (39% versus 52%) respectively. By contrast, the rate of skilled birth attendant in urban area showed stagnation during the same period (90% versus 91%). The effort made by the Ministry of Health to improve the supply of health services in-country appears to be reflected in this improvement. Indeed, the number of health centers almost doubled between 2008 and 2015 (60 versus 106); the number of health posts shows a comparable trend (480 versus 642). Similarly, the number of health personnel increased from 4321[107(p14)] to 6625[74(p14)] during the same period. Furthermore, the creation of four health schools within the country as well as a faculty of medicine in Nouakchott during this period partially fulfilled the deficits in human resources in rural area.

FIGURE 32: INEQUALITY IN SKILLED BIRTH ATTENDANT IN URBAN -RURAL AREA (2007-2015)[41,42 ,43]



However, the gap between urban and rural areas continues to be high. In 2007, only 39% of women who gave birth in rural areas were attended by skilled compared to 90% in urban areas, this represent 52 percent points of difference. In 2015, 52% of women who gave birth in rural

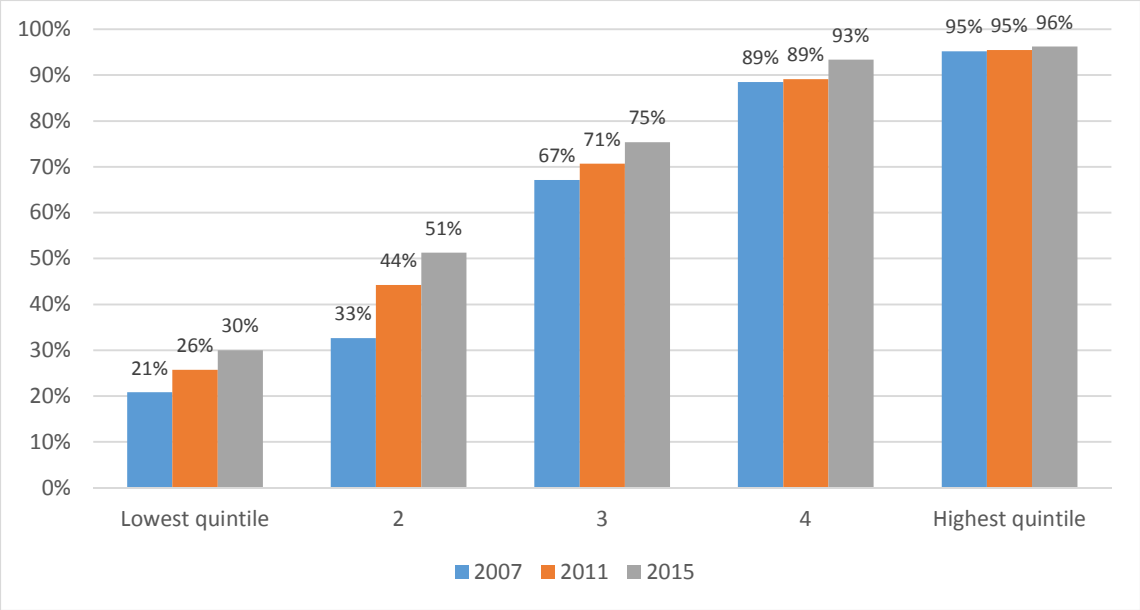
[107] Ministry of Health. Yearbook of health statistics 2008. [Annuaire des statistiques sanitaires 2008]. Nouakchott : Ministry of Health; 2009

areas were attended by skilled compared to 91% in urban areas, this represent 38 points of difference.

Inequality in skilled birth attendant according to socio-economic status (2007-2015)

Figure 33 reveals a large disparity in skilled birth attendant by socio-economic status. The rate of skilled birth is very high for the richest quintile during the period 2007 and 2015 (95% versus 96%) respectively while less than third of women in the poorest quintile (21% versus 30%) respectively benefit from skilled birth.

FIGURE 33: INEQUALITY IN SKILLED BIRTH ATTENDANT BY SOCIO-ECONOMIC STATUS[41,42,43]



As a result, in 2015 rich women were about 3.2 times (96% versus 30%) more likely to benefit from skilled birth attendant than the poor. Skilled birth attendant increased by nearly nine percentage points among women in the lowest quintile (the poorest) against one percentage points among women in the last quintile (the richest), but the difference still huge and represents sixty-six percentages (66%) points between the poor and the rich in 2015 (30% among the poor and 96% among the rich).

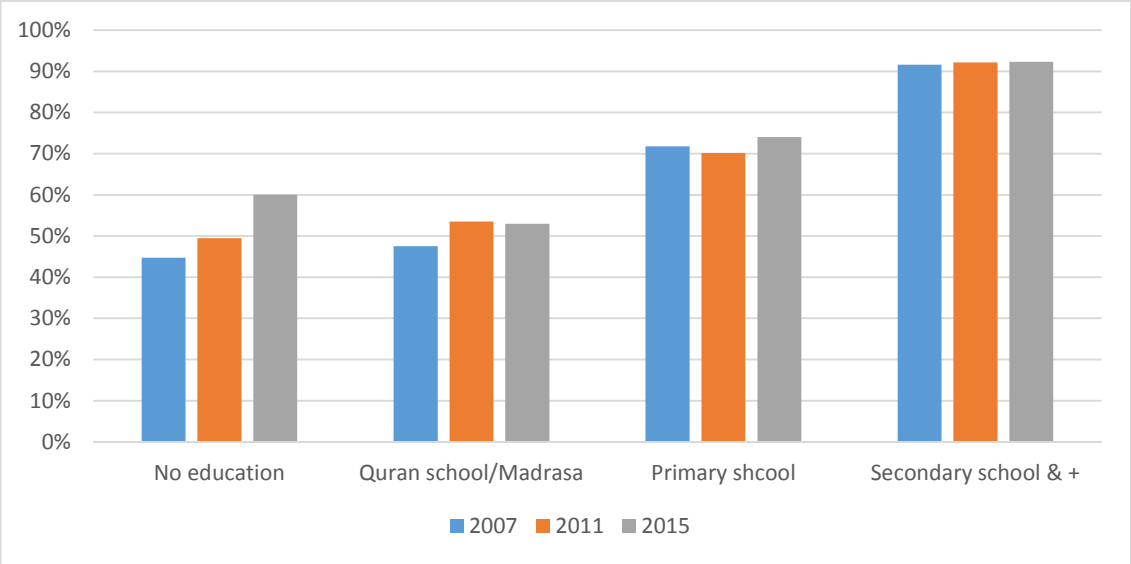
Like other African countries, several strategies for reducing financial barriers have been attempted. These strategies vary from country to country, ranging from the partial subsidy of the price to the total subsidy (free). For example, Burkina Faso has adopted the partial subsidy formula for caesarean delivery at 80%, part of which remains the responsibility of families. In Senegal, Mali and Niger, policies for free caesarean delivery were introduced from 2005 onwards. All costs within the hospital related to caesarean delivery (preoperative assessment, surgical procedure and post care -operative) are paid for by the State. In 1998, the Ministry of Health initiated, with the support of the French Cooperation an obstetrical risk insurance scheme. The "insurance scheme" corresponds to a contribution equivalent to approximately 18 euros, enabling pregnant women to follow their pregnancy and to give birth in the public health facility, whatever the course of the pregnancy, childbirth and possible complications, including caesarean section. This scheme aims to improve women's financial access to maternal health care, which is recognized as essential for reducing morbidity and maternal and infant mortality. It is based on a set of basic gynaecological and obstetric services provided by health facilities in Mauritania. This system is offered at a fixed cost to pregnant women to guarantee them a standard care, which considers all the contingencies that can present pregnancy and childbirth. However, the costs related to the transportation of patients from their homes to the referral hospital are not considered in this scheme. It is therefore unlikely that the poorest women, who live far from health facilities, will be able to benefit from these policies. Moreover, obstetrical Package Impact Study shows that the overall impact of the “insurance scheme” on skilled birth attendant and reproductive health services in general was limited.[108(p47)]

Based on MICS 2015 survey, the principal reason for which women have not delivered at health facilities are: tradition to give birth at home (35.1%), distance from health facilities and constraints associated with transportation (31.1%), cost of care (6%) and others 27.7%.

[108] Dumont Alexandre(IRD), PHILIBERT Aline, RAVIT Marion, DOSSA Inès, BONNET Emmanuel et RIDDE Valéry. Impact of the obstetrical insurance scheme in Mauritania Statistical study based on socio-sanitary data. [Impact du forfait obstétrical en Mauritanie Etude statistique à partir des données socio-sanitaires de 2001 à 2011]. Paris: French Development Agency; 2016

Inequality in skilled birth attendant according to education level (2007- 2015)

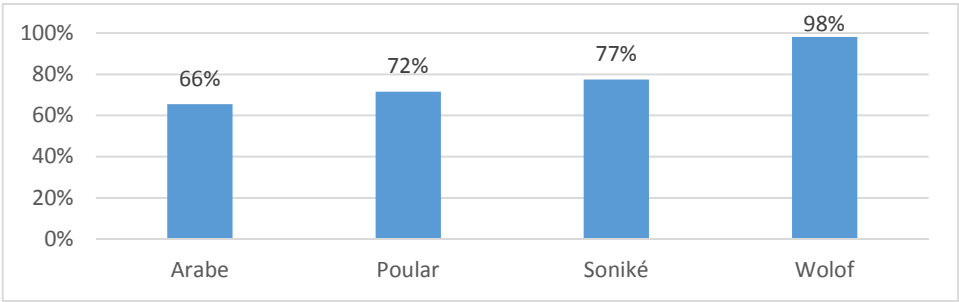
FIGURE 34. SKILLED BIRTH ATTENDANT ACCORDING TO THE LEVEL OF EDUCATION[41,42,43]



The various MICS surveys (Figure 34) show that the skilled birth attendant increases with the education of women. Women who were knowledgeable of risk factors were more likely to seek skilled birth attendant compared to those with no knowledge. In 2015, women with a secondary school level or more was 1.5 times more likely to seek skilled birth attendant.

Inequality in skilled birth attendant according to ethnicity of women (2015)

FIGURE 35. SKILLED BIRTH ATTENDANT ACCORDING TO LANGUAGE SPOKEN BY WOMEN [43]

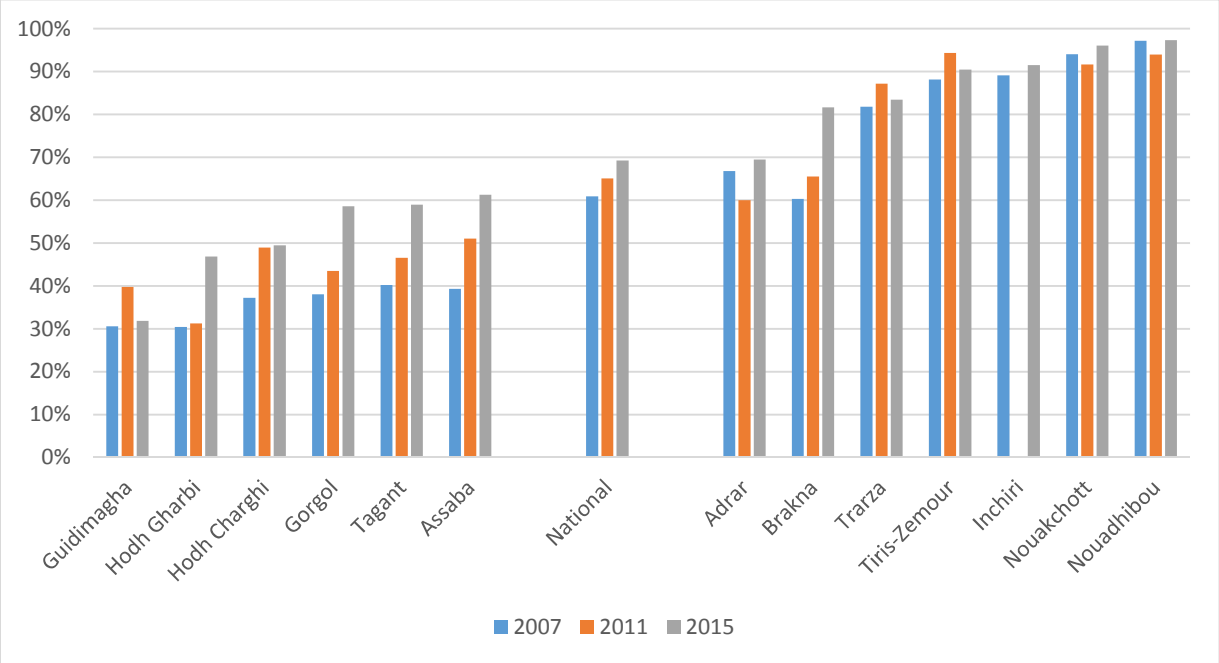


Skilled birth attendant varies according to the ethnicity of the woman measured through the language she speaks (Figure 35). Almost all Wolof woman tend to have a skilled birth attendant (98%) unlike Arab women of whom only two-thirds (66%) have an assisted delivery which

represents a difference of 33 percent points between the two ethnics. Due to cultural differences skilled birth is more frequent among others African ethnic groups than Arabs such as Fulani (72%) and Soniké (77%).

Inequality in skilled birth attendant by Wilaya (2007- 2015)

FIGURE 36. SKILLED BIRTH ATTENDANT BY WILAYA[41,42,43]



As can be seen in Figure 36 all the south-east wilayas have a rate of skilled birth attendant below the national level. Poverty and distance from health facilities and inadequate transportation is a major barrier to the utilization of skilled birth attendant in these wilayas. Moreover, the disparity between the wilayas is striking: in 2015 the lowest rate was recorded at Assaba with 32% and the highest rate was recorded in Nouakchott (92%) which represents a difference of sixty percent (60%) points between the two wilayas. Indeed, health infrastructures are concentrated in big cities such as Nouakchott and Nouadhibou where access to health facilities is relatively easier. All big cities recorded rate of skilled birth attendant exceeds 90%.

Concentration index and the decomposition concentration index

Concentration index for skilled birth attendant between 2007 and 2015

TABLE 23. EVOLUTION OF CONCENTRATION INDEX FOR SKILLED BIRTH ATTENDANT BETWEEN 2007 AND 2015

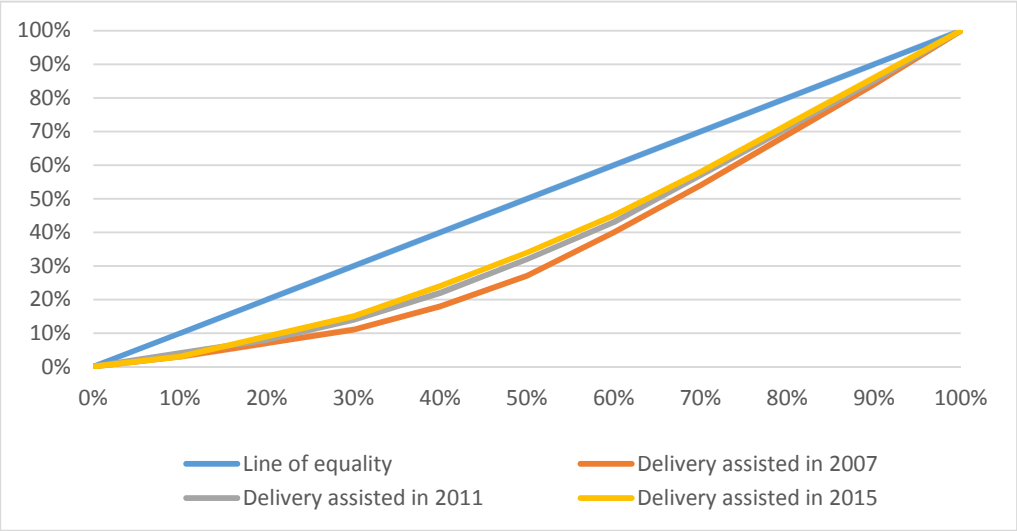
	2007	2011	2015
Standard concentration index (standard error)	0. 27444 (0. 00625)	0. 23262 (0.00604)	0. 20070(0.00518)
Wagstaff norm. CI (standard error)	0. 68447(0.01560)	0.63141(0.01640)	0. 6220(.01606)
Erreygers norm. CI (Standard error)	0.65762(0.01499)	0.58768(0.01526)	0. 543806 (0. 01404)

Table 23 shows that the concentration index, Erreygers' corrected concentration index and Wagstaff 's corrected concentration index for skilled birth attendant has a positive value from 2007 to 2015 denoting that this indicator is concentrated among the wealthier women. The value of the index was 0.2682 in 2007 compared to 0.2016 in 2015. The decrease in the concentration index is very limited compared to the decline observed in family planning concentration index.

The concentration curve of skilled birth attendant between 2007 and 2015

For illustration, Concentration Curve for skilled birth attendant for the three MICS surveys (2007, 2011 and 2015) are shown in Figure 37 below. (see red, grey and orange lines respectively)

FIGURE 37: THE CONCENTRATION CURVE FOR SKILLED BIRTH ATTENDANT BETWEEN 2007 AND 2015



The concentration curves in 2007, 2011 and 2015 lie under the 45°-line confirming that skilled birth attendant is concentrated among the richest women during this period. Between 2007 and 2015, the upward movement of the concentration curve towards the equality line is limited and much less pronounced than in the case of family planning. The concentration curve shows that poorest 50% of benefit only from 27% of skilled birth attendant in 2007, this situation was slightly improved in 2015 where the poorest 50% of the population benefit from 34% of skilled birth attendant in 2015.

The decomposition of the concentration index of skilled birth attendant between 2007 and 2015

shows the elasticity of skilled birth attendant the concentration index, the total contribution and the percentage of each factor to the concentration index of skilled birth attendant. The factors in relation with skilled birth attendant are age of women, urban-rural location, women's level of education, wealth index and the ethnicity of the woman measured by language spoken.

TABLE 24. DECOMPOSITION OF CONCENTRATION INDEX FOR SKILLED BIRTH ATTENDANT

	2007			2011			2015		
	Elasticities	*CI*	Contribution	*Elasticities*	*CI*	Contribution	*Elasticities*	*CI*	Contribution
Age of women	-0.0699	-0.0154	0.0010	-0.0235	-0.0116	0.0002	-0.0160	-0.0050	0.0001
Education	0.0302	0.0173	0.0005	0.1773	0.0959	0.0170	0.0699	0.0950	0.0066
Per capita expenditure	0.7132	0.2829	0.2017	0.6897	0.2694	0.1858	0.7045	0.2709	0.1908
Ethnicity	0.0246	0.0734	0.0018	0.0363	0.0474	0.0017	0.0142	0.0586	0.0008
Urban/rural location	-0.4071	-0.1304	0.0531	-0.1595	-0.1209	0.0193	-0.1406	-0.1370	0.01927
Region/Wilaya	0.0422	0.2508	0.0106	0.0010	0.2199	0.0002	-0.0704	0.2474	-0.0174
"Residual"			0.0003			-0.0022			0.0021
Total			0.2691			0.2221			0.2024

The positive concentration indices for women's level of education, region of residence, per capita expenditure and the ethnicity of the woman means that if skilled birth attendant is correlated with these variables only, it will show a pro-rich distribution.

Inversely, negative concentration indices for age of women and urban-rural location means that if skilled birth attendant is correlated with these variables only, it will show a pro-poor distribution.

The contribution of each factor to concentration index show uneven trends. Women's education contribution to inequality has increase between 2007 and 2015 (0.0005 versus 0.0066 respectively. Women's age has no contribution to inequality. All others factor such as Urban/rural location, wealth index and ethnicity of women contribution to inequality have decreased over times. However, wealth index decreases in the contribution to is much less pronounced than in the case of urban/rural location and ethnicity.

The contribution of all factors to inequality declined from 0.2691 in 2007 to 0.2041in 2015 but still favours the rich in the sense that skilled birth attendant is more concentrated among rich married women.

Overall, skilled birth attendant in all surveys is widely affected by wealth index. The wealth index factor remains the major contributor to skilled birth attendant concentration index (0.6897and 0.1908 respectively in 2007 and in 2015) followed by urban rural location. The significant contribution of wealth index and place of residence was consistent with several studies in Sub-Saharan African countries and others developing countries.[109,110,111]

[109] Collin Simon, Anwar Iqbal and Ronsmans Carine . A decade of inequality in maternity care: antenatal care, professional attendance at delivery, and caesarean section in Bangladesh (1991–2004). International Journal for Equity in Health. 2007; 6:9

[110] Zere Eyob et al. Inequities in utilization of maternal health interventions in Namibia: implications for progress towards MDG 5 targets. International Journal for Equity in Health. 2010; 9:16

[111] De La Torre et al. Equity of access to maternal health interventions in Brazil and Colombia: a retrospective study. International Journal for Equity in Health. 2018 ; 17:43

Postnatal care visits in Mauritania

Like many of the sub-Saharan countries, neonatal mortality in Mauritania remains high. In 2015, Neonatal mortality accounts for 53% of deaths of children under five. Premature neonatal deaths could be prevented through achievement of simple and low-cost interventions including those provided during the postnatal care

Postnatal care (PNC) is the care given to the mother and her new-born immediately and for the first six weeks after birth. The time immediately following childbirth is a period of high risk for mothers and new-borns. Half of all postnatal maternal deaths occur during the first week after the baby is born, and the majority of these occur during the first 24 hours after childbirth.[112(p80)]

Each woman and each baby should receive a total of four postnatal visits:

- The first day (24 hours)
- The third day (48-72 hours)
- Between the 7th and 14th day
- The sixth week

In practice, whether the woman delivers her baby at home or in a health facility, in most of cases postnatal care services are not routinely available in Mauritania. Even if postnatal care

is available, it is not practiced properly, due to lack of knowledge and skill by the health workers, and at times due to lack of essential equipment and supplies.

TABLE 25 POSTNATAL VISITS

	2001	2007	2011	2015
Postnatal care visits	9.30%	Na	34.8%	**55.7%**

[112] Warren Charlotte, Daly Pat, Toure Lalla and Mongi Pyande. Postnatal care. In: Partnership for Maternal, Newborn & Child Health. Opportunities for Africa's Newborns. Geneva: World Health Organization; 2018

Table 25 shows that despite an improvement of the situation in 2015 compared to the year 2001 near half of women half of the women who gave birth did not receive a postnatal care visit for preventive care services and for their new-born. Postnatal care (PNC) programmes are among the weakest of all reproductive and child health programmes in Mauritania.

Inequality in postnatal visits

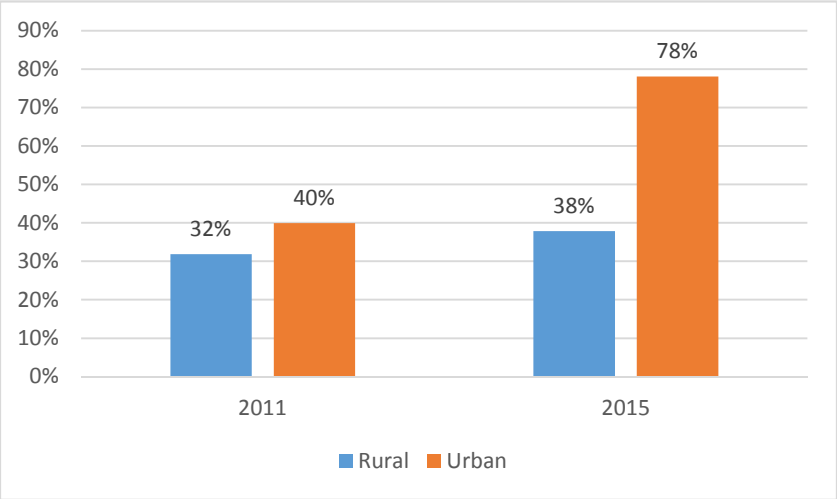
Definition of study variables

To explain differences in postnatal care for the baby, key variables of interest were used to measure preventable socioeconomic related health inequalities. Those variables are urban rural location, household income, region of residence, maternal age at birth, educational attainment, language spoken in the home as a proxy for ethnicity, and age of women.

Inequality in postnatal visits by urban-rural location 2011-2015

Figure 38 shows postnatal visits is almost doubled in the urban area between 2011 and 2015 (40% versus 78%) respectively. By contrast, postnatal visits in rural area showed a little improvement during the same period (32% versus 38%).

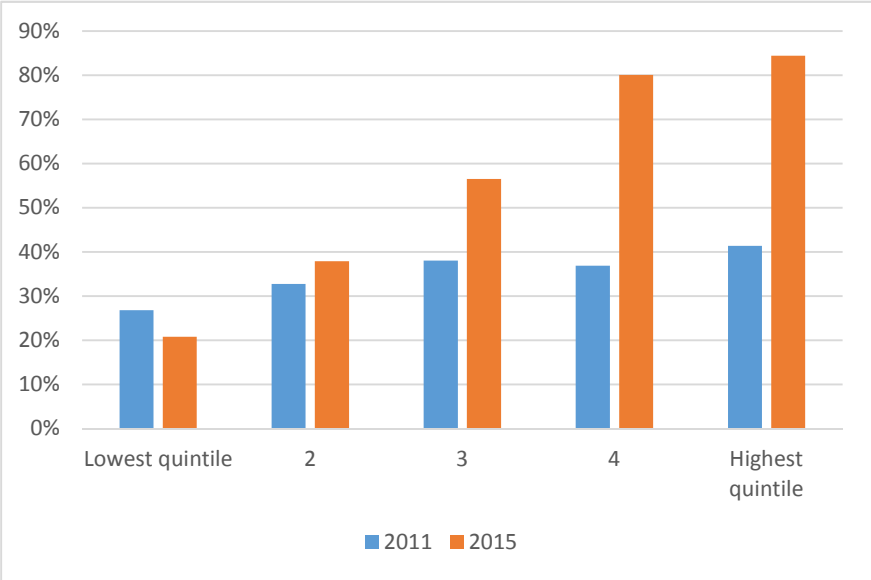
FIGURE 38 POSTNATAL VISITS IN URBAN -RURAL AREA (2011-2015)[42,43]



Inequality in postnatal visits according to economic status (2011- 2015)

Figure 39 shows that the poor do better in 2011 compared to 2015 (27% versus 23%) respectively. The disparity between the poor and the rich is enlarged over time. In 2011, rich women were about 1.5 times (41% versus 27%) more likely than the poor to make a postnatal visit. In 2015, rich women were about 4 times (84% versus 21%) more likely than the poor to make a postnatal visit. The overall increases in postnatal visits at the national level have benefited mostly the rich.

FIGURE 39 POSTNATAL VISITS BY ECONOMIC STATUS[42,43]



Inequality in postnatal visits by education level and language spoken, place of delivery and mother's age at birth 2011-2015

¡Error! No se encuentra el origen de la referencia. shows that postnatal visits increases with the education of women. Women who were knowledgeable of risk factors were more likely to seek postnatal care compared to those with no knowledge. In 2015, women with a secondary school level or more were 2 times more likely to go to postnatal visits. The positive association between women education and postnatal care might be explained by the fact that education is one of the main factor in empowering women decision making regarding healthcare service and health seeking behaviour.

Like in others reproductive health services, the Wolof woman tend to have done postnatal visits (84.2%) more than any other ethnic group. The Soniké comes second with about three-quarters (76.4%) of the women who have done the postnatal visits. Unlike Arab women of whom only half (54.3%) have done the postnatal visits.

TABLE 26 POSTNATAL VISITS BY EDUCATION LEVEL AND LANGUAGE SPOKEN, PLACE OF DELIVERY AND MOTHER'S AGE AT BIRTH 2011-2015 [42,43]

	2011	2015
Education level		
No education	31,5%	50,3%
Coran School/Madrasa	31,0%	40,2%
Primary school	36,9%	61,6%
Secondary school	42,4%	80,4%
Mother's age at birth		
Less than 20	31,9%	54,8%
20-34	35,6%	59,2%
35-49	35,8%	54,4%
Language		
Arab	33,8%	54,3%
Fulan	40,8%	66,2%
Soniké	29,7%	76,3%
Wolof	44,9%	84,2%
Place of delivery		
Home	40,0%	8,1%
Health facility	31,8%	79,3%
Public	31,9%	79,0%
Private	35,6%	91,5%

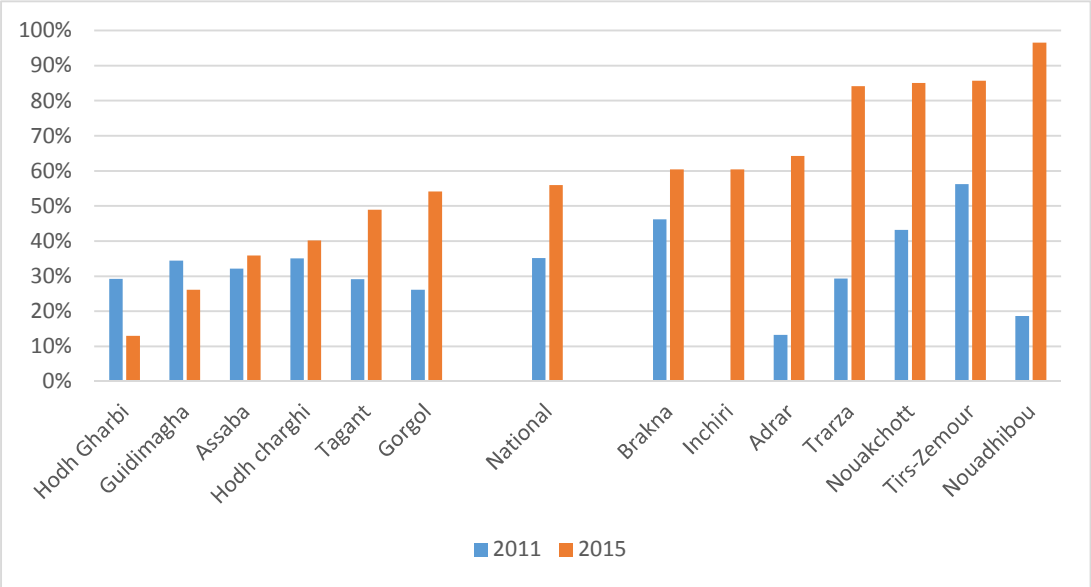
Postnatal care was found to be lower for women of 35-49 of age as well as teenage under 20 year of age. The latter is a major health concern because of its association with higher morbidity and mortality for both the mother and the child.

Women who delivered in health facilities were more likely to utilize postnatal care than those delivered at home. In 2015, Women who delivered in private health facilities and public health facilities were respectively 11 and 10 times more likely to utilize postnatal care than those delivered at home. The table 26 also shows a significant drop in the percentages of women who gave birth at home and who utilised postnatal care between 2011 and 2015, respectively from 40% to 8.1%. This could be partly explained by improving geographical accessibility as well as the increase in childbirth attendance rate between 2011 and 2015 from 65% to 69% as we saw in the previous section. However, the cultural aspects that encourage home birth are still very strong.

Overall, the positive association between place of delivery and postnatal care visits is likely to be attributed to the fact that women who have given birth in a health facility are more likely to be exposed to information about the importance of postnatal care visits. In addition, they may also have better education as well as better economic conditions especially for those who have given birth in a private health facility.

Inequality in postnatal visits according to region/wilaya (2007- 2015)

FIGURE 40 POSTNATAL VISIT BY WILAYA[42,43]



The disparity between the wilayas is flagrant: in 2011 the lowest rate was recorded at Adrar with 13% and the highest rate was recorded in Tiris-Zemour (56%) which represents a difference of forty-three percent (43%) points between the two wilayas. In 2015 the lowest rate was recorded in Hodh Gharbi with 13% and the highest rate was recorded in Nouadhibou (97%) which represents a difference of eighty-four percent (84%) points between the two wilayas. At least two wilayas recorded a postnatal visit rate in 2015 below its level in 2011: Hodh Gharbi (29% versus 13%) and Guidimagha (34% versus 26%) respectively.

Concentration index and decomposition of concentration index

Concentration index

Table 27 shows that the concentration index, Erreygers' corrected concentration index and Wagstaff 's corrected concentration index for postnatal visit has a positive value from 2011 to

2015 denoting that postnatal visit is concentrated among the wealthier women. The value of concentration index and corrected concentration index increased overtime.

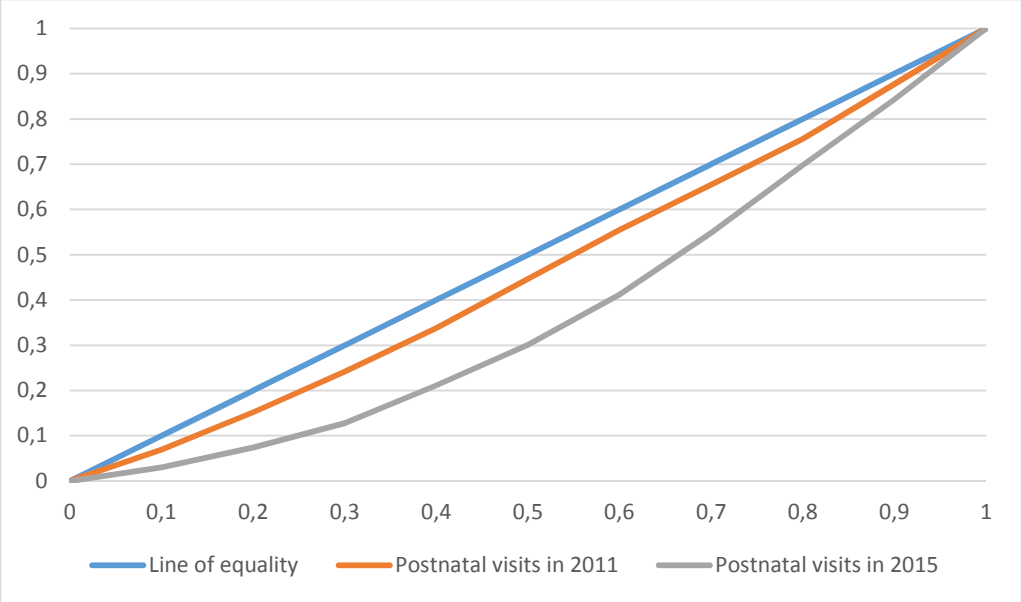
TABLE 27 CONCENTRATION INDEX FOR POSTNATAL VISITS BETWEEN 2011 AND 2015,

	2011	2015
Standard concentration	0.0760 (0.0130)	0.2249 (0.0065)
Wagstaff norm. CI(standard	0.1148 (0.0197)	0.5378 (0.0156)
Erreygers norm. CI(Standard	0.1027 (0.01768322)	0.5234(0.0152)

The concentration curve of postnatal visits between 2011 and 2015

For illustration, Concentration Curve for postnatal visit for the MICS surveys (2011 and 2015) are shown in Figure 41 below. (see red and grey lines respectively).

FIGURE 41 THE CONCENTRATION CURVE FOR POSTNATAL VISIT BETWEEN 2011 AND 2015



The concentration curves in 2011 and 2015 lie under the 45°-line confirming that postnatal visits are concentrated among the richest women during this period. Between 2011 and 2015, the downward movement of the concentration curve far from the equality line confirm the

increase in inequality between poorer and richer women. In 2011, 50% of the poorest population benefitted only from 44.7% of postnatal visits. This situation was worsened in 2015 where the poorest 50% of the poorest population benefitted from 30.1% of postnatal visits in 2015.

The decomposition of the concentration index of postnatal visits between 2011 and 2015

Table 28 shows the elasticity of postnatal visits' concentration index, the total contribution and the percentage of each factor to the concentration index of postnatal visits. The factors in relation with postnatal visits are age of women, urban-rural location, women's level of education, wealth index and the ethnicity of the woman measured by language spoken.

TABLE 28 DECOMPOSITION OF CONCENTRATION INDEX FOR POSTNATAL VISITS, USING LINEAR REGRESSION MODEL

	2011			2015		
	Elasticities	*CI*	Contribution	*Elasticities*	*CI*	Contribution
Age of women at birth	0.1755	-0.0052	-0.0009	-0.0148	-0.0017	0.00002
Education	0.2231	0.0959	0.0214	0.1134	0.0950	0.0107
Per capita expenditure	0.1353	0.2694	0.0364	0.6110	0.2709	0.1655
Ethnicity	0.0916	0.0474	0.0043	0.0685	0.0586	0.0040
Place of delivery	-0.0625	0.1459	-0.0091	0.1480	0.0236	0.0034
Urban/rural location	-0.0695	-0.1209	0.0084	-0.1491	-0.1370	0.0204
Region/Wilaya	0.0625	0.2199	0.0137	0.0822	0.2474	0.0203
"Residual"			0.0042			0.0001
Total			0.0786			0.2248

The positive concentration indices for women's level of education, , region of residence per capita expenditure and the ethnicity of the woman means that if of postnatal visits is correlated with these variables only, it will show a pro-rich distribution.

Inversely, negative concentration indices for age of women and urban-rural location means that if of postnatal visits is correlated with these variables only, it will show a pro-poor distribution.

The contribution of each factor to concentration index show uneven trends. Mother's age at birth, place of delivery and ethnicity show low contribution to inequality of postnatal visits between 2011 and 2015. While wealth index and urban/rural location contribution increased significantly between 2011 and 2015.

The contribution of all factors to inequality increased threefold (0.0780 in 2011 to 0.2240 in 2015) and still in favours the rich in the sense that postnatal visits is more concentrated among richer women.

The residual regression error has decreased from 0.004 in 2011 to 0.00018 in 2015. This reflects the income-related inequality in postnatal care utilisation that is not explained by systematic variation in the regressors by income, which should approach zero for a well-specified model.

Overall, postnatal visits in all surveys is widely affected by wealth index. The wealth index factor remains the major contributor to child fully vaccinated concentration index followed by the place of child household and the level of education. The result was consistent with several studies in Sub-Saharan African countries and others developing countries

Overall, skilled birth attendant in all surveys is widely affected by wealth index (0.269 and 0.1650 in 2011 and 2015, respectively). The wealth index factor remains the major contributor to concentration index followed by the place of residence of women. The significant contribution of wealth index and place of residence agree with results from numerous studies in developing countries.[109,110,111]

Child vaccination in Mauritania

The Expanded Program of Immunization is one of the priority programs of the Ministry of Health in Mauritania. It targets to reduce the morbidity and mortality of vaccine-preventable diseases. The Program started in 1977 in two experimental areas of Trarza: Keur-Macene and Rosso. Then, extended gradually and generalized in 1984. Three vaccination strategies are used to reach populations: fixed strategy, advanced strategy and mobile strategy. The fixed strategy is provided through health facilities. The advanced strategy target population between 5 and 15 Km. It aims to ensure the periodic vaccination of these isolated populations (usually once a month per village). The mobile strategy targets population located more than 15km from the health infrastructures.

The sources of funding for vaccine procurement are mainly from the state and some development partners, particularly GAVI and UNICEF.[113(p14)] Vaccines are stored at the central cold chain, which distributes them to wilayas (region) on quarterly base, at the Moughataa (District) level every two months and monthly in the fixed vaccination units.

In Mauritania, vaccination is not compulsory. The National Immunisation Programme offers vaccination for children from 0-11 months against the following diseases: tuberculosis (BCG), polio, diphtheria, tetanus, pertussis, hepatitis B, infections against Haemophilic Influenza type b and measles (VAR). Recently pneumococcal vaccines (PCV13) and rotavirus diarrhoea (Rota) have been added to the vaccine calendar in 2013 and 2014 respectively.[114(p10)] A fully vaccinated child received all antigens before the age of 12 months. All the vaccinations that are part of the National Immunisation Programme reduce the risk of infection with the diseases and reduce the severity of the disease.

[113] Ministry of Health. Report of the External Review of the Expanded Program on Immunization. [Rapport de la revue externe du Programme Elargi de Vaccination]. Nouakchott: Ministry of Health; 2014

[114] Ministry of Health. *Comprehensive Pluriannual Plan 2016-2020 of the Expanded Program on Immunization. [Plan Pluri Annuel Complet (PPAC) 2016 - 2020 du Programme Elargi de Vaccination]*. Nouakchott: Ministry of Health; 2015

During the last fifteen years few parents in Mauritania (Less than 50%) have their children fully vaccinated. Less than 25% of children, were fully vaccinated before the age of 12 months as recommended by the National Immunisation Programme (Table 29).

TABLE 29. CHILD FULLY VACCINATED (2001-2015)[40,41,42,43]

	2001	2007	2011	2015
Vaccinated before the age of 12 months	24.7%	23%%	11.8%	23.6%
Vaccinated at any time	31.9%	35.8%	38.4%	48.7%

Table 29 shows that the rate of children fully vaccinated before the age of 12 months in 2015 is at little bit lower than its level in 2001 (24.7% versus 23.6%). However, the percentage of children who are fully vaccinated even after the age of 12 months increased by almost 18 percentage points (31% in 2001 versus 48% in 2015). Overall, child vaccinated rate continues to be low. The main reasons for non-vaccination of children are: i) insufficient information of parents regarding the benefits of vaccination (35.3%), ii) lack of motivation of parents (40.4%) and iii) reasons related to the obstacles encountered at the level of the immunization service (24.3%).[113(p69)]

TABLE 30. CHILD VACCINATED BY ANTIGEN 2007-2015 [41,42,43]

	Child vaccinated at any time	
	2001	**2015**
BCG	74,7	89.6
Polio at birth	40.5	86.2
Polio 1	80,1	89.8
Polio 2	65,5	80.3
Polio 3	43,8	64.9
Penta 1	70	87.7
Penta 2	53.5	78.9
Penta 3	39.9	62.7
HepB at birth	na	89.6
Pneumo 1	na	80.3
Pneumo 2	na	70.9
Pneumo 3	na	56.1
rota virus 1	na	68.5
rota virus 2	na	60.4
Measles	62	72.4
Child completely vaccinated	**31,9**	**48.7**

Table 30 shows the percentage of children fully vaccinated by antigen in 2001 and 2015. The BCG, measles and hepatitis B vaccine used in the recommended period in more than 72.4% and 89.6% respectively in 2015. The rate of administration of other antigens ranges from 56.1% for Pneumonia 3 to 64.9% for Polio 3.

Mauritania recorded an outbreak of measles in 2009, 2010 and 2011. Measles epidemic was recorded in 2010, with 620 cases and the number of suspected cases of measles reported has increased in recent years from 48 cases in 2012 to 120 in 2014.[114(p34)]

Vaccination coverage is inadequate and insufficient, whether at the level of fixed posts, outreach vaccinations or mobile and supplementary vaccination activities. The fixe strategy is

available only in 67% of the health facilities. Moreover, implementation of outreach vaccinations is not systematic where only 4% of health facilities carried out these activities and only 2% of health facilities carried out mobile and supplementary vaccination activities.[72(p14)] The outreach and mobile vaccination activities are not practiced for several reasons, including lack of transport, lack of motivation of health personal, lack of fuel, lack of staff, lack of vaccine, lack of equipment (Vaccine carriers or accumulators).[114(p14)] In addition, funding for these activities depends largely on the external resources. The low level of external financing of health sector over the last 9 years explains partly the irregularity and low degree of compliance of these two strategies. This might contribute to the decrease in the immunization rate observed above in rural area as well as in poorest quintile compared to the richest quintile between 2007 and 2015.

The likelihood of a child being fully immunized is often directly linked with the family's distance to the nearest facility offering vaccinations. Those who miss out on routine vaccination activities are often children living in remote locations with the poor quality of the means of transport. In Mauritania, 32.7% of population lives more than 5 km from the nearest health facility. Depending on urban-rural location, about 68.9% of rural population lives more than 5 km from the nearest health facility.[56(p125)] This population with limited access to health care is generally covered by mobile strategy and advanced strategy. The irregularity and low frequency of these strategies negatively impact a significant portion of the population and deprive them of vital health services such as vaccination.

Inequality in Child vaccination

To explain differences in child vaccination indicator, key variables of interest were used to measure preventable socioeconomic related health inequalities. Those variables are urban rural location, household income, region of residence, maternal age at birth, educational attainment, language spoken in the home as a proxy for ethnicity, and age of women.

Inequality according to place of residence

FIGURE 42: CHILD FULLY VACCINATED IN URBAN -RURAL AREA BETWEEN 2007 AND 2015[41,42,43]

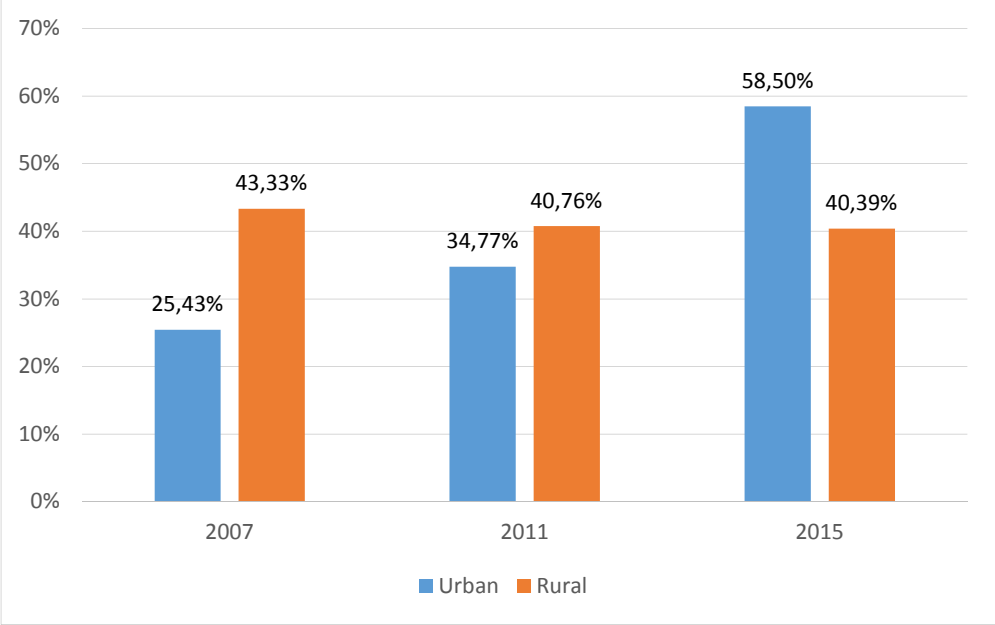


Figure 42 shows that the rate of children completely vaccinated in rural areas has been decreasing in the last few years. The overall increase in the immunization rate is driven mainly by the fixed activities of the health structures. The rate of children completely vaccinated in rural area has fallen from 43% in 2007 to about 40% in 2015. Inversely, the urban rate has multiplied by 2.3 during the same period (25% in 2007 versus 59% in 2015). In 2007 and 2011, the fully vaccinated children were more likely to be in rural areas than in urban areas (43% rural versus 25% urban) and (41% rural versus 35% urban), respectively. This situation has been reversed since 2015 (40% rural versus 59% urban) due to the decline in advanced and

mobile activities that cover rural areas because of under-funding of immunization program and the volatility of its funding due to its dependence on external resources, which accounts for more than 90% of the National Immunisation Programme funding.[73(p47)]

Inequality in fully immunized children according to socio-economic status

Poverty increases a child's exposure to disease and reduces his or her ability to fight it. The poorest children also tend to be the ones who lack access to vaccines or medical treatment.

The Figure 43 below shows the inequality in the child vaccination according to the socio-economic profile.

FIGURE 43:CHILDREN COMPLETELY VACCINATED BY SOCIO-ECONOMIC STATUS BETWEEN 2007 AND 2015[41,42,43]

The Figure 43 shows the national trends of inequality in child fully vaccinated by poverty quintile over last decade. It indicates that the situation of the lowest quintile was better in 2007 compared to the highest quintile (38% lowest quintile versus 24% highest quintile). This situation has been reversed since 2011 (32% lowest quintile versus 44% highest quintile). The gap between the lowest quintile and the highest quintile widened considerably in 2015 (31% lowest quintile versus 71% highest quintile).

Inequality in fully immunized children according to gender, education level and ethnicity between 2007 and 2015

TABLE 31 CHILD VACCINATION BY SEX, EDUCATION LEVEL AND ETHNICITY BETWEEN 2007 AND 2015 [41,42,43]

	2007	2011	2015
Gender			
Male	35%	40%	49%
Female	37%	36%	49%
Education			
No education	35%	33%	48%
Coran School/Madrasa	25%	41%	35%
Primary school	37%	38%	49%
Secondary school	41%	45%	69%
Ethnicity			
Arab	na	na	44.6
Soniké	na	na	51.0
Fulani	na	na	64.7
Wolof	na	na	75.6

Inequality in fully immunized children according to gender, education level and ethnicity between 2007 and 2015

Table 31 shows the percentage of children fully vaccinated do not change in significant ways according to the sex of the child. By 2015 the rate of children fully vaccinated was the same for both sexes (49%).

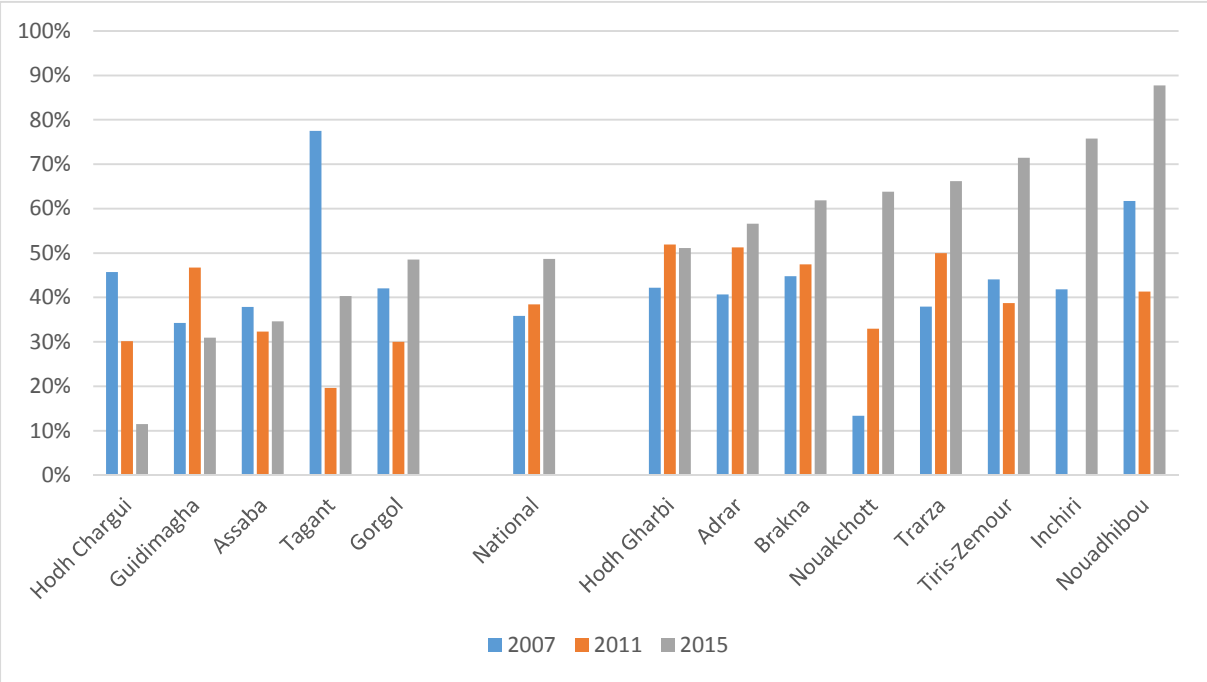
Regarding the mother's level of education, it can be noted that the percentage of children fully vaccinated is higher among the most educated (post-secondary) with 41%, 45% and 69% versus 35%, 33% and 48% for no educated women in 2007, 2011 and 2015 respectively.

According to the language spoken in the household, MICS 2015 survey shows that Wolof and Fulani households are the ones where the percentage of children fully vaccinated is the most important: the percentage of children completely vaccinated represent 75.6% and 64.7%

respectively compared with relatively low rates at the level of households that speak Soniké (51.0%) or Arabic (44.6%).

Geographical disparity in the rate of fully immunized children

FIGURE 44: CHILD VACCINATION BY REGION BETWEEN 2007 AND 2015 [41,42,43]



Except Tagant, Assaba, Guidimagha et Hodh Chargui, all the others wilayas, experienced an increase in the proportion of children fully vaccinated from 2007 to 2015. Nevertheless, there were substantial increases in Nouakchott, Nouadhibou, Inchiri Tiris-Zemour and Trarza, where the percentage of increase ranges from 27 (Trarza) to 50 (Nouakchott) percentage. In 2007 and 2011 only two wilayas had a rate of children completely vaccinated higher than the threshold of 50% compared to 2015 where almost half of the wilaya (7) had a rate higher than 50%.

The gap between wilayas widened by 2 points between 2007 and 2015. In 2007, the number of children fully vaccinated in Tagant was 6 times higher than Nouakchott (78% versus 13%). By 2015, Nouadhibou was 8 times higher than Hodh Chargui (88% versus 11%).

Concentration index and decomposition of concentration index

Concentration index

Table 32 shows that the concentration index for child vaccinated rate has a negative value (-0.0932) in 2007 2007 while Erreygers' corrected concentration index and Wagstaff 's corrected concentration index show a value of concentration index near zero.This denotes that this indicator was more concentrated among the poor.

TABLE 32 EVOLUTION OF CONCENTRATION INDEX FOR CHILDREN FULLY VACCINATED BETWEEN 2007 AND 2015

	2007	2011	2015
Standard concentration index(standard	-0.0433	0.0575 (0.0171)**	0.1558
Wagstaff norm. CI(standard error)	-0.0725(0.0305)	0.0952(0.0284)	0.3188 (0.0243
Erreygers norm. CI(Standard error)	-0.0698(0.0293)	0.0911(0.0271)	0.3148(0.0243)

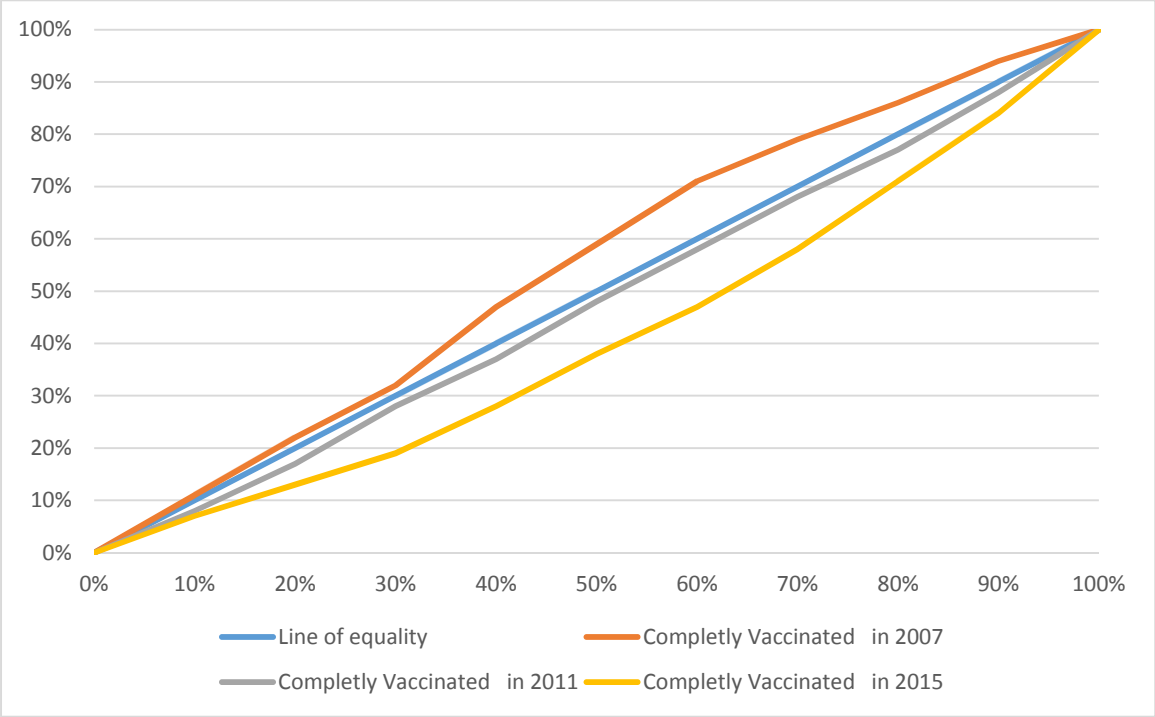
However, the inequity between the poor and the rich has shifted in favour of the rich from 2011 where the rate of concentration index has become positive (0,0391). In 2015, the inequity between the poor and the rich has worsened. The concentration raised from 0.0391 in 2011 to 0.1698 in 2015, in other words the 2011 rate was quadrupled in 2015. The evolution of concentration index from 2007 to 2015 shows that the poor were left behind and not benefited from the increase of child vaccinated rate. In 2011 and in 2015, Erreygers' corrected concentration index and Wagstaff 's corrected concentration index also shows a positive value denoting that this indicator was more concentrated among the better off.

Concentration curve

For illustration, Concentration Curve for child vaccinated for the three MICS surveys (2007, 2011 and 2015) are shown in Figure 45 below. The graph shows that the concentration curve was above the equality line in 2007. The curve went down to be below but close to the equality

line in 2011. In 2015, the curve moved below and away from the equality line (see the yellow curve in the graph).

FIGURE 45. THE CONCENTRATION CURVE FOR THE CHILD FULLY VACCINATED RATE BETWEEN 2007 AND 2015



In 2007, the poorest 50% of the children benefitted from more than 60% of vaccination rate. This situation was worsened in 2015 where the poorest 50% of the population has only from 38 % of child vaccination.

Decomposition of concentration index for child immunization

Table 29 shows the elasticity of child fully vaccinated concentration index, the total contribution and the percentage of each factor to the concentration index of child fully vaccinated. The factors in relation with child fully vaccinated are age and sex of child, urban-rural location, household's level of education, household's wealth index and the ethnicity of the household measured by language spoken.

TABLE 33. DECOMPOSITION OF CONCENTRATION INDEX FOR CHILD VACCINATION

	2007			2011			2015		
	Elasticities	*CI*	Contribution	*Elasticities*	*CI*	Contribution	*Elasticities*	*CI*	Contribution
Age of women at birth	0.0208	-0.1203	-0.0025	0.3624	0.0040	0.0014	0.0138	-0.0028	-0.00003
Child age	-0.2678	0.0204	-0.0054	0.1547	0.0003	0.00004	0.0610	-0.0322	-0.0019
Child sex	0.0061	-0.0058	-0.00003	-0.1541	0.0034	-0.0005	-0.0192	0.0005	-0.00001
Education	0.0857	0.0260	0.0022	0.2214	0.0954	0.0211	0.1113	0.0933	0.0103
Per capita expenditure	0.1665	0.2866	0.0477	0.4661	0.2684	0.1251	0.6001	0.2792	0.1675
Ethnicity	0.0327	0.0578	0.0018	0.0297	0.0544	0.0016	0.0976	0.0542	0.0052
Urban/rural location	0.3641	-0.126	-0.0459	0.7797	-0.1172	-0.0913	0.3871	-0.1331	-0.0515
Region/Wilaya	-0.4066	0.2618	-0.1064	-0.0341	0.2148	-0.0007	0.1279	0.2400	0.0307
“Residual”			0.0024			-0.0062			0.0073
Total			-0.1061			0.0504			0.1678

The column for contribution shows the absolute contribution of each determinant variable to economic inequality. The positive concentration indices for women's level of education, region of residence, per capita expenditure and the ethnicity of the woman means that if child fully vaccinated is correlated with these variables only, it will show a pro-rich distribution.

Inversely, negative concentration indices for age of women at birth and urban-rural location means that if child fully vaccinated is correlated with these variables only, it will show a pro-poor distribution.

The contribution of each factor to concentration index show uneven trends. Gender and age show no contribution to inequality child fully vaccinated while mother's education contribution and ethnicity to inequality remain unchanged between 2007 and 2011.

Wealth index contribution have doubled between 2007 and 2015 (0.0470 versus 0.1670) respectively. likewise, region of residance contribution increased from significantly from -0,1060 in 2007 to 0,0307in 2015.

The contribution of all factors to inequality increased from -0,106 in 2007 to 0,167 in 2015 and became in favours the rich in the sense that child fully vaccinated became more concentrated among child form richer household.

Overall, child fully vaccinated in all surveys is widely affected by wealth index. The wealth index factor remains the major contributor to child fully vaccinated concentration index followed by the region of residence and the level of education. The result was consistent with several studies in Sub-Saharan African countries and others developing countries.[115,116,117]

[115] Ataguba John, Ojo Kenneth and Ichoku Hyacinth. Explaining socio-economic inequalities in immunization coverage in Nigeria. Health Policy and Planning. 2016 ; 1212 : 1224

[116] Lauridsen Jørgen and Pradhan Jalandhar. Socio-economic inequality of immunization coverage in India, Health Economics Review. 2011; 1:11

[117] Raza et al. Differential achievements in childhood immunization across geographical regions of Pakistan: analysis of wealth-related inequality. International Journal for Equity in Health. 2018; 17:122

Discussions

The results of the analyses of wealth-related inequalities are mixed. Over time, there has been a narrowing of wealth-based inequalities in contraceptive use and skilled birth attendant. This is encouraging. It suggests that further expansion in their coverage could substantially reduce the remaining inequalities. Progresses outside the health sector such as improvements to infrastructure, the significant drop in the poverty rate and the improvement of the economic situation where the country left the group of low-income countries to be in the group of low-income middle-income countries are likely to have a role in the trends observed. However, more focus should be given to a) the availability of care services at the level health center and health post; b) equitable human resources distribution mainly outside large cities such as Nouakchott and Nouadhibou which attract more than have of health workers; c) retention of health personnel and introducing a specific accompanying measures for health personal to improve working conditions in rural areas.

We also find that for the poor and rural, health outcomes have worsened, and the gap in child immunization and postnatal care visits between rich and poor households has widened. For the immunization, the results showed, the lack and irregularity of outreach and mobile immunization activities might contribute to this results. Especially since outreach and mobile immunization make it possible to reach the population living in a radius beyond 5 km which are not covered by the health facilities activities of vaccination. Several reasons, might explain the lack or insufficiency of outreach and mobile immunization including lack of transport, lack of motivation of health personal, lack of fuel, lack of staff, lack of vaccine, lack of equipment. In addition, funding for these activities depends largely on the external resources, particularly UNICEF which has seen its contribution to the operational costs of immunization activities decreases in recent years.

We also find that inequality patterns showed little progress in antenatal.

Overall, socio-economic and health system factors contributors largely to this inequality. For improving maternal and child health care utilization these factors need to be addressed with

special emphasis on woman's education. Mother's education was recurrently counted as a one of the determinant of maternal and child health indicators in many countries.[118,119,120,101]

These studies indicated that education increases mothers' knowledge of multiple dimensions of health and that this awareness of health transforms into a greater use of maternal and child health services, which is not surprising in the context of Mauritania where only half (52%) of young women in Mauritania can read and write and that the level of literacy varies considerably by region.[40]

[118] GREENAWAY EMILY, LEON JUAN and BAKER DAVID. Understanding the association between maternal education and use of health services in Ghana: exploring the role of health knowledge. Journal of Biosocial Science. 2012 ; 733 :747.

[119] Nkonki Lungiswa et al. Explaining household socio-economic related child health inequalities using multiple methods in three diverse settings in South Africa. International Journal for Equity in Health. 2011; 10:13

[120] Goland et al. Inequity in maternal health care utilization in Vietnam. International Journal for Equity in Health. 2012 ; 11:24

Chapter IV: Equity in health care financing system

Health financing policy is crucial to health system as it defines: i) Revenue collection for health, and consequently identifies how much money are available to health sector; ii) Remove financial barriers to access and reduce financial risks of illness; iii) The use of available resources.

> Health financing system goal is to enable "All people to have access to services and do not suffer financial hardship paying for them. This goal was defined as universal coverage, sometimes called universal health coverage" (WHO 2010).

The fundamental objective of health financing strategy is to enable population to access quality health services based on need at a reasonable cost in relation to their ability to pay. The way in which a country finances its health care services can have a major bearing on the access to health services for the poor.

Health financing impacts on access to quality health care services in two ways[121(p5)]:

- on the supply side by ensuring that basic care services are adequately financed and delivered;
- on the demand side by reducing financial barriers to access and by making sure that funds are raised, and services delivered in ways which are affordable to all.

In Mauritania, there is no health financing policy document. However, the third poverty reduction strategy paper propose to "develop human resources and access to essential infrastructure". Within this axis, the social and health sector occupied a prominent place, with three objectives[122(p45)]:

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[121] Pearson Mark. Allocating public resources for health: developing pro-poor approaches London: The DFID Health Systems Resource Center (HSRC); 2002

[122] WATSON Carol et Ould Brahim Ould Jiddou FAH. Study on Social Protection in Mauritania: Situation Analysis and Operational Recommendations. [Etude sur la protection sociale en Mauritanie: Analyse de la situation et Recommandations Opérationnelles]. Nouakchott: United Nations International Children's Emergency Fund (UNICEF) – Mauritanie; 2010

1. Improve indicators of mortality and morbidity especially for the poorest,
2. Mitigate the impact of health spending on the poorest households, and
3. Strengthen the participation of populations in the management of their health.

Nevertheless, a significant proportion of Mauritanian populations still not have access to basic healthcare services. This is due to various socio- economic reasons. Patient's inability to pay is one of them. With the increasing incidence of non-communicable disease and privatization, cost of healthcare has been increasing and becoming unaffordable to many. More often people end up making catastrophic expenditure and face impoverishment. To finance their healthcare expenditure, they often adopt inefficient mechanism like borrowing, selling of valuable assets and even curtailing children's education. World Health Organization (WHO) defines catastrophic expenditure as out-of-pocket spending for health care that exceeds a certain proportion of a household's income with the consequence that households suffer the burden of disease. Impoverishment due to health payments measure whether families fall into poverty through out-of-pocket spending.

In Mauritania, resources of funding for health sector include public funds, international donor contribution and private contribution including Out-of-pocket payment of household for health services.

This chapter is organized into three sections. In the first section, we will highlight government health fudging with the following focus:

- Benefit incidence of government public health spending
- Efficiency and effectiveness of resource allocation and use of health services of an acceptable quality.

In the second section we will examine the contribution of external health funding and in the third section we will discuss the private health expenditure from equity perspective with focus on the Mauritanian Healthcare Financing system, where the role of public, private and social health insurance will be discussed

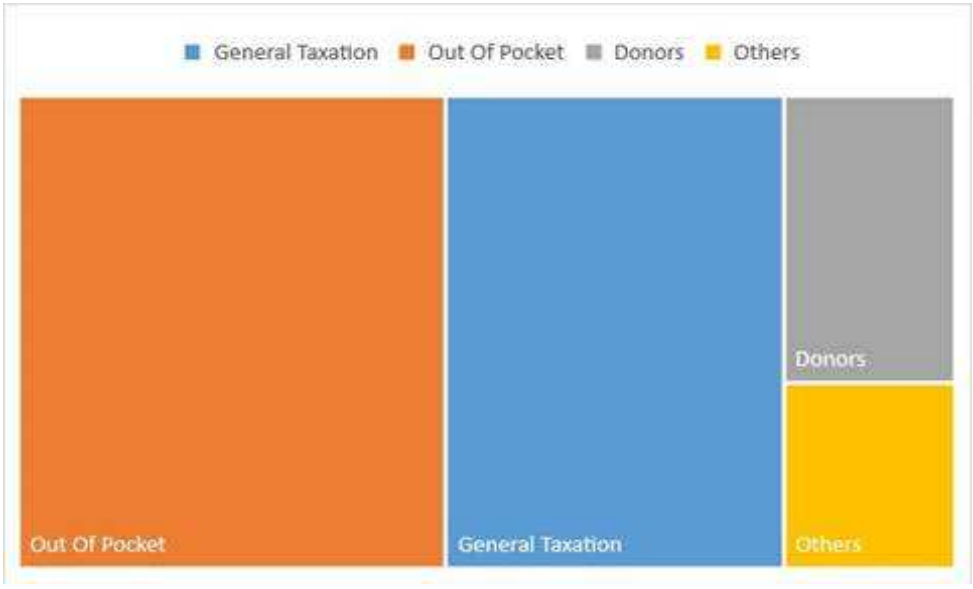
- Incidence of Catastrophic Health Payments
- Impoverishment linked to out-of-pocket health payments

Public Health Expenditures

Public health spending account for around 36% of total health spending, on average, over the period 2011-2015. Government budget allocations come from general tax revenues, both direct and indirect taxes. Therefore, the amount of the allocation depends on the extent to which revenues can be collected. Also, it depends on the importance given to health in comparison with other sectors. Like most African countries, in Mauritania, proper collection of revenues through public taxes is difficult because the large size of the informal sector, which employs around 86.5%[123(p45)] of the labour force and tax collection mechanisms are inefficient.

The main challenge for governments in financing health care systems is raising revenues efficiently and equitably to provide individuals with essential health services and financial protection against unpredictable catastrophic financial losses caused by ill health. While government revenue- raising capacity is weak, Mauritania rely more on revenues from user fees.

FIGURE 46. HEALTH FUNDING RESOURCES

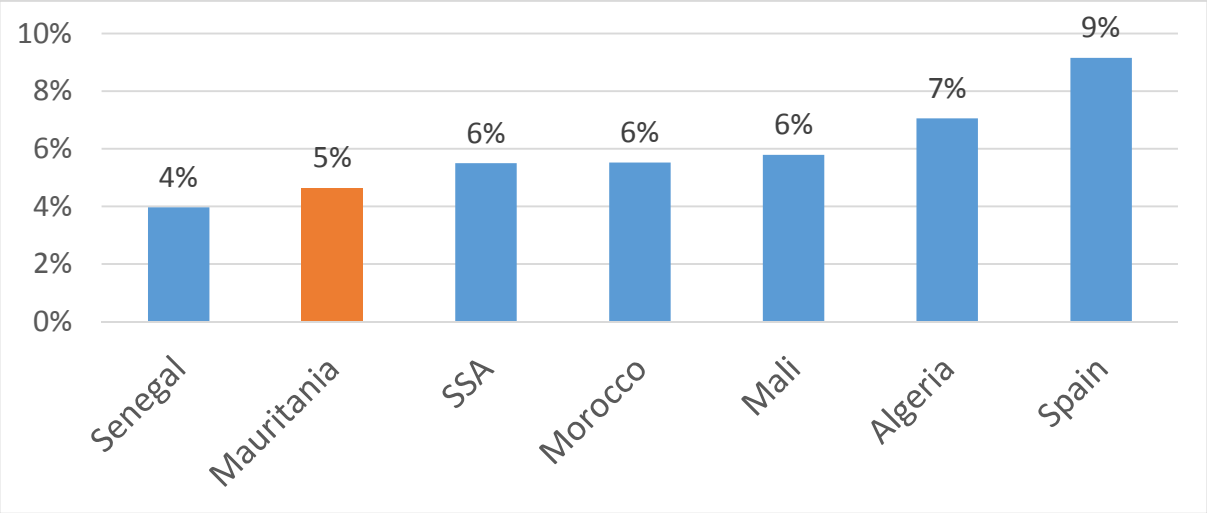


[123] National Office of Statistics. *Employment and informal sector situation in Mauritania in 2012. [Situation de l'emploi et du secteur informel en Mauritanie en 2012].* Nouakchott: National Office of Statistics; 2014

Generally, public health spending includes ministry of health, other ministries and public entities as well as national health insurance expenditure for health. Globally, the government health expenditures (GHE) in Mauritania is very low.

In 2015, Mauritania's total health expenditures were about 5 percent of GDP. In comparison with other countries, Mauritania has a somewhat low share of its GDP to health.

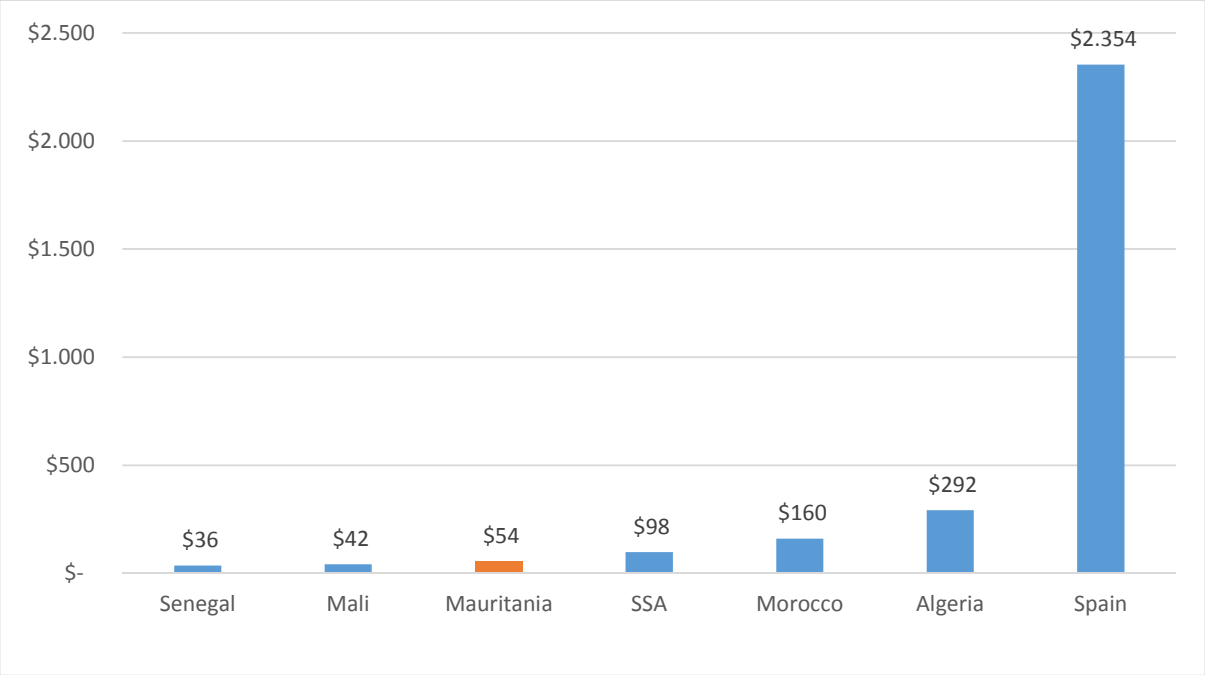
FIGURE 47 HEATH EXPENDITURE (CHE) AS % GROSS DOMESTIC PRODUCT (GDP)[124]



In per capita terms, Mauritania's total health expenditures were about US$ 54 per capita. This is far below the SSA average (US$ 98) and far from developing countries like Spain in this example.

[124] World Health Organization. Global health expenditure database [Internet]. Geneva: World Health Organization; 2017; [cited 2017 Dec 8]. Available from: http://apps.who.int/nha/database

FIGURE 48 HEALTH EXPENDITURE (CHE) PER CAPITA IN US$[124]



Lower government health expenditures may negatively impact the performance of health indicators and reflected somehow the poor health outcomes. In this regard, countries with a comparably low level of income countries like Mali and Senegal show better health outcomes than Mauritania in term of Maternal Health Mortality.

Public funds may play a relatively modest role in terms of overall health expenditure. However, they are usually the only funds over which Ministry of Health have direct control and are also often the key source of financing for the services used by the poor.

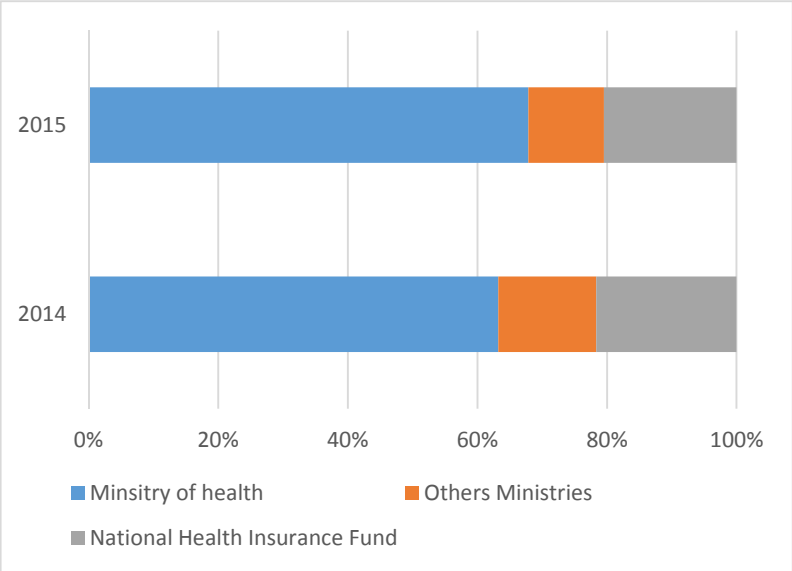
Based on World Health Organization's definition of Government Health Expenditure, which includes government expenditures channelled outside the ministry of health, the share of health in general government expenditures is around 6%. This is far from the Abuja target of 15 percent and NHDP target of 8%, and lower than neighbour courtier's (See Table 34).

TABLE 34 GOVERNMENT HEALTH EXPENDITURE AS % OF GENERAL GOVERNMENT EXPENDITURES, 2014[124,125]

	GHE (% of gen. gov. exp.)
Mauritania	6%
Mali	7%
Senegal	8%
Algeria	10%
Morocco	6%*

Ministry of Health expenditures are the main source of government health spending. They account for more than two-thirds of the government's health expenditure in 2015 (See Figure 49). The National Health Insurance Fund, which covers only 15% of the population, accounts for about 20% of the government's health care spending in 2015.

FIGURE 49. DISTRIBUTION OF GOVERNMENT HEALTH EXPENDITURE[126]



General government allocations and trends are analysed below with bulk of analysis based on Ministry of Health expenditures, which account for 66 percent of public health expenditure and

[125] World Bank. Global health expenditure database [Internet]. Washington DC: World Bank; 2017; [cited 2017 Dec 8]. Available from: https://data.worldbank.org/indicator/NE.CON.GOVT.ZS

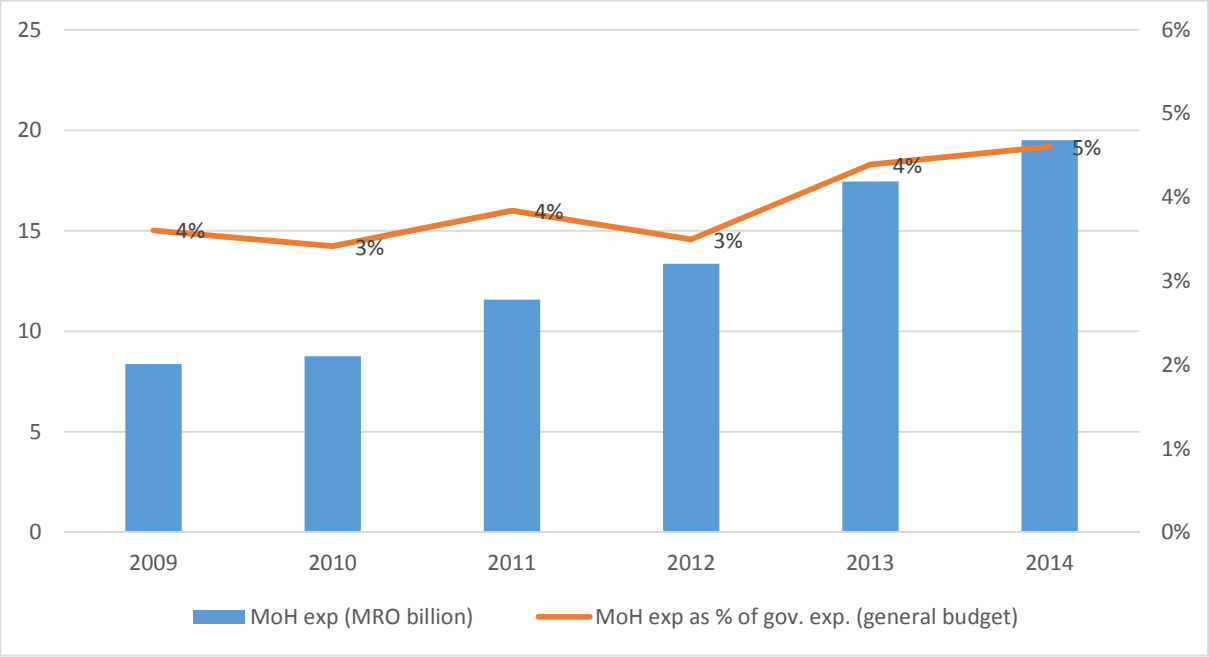
[126] Ministry of Health. Health Accounts Report Years: 2012-2015. [Rapport des comptes de la santé Années : 2012- 2015]. Nouakchott: Ministry of Health; 2017

for which data are available.

Ministry of health Expenditure: Size and Trends

MoH spending increased more than twofold in nominal terms over 2009–14, from roughly MRO 8.4 Billion to MRO 19.5 Billion, but remained relatively stable as a share of the general budget, around 4% (Figure 50).

FIGURE 50 GOVERNMENT BUDGET ALLOCATED TO HEALTH IN BILLION OUGUIYAS (2009-2014)[127]



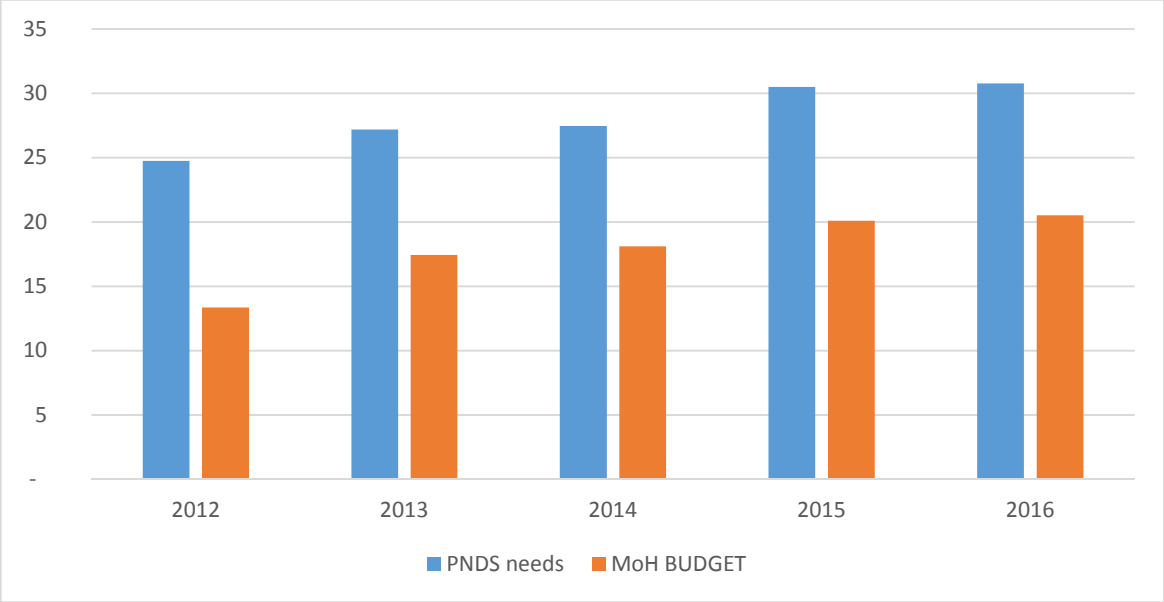
This increase was driven by high economic growth recorded between 2009 and 2014 which has led to a jump in the general government budget from roughly 241 billion ouguiyas to 430 billion ouguiyas.

Overall, Ministry of health spending remains insufficient in relation to the financial needs expressed in the National Health Development Plan 2012-2020. The latter estimated that, at least 27 billion ouguiyas should be devoted to health annually in order reach the sectorial targets between 2012 and 2015 (See Figure 51). This amount represents on average 8% of total

[127] World Bank. BOOST Public Expenditure Database[Internet]. Washington DC: World Bank; 2017; [cited 2017 Dec 8]. Available from: http://boost.worldbank.org

government budget.

FIGURE 51: ACTUAL HEALTH EXPENDITURES IN RELATION TO REQUIRED NHDP FINANCING, MRO BILLIONS (2012–2016) [64,127,128,129]



Efficiency and the health system building blocks

The concept of efficiency in health systems allows the production of best possible health and financial protection outcomes from the available resources.

Despite the relatively high spending on health services in Mauritania, health outcomes particularly for maternal and child health services indicating a weak relationship between public expenditure and health outcomes. Inadequate health service delivery is reflected by the poor results in the attainment of the maternal and infant mortality indicator target.

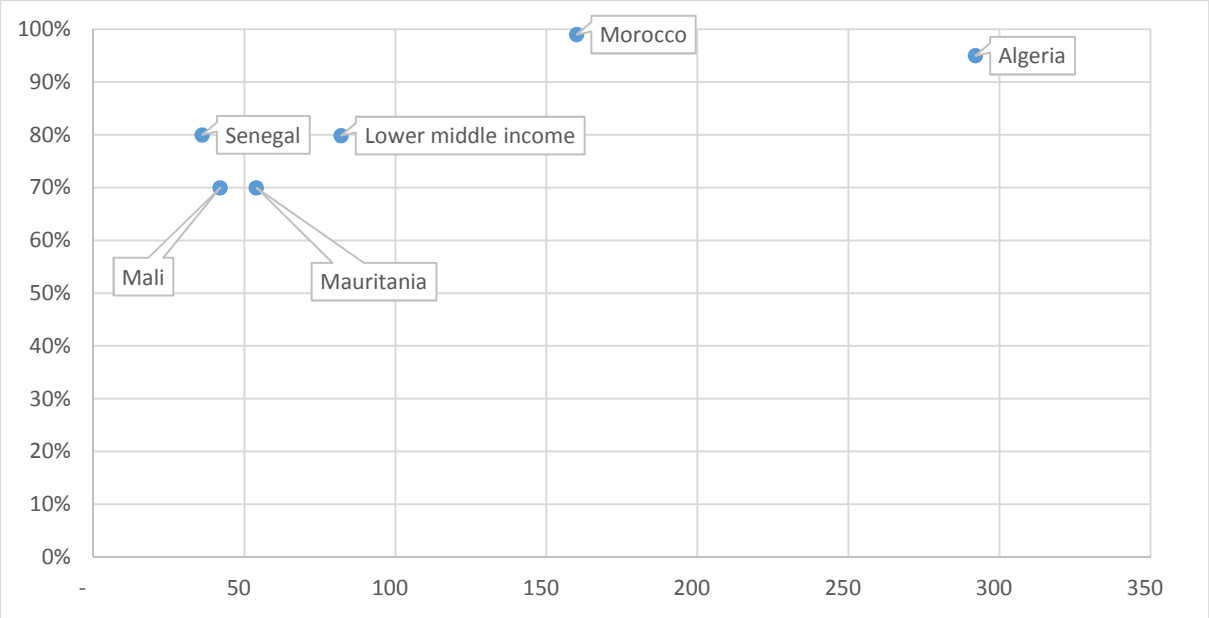
Taking measles (% of children aged 12 to 23 months) as an example for a sub-regional comparison in immunization, we can observe that the health system in Mauritania is slightly more efficient than the average of the lower middle-income countries. However, Mauritania is

[128] Ministry of Economy and Finance. Initial budget law, state budget for the year 2015. [Loi de finances initiale, budget de l'Etat pour l'année 2015]. Nouakchott: Ministry of Economy and Finance ; 2015

[129] Ministry of Economy and Finance. Initial budget law, state budget for the year 2016. [Loi de finances initiale, budget de l'Etat pour l'année 2016]. Nouakchott : Ministry of Economy and Finance ; 2016

worse than similar neighbouring countries such as Mali and Senegal, as the graph below illustrate.

FIGURE 52 PERCENTAGE OF IMMUNIZATION, MEASLES (% OF CHILDREN AGES 12-23 MONTHS) BY LEVEL OF TOTAL HEALTH SPENDING, MAURITANIA, SENEGAL, MALI, ALGERIA, MOROCCO AND MIDDLE-INCOME COUNTRIES IN 2015(EACH POINT REPRESENTS A COUNTRY) [81]



The 2010 World Health Report 'Health System Financing: The Path to Universal Coverage'[130] identifies sources of inefficiency and links these to the health system six building blocks namely (i) service delivery, (ii) health workforce, (iii) health information systems, (iv) access to essential medicines, (v) financing, and (vi) leadership/governance.

Medical products and vaccines

Like sub-Sahara African countries, the price of medicines in Mauritania is higher than necessary particularly regarding the international reference price. In addition, the use of substandard and counterfeit medicines is important, as more than 30% of nationally sold drugs are not registered. This situation provides an opportunity to improve the efficiency of drug management.

[130] World Health Organization. The world health report 2010 - Health System Financing: The Path to Universal Coverage. Geneva: World Health Organization; 2010

Sustainable financing

Health financing include the functions of revenue collection, pooling and service purchasing. The revenue collection analysis shows that the Ministry of Health (36%) and households (48%) are the largest public and private contributors, spending more than 84% of total health spending. Risk pooling mechanisms shows that health insurance coverage rates remain extremely low where less than 15 % of the population is estimated to be covered.[131(p18)] Purchasing of health services in the public sector is mostly a passive exercise. The legal framework and the institution of public financial management and the practices for the preparation of the government budget do not support the implementation of results-based management. Overall, budget preparation is characterized by a budgeting method based on budgeting by input item and not by Program / Result. This affects Ministry of health's ability to allocate resources to be in line with sector priorities

Health workforce

The leading causes of inefficiency pertaining to health workers are the insufficient and inadequate distribution of health workers by region and lack of motivation. No region meets the minimum threshold of 23 doctors, nurses and midwives per 10 000 inhabitants that was established by WHO as necessary to deliver essential maternal and child health services. The bulk of human resources for health are concentrated mainly in Nouakchott and the big city. Rural areas are most affected by shortage of human resources of health for health. Difficult working conditions in rural areas and socio-cultural factors greatly complicate the assignment or redeployment in these areas without specific accompanying measures.

Health service delivery

Funding high-cost, low-effectiveness interventions when low-cost, high-effectiveness interventions are uncovered is one of the leading causes of inefficiency are associated with health service delivery. The benefit incidence analysis study carried out as part of this research (see page 161 an on) shows that 84% of public subsidies go to the level of hospitals at the expense of the primary level. Primary care is crucial and refers to first-contact, continuous,

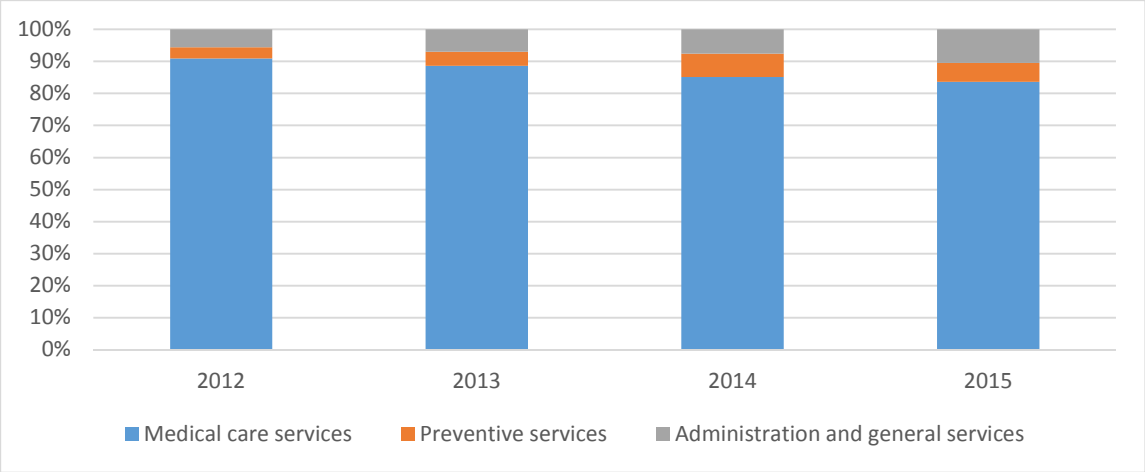
[131] Ministry of Health. National Policy of Health by 2030. [Politique Nationale de Sante à l'horizon 2030]. Nouakchott: Ministry of Health; 2017

comprehensive, and coordinated care provided to populations. Evidence suggests that effective primary care is associated with improved access to health care services, reduced hospitalizations, cost effectiveness and enhanced equity.

The quality of care is also crucial to improving health outcomes and effectiveness, especially as two-third of health care provided is managed by the government.

A classification of national health account appropriations by a very broadly programmatic classification of health care services shows that expenditures on curative services absorbed 84–91 percent of all MoH expenditures (including hospital and ambulatory care, and some national programs including HIV, malaria and tuberculosis). In contrast, Government spending on health prevention is very low and represented on average about 5 percent of Government spending in 2012 and 2015.

FIGURE 53 HEALTH APPROPRIATIONS BY TYPE OF CARE (%)[126,132]



Along with prevention, primary care is generally recommended because they are cost-effective and include high positive externalities. The only trace of efforts toward low-cost, high-impact activities comes from prevention expenditures and from vertical health programs.

Also, the Result Based Financing program in Mauritania, which has just started, may improve the delivery of services through a service compensation mechanism combined with a balanced list to assess the quality of the centers. On the demand side, the program reduces the financial

[132] Ministry of Health. Health Accounts Report Years: 2011, 2012 and 2013. [Rapport des comptes de la santé Années : 2011, 2012 et 2013]. Nouakchott: Ministry of Health; 2015

burden of user fees for child health (MCH) services in pilot regions. Evidence from others African countries suggests that shifting the focus from inputs to outcomes can help achieve high-impact, quality health services for poor women and children.

Leadership and governance

Poor governance contributes, in part, in poor health outcomes. Informal, under-the-table payments to public health care providers lowers the quality of services offered, denies populations equal access to healthcare, and increases the cost of services provided. Informal payments may include, obtain drugs, receive better or more care, avoiding the queue, or as an insurance to receive better care in future. These practices, is manifestation of poor governance.

Like in other countries in the region, procurement in Mauritania is considered to be one of the most corrupt areas of government. Procurement corruption raises the price paid for goods or services, thus increasing inefficiency; goods and services may not even be needed, may not be delivered, or may be of sub-standard quality.

Absenteeism also is indicative of governance failure. Given the already limited numbers and inequitable distribution of health care workers, particularly in-country, absenteeism triggers interruption of health care service delivery, undermines health service quality and economic losses. It is indicative of governance failure.

Information systems

The National Health Information System, "*as such, do not figure directly in the WHO's 'ten leading causes of inefficiencies'. However, quality data are required to assess health system efficiency levels, and to improve decision- making with a view to achieving greater efficiency*".[133(p10)]

In Mauritania, the functioning of the National Health Information System (NHIS) remains a real problem. The NHIS does not make timely information available to policymakers and

[133] Collaborative Africa Budget Reform Initiative. Improving technical efficiency in health spending in Africa Keynote paper [Internet]. Collaborative Africa Budget Reform Initiative ; 2018 [cited 2018 Septembre 16]; Available from: https://www.cabri-sbo.org/uploads/files/Documents/events_2016_cabri_health_dialogue_efficiency_in_health_spending_engl.pdf

data are not being used in decision-making. Indeed, several evaluations of the NHIS have shown a low completeness and promptness of the data, their low quality and their discrepancy, mainly due to the parallelism of the data management systems which leads to a multitude of reports.

Moreover, the NHIS is not used for resource allocation. Indeed, the allocation of resources is limited by the budgetary framework (of the Ministry of Finance) which is done afterwards. In addition, NHIS information is insufficiently used for service delivery management, periodic monitoring and evaluation as well as advocacy for behavioral change with respect to risk factors, due to significant gaps in some data sources. Indeed, (i) the individual files (health records, operational files, clinical files, etc.) are insufficiently used; (ii) records of health services (registers, monthly or quarterly reports, etc.) are experiencing problems of promptness and completeness.

Disparity of government health spending by level of care and by region

The Ministry of health budgetary data do not always have the needed information. Usually, projected budgetary data are available in very detailed terms, but these are often very different from actual amounts spent. The latter data are difficult to have, mainly due to a lack of monitoring of the budget cycle. Using a series of "manipulations", it was possible to construct the necessary tables for our analysis.[19 (p6)]

The following table summarizes government health expenditures in Mauritanian ouguiyas in 2014 based on the Ministry of health data.

TABLE 35 GOVERNMENT HEALTH EXPENDITURE BY TYPE OF HEALTH FACILITIES AND BY REGION (IN OUGUIYAS MRO)[134]

Region	Population	Health post	Health Center	hospital	Total
Hodh Chargui	428354	54 600 000	22 400 000	98 560 718	175 560 718
Hodh Gharbi	292877	34 200 000	16 800 000	86 060 478	137 060 478
Assaba	325209	46 200 000	14 000 000	144 251 938	204 451 938
Gorgol	341562	31 800 000	14 000 000	113 417 407	159 217 407
Brakna	309659	47 400 000	19 600 000	98 199 500	165 199 500
Trarza	264954	52 200 000	19 600 000	123 110 000	194 910 000
Adrar	58335	13 200 000	11 200 000	82 822 275	107 222 275
Nouadhibou	128197	6 600 000	5 600 000	180 656 762	192 856 762
Tagant	77976	18 000 000	8 400 000	90 429 410	116 829 410
Guidimagha	274162	22 200 000	14 000 000	83 188 000	119 388 000
Tiris-Zemour	52279	1 800 000	8 400 000	37 000 000	47 200 000
Inchiri	19360	3 000 000	2 800 000	35 000 000	40 800 000
Nouakchott	1004487	13 200 000	50 400 000	1 974 346 860	2 037 946 860
Total		**344 400 000**	**207 200 000**	**3 147 043 347**	**3 698 643 347**

Table 35 shows the government expenditure on health by type of health facility and by region.

The Figure 54 and Figure 55 examine with more detail the mains ideas shown in the table.

[134] Ministry of Health. Budget implementation status 2014. [Etat d'execution du budget 2014]. Directorate of Planning Cooperation and Sanitary Information. Nouakchott: Ministry of Health ; 2018

FIGURE 54 MINISTRY OF HEALTH EXPENDITURES BY REGION AND PER CAPITA.[134]

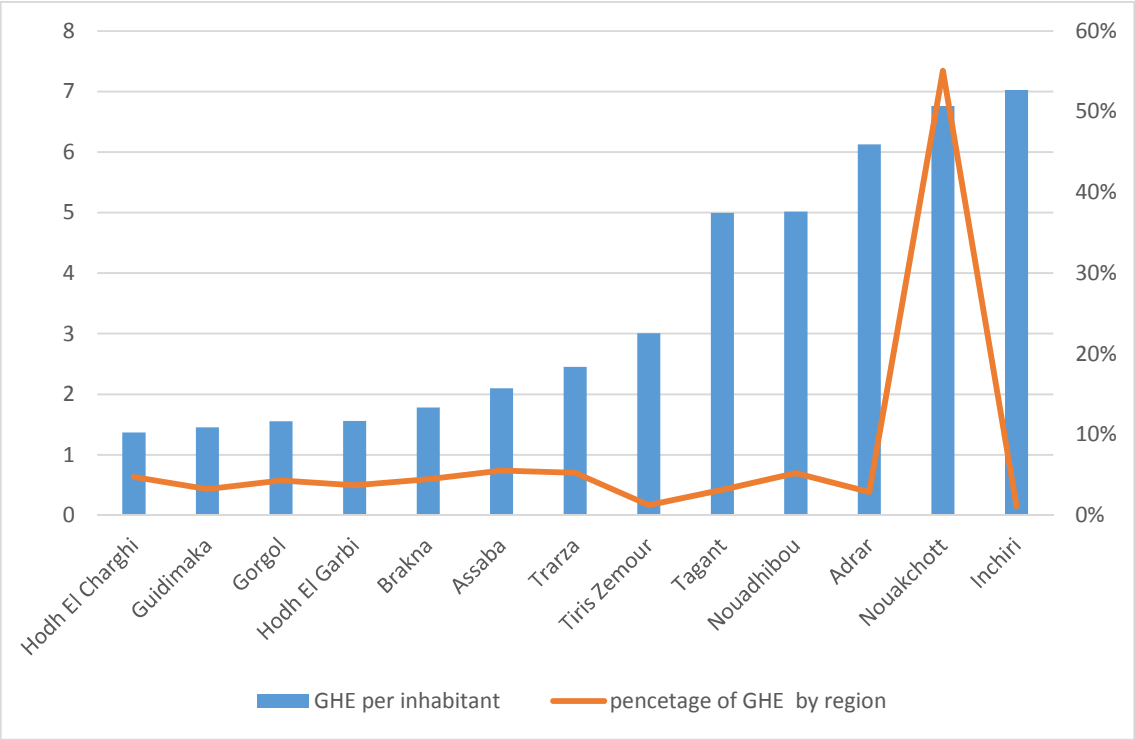


Figure 54 shows the distribution of government health expenditures by region and per capita. It also shows in term of percentage the distribution of total government health expenditure.

In terms of per capita spending, the graph indicates an important disparity between regions. The Hodh Chargui region recorded the lowest level with $ 1.35 per capita per year and the Inchiri region recorded the highest level with $ 7.02 per capita per year. This is partly explained by the huge disparity in the population size in both regions. Hodh Chargui is the most populated region after Nouakchott with a population of nearly half a million inhabitants while the region of Inchiri constitutes the least populated region of Mauritania with only about twenty thousand (20.000) inhabitants. Except for Tagant, all wilayas of the south have received a government health spending varies between one US dollar (1US $) to three US dollars (US $ 3) per inhabitant per year. All northern wilayas benefited from a government health spending ranges from three dollars (3 US $) to seven dollars (7 US $) per capita per year. Nouakchott and Nouadhibou benefited from a government health spending ranges from five dollars (5 US $) to six dollars (6 US $) per capita per year. The inequalities between wilayas are obvious: Nouakchott, Adrar and Inchiri benefited from four to five times higher average per capita government health expenditure than Hodh Chargui, Guidimagha, Gorgol and Hodh Gharbi.

In nominal terms, government health expenditure by level and by wilaya shows that Nouakchott receives more than 55% of the government health expenditure. We should note that all national hospitals (specialized and general hospitals) are in Nouakchott. By contrast, the government health expenditure varies between 1% and 6% in all other regions. The region of Tiris-Zemour and Inchiri benefit about 1% each from government health expenditure. The situation of Inchiri and Tiris-Zemour is explained by the low density of the population in this region. This means that the amount spent compared to the population is high, but in nominal terms the amount is low. In addition, these two regions are industrial regions whose health system benefits from industrial and mining companies.

FIGURE 55: GOVERNMENT HEALTH SPENDING GOES MAINLY TO HOSPITALS [134]

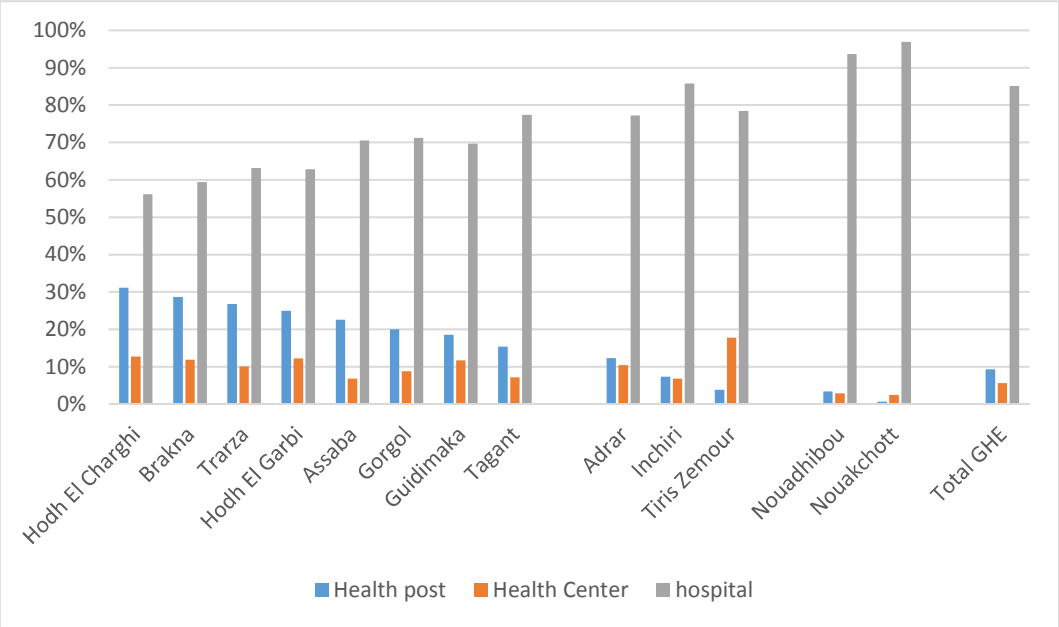


Figure 55 shows that government health spending goes mainly to hospitals. Overall, the graph shows that 85% of total government spending goes to hospitals compared with 9% for health posts and only 6% for health centers. In all regions, hospitals benefited the most from government health spending. The share of hospitals from government spending varies between 56% in Hodh Chargui and 97% in Nouakchott. As for health posts, their share in government health spending varies from 1% in Nouakchott to 31% in Hodh Chargui. Health posts are generally located in remote rural areas, Hodh Chargui hosts the largest number of health posts in the country as 85% of the population of the wilaya are in the rural area. Nouakchott, have a rate of rurality around zero. Government health spending at the health

center level follows the same trends as health posts with a smaller percentage ranging from 2% in Nouakchott to 13% in Hodh Chargui.

In general, government health expenditure at the primary level (poste and health centers) are higher in the southern regions than in the northern regions, due to the rurality.

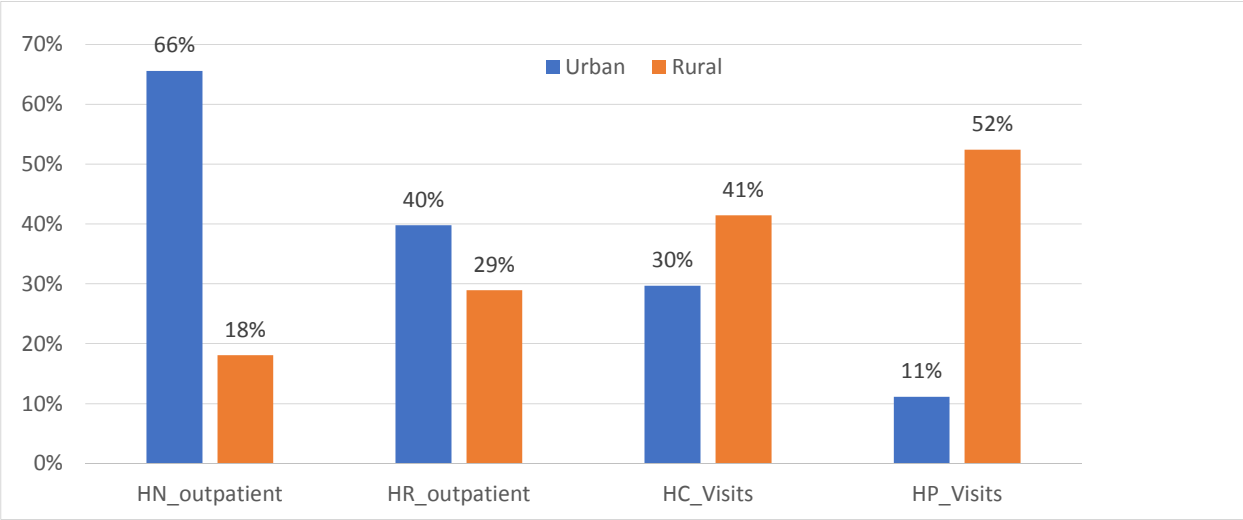
Benefit incidence analysis of government health spending

Improving access and ensuring that government expenditure on health favour the poor are ones of the main goals of National Strategy for Accelerated Growth and Shared Prosperity. Equity goals and the moving toward universal health coverage justifies the subsidization of health care services to ensure financial protection particularly for the poor. This section assesses the distribution of public health care benefits in Mauritania. The benefit incidence analysis (BIA) is used to define who benefits from public spending on health. This is done by contrasting individual utilization and health expenditure data, estimated from household surveys, with public expenditure data.

Utilization of public health services

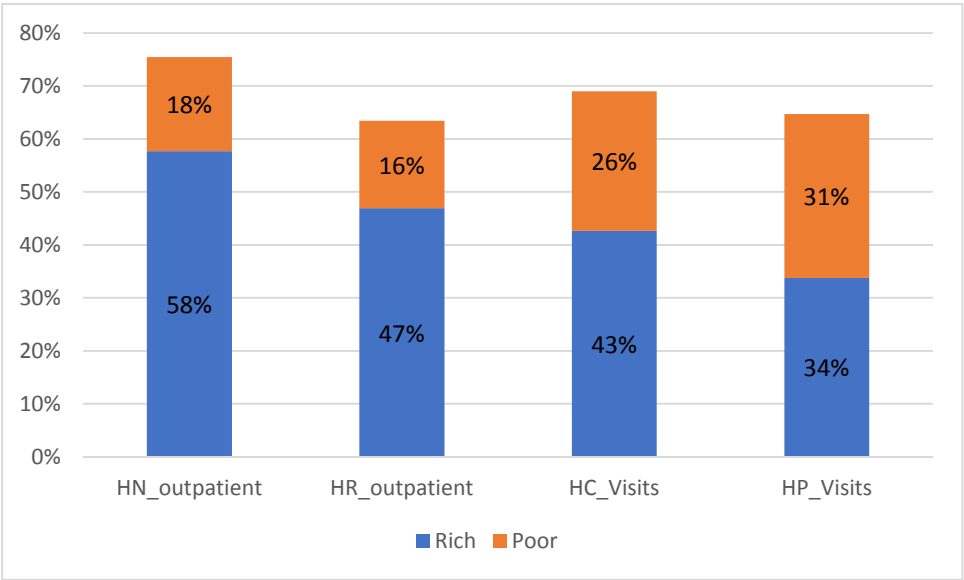
Overall, the utilization of public health services by the general population is like that of subgroups of children and mothers discussed in the previews chapter. Progress in access to and utilization of health services has been highly uneven, with significant gaps that have particularly disadvantaged rural and poorer quintiles. The decomposition of health services utilization by type of health facility shows that urban population tends to use hospital care widely: (66%) for national hospital and (40%) regional hospital versus (18%) and (29%), respectively, for the rural population (figure 1). Inversely, rural populations dominate the primary health care utilization: health center (41%), and health post (52%) in comparison with their urban counterpart (30%) and (11%), respectively.

FIGURE 56: UTILIZATION OF HEALTH SERVICES ACCORDING TO PLACE OF RESIDENCE (URBAN / RURAL) [56]



Health utilization according to poverty status shows a similar trend to urban rural location. Overall, health services are used by the better-off more than the poor. The non-poor, whose total monthly income per capita was above the national poverty line and who reported being ill during the two weeks prior to the survey, were 3 times more likely to use hospital care, 1.6 and 1.09 times more likely to use health centers and health post care, respectively, than their poor peers (figure 62).

FIGURE 57 USE OF HEALTH SERVICES ACCORDING POVERTY STATUS (POOR VERSUS NON-POOR) [56]



Similarly, poor individuals tend to use primary health care services (health posts and health centers), while the better-off predominantly use hospitals (Figure 57).

Overall, utilisation of national hospital care is higher than primarily care level as shown in table 43. The average number of outpatient visits at the national hospital level is the highest (0.409), while the lowest average number of outpatient visits is observed at the level of health post (0.326). Regional hospitals and health centers have a slightly similar average number of outpatient visits 0.342 and 0.358, respectively. The utilisation of hospitals outpatient visits compared to the primary level illustrates the dysfunction of reference and counter-reference system.

The distribution of health care utilization across socioeconomic groups shows that in the case of national hospital, the average number of outpatient care is 0.117 for the first quintile and this increases sharply with income to 0.805 for the last quintile. In the case of regional hospital, the average number of outpatient care is 0.082 for the first quintile, and this increases also with income to 0.538 for the last quintile. For health center the average number of outpatient visits increase with income from 0.238 for the first quintile, and this increases moderately with income to 0.476 for the last quintile. Overall, hospitals and health center outpatient visits are more frequent among the rich. The opposite is true for outpatient visits to health post facilities, where outpatient visits are more frequent among the poor and utilization decrease slightly with income from 0.258 for the first quintile to 0.228 for the last quintile.

TABLE 36 DISTRIBUTION OF PUBLIC HEALTH CARE UTILIZATION IN MAURITANIA, 2014

Cumulative shares	HN_outpatient	HR_outpatient	HC_Visits	HP_Visits
Lowest quintile	0.117	0.082	0.238	0.258
2	0.246	0.202	0.288	0.387
3	0.376	0.378	0.363	0.368
4	0.376	0.378	0.363	0.368
Highest quintile	0.805	0.538	0.476	0.228
Total	0.409	0.342	0.358	0.326

Who Benefits from Public Health Spending?

Table 44 shows public subsidies distribution across wealth quintile at different health facilities for outpatient visits and the total subsidy across. It presents also the concentration indexes and its standards error, tests of dominance against 45° line and against Lorenz, and Kakwani index.

The results indicate a similar pattern with the distribution of utilization. Overall, the public subsidies favors the richest quintile at hospitals and health center care while the poorest quintile is favoured at health post care. The cumulative quintile shares for the total subsidy shows that, the poorest quintile share is lower than 20 percent but greater than its share of total consumption. At higher quintiles, the cumulative subsidy shares are also lower than their respective population share. Greater inequality emerges in the distribution of government subsidy on hospital outpatient care. The poorest quintile share of the subsidy is 5.75% for national hospital and 4.83 %for regional hospital. This is far below their population share (20%) and also their share of total consumption (6.65%). At the level of primary health care, the inequality in the distribution of health benefits across quintiles for outpatient visits is less more pronounced. The poorest quintile share of the subsidy is lower than 20 percent for health center (13.9%) and health post (15.87%) but greater than its share of total consumption (6.65%). At higher quintiles, the cumulative subsidy shares are greater than its share of total consumption (58.56%) for both health center (73.42%) and health post (85.98%). However, the cumulative subsidy shares deviate from the population share for health center.

TABLE 37 DISTRIBUTION OF PUBLIC HEALTH CARE SUBSIDIES IN MAURITANIA, 2014

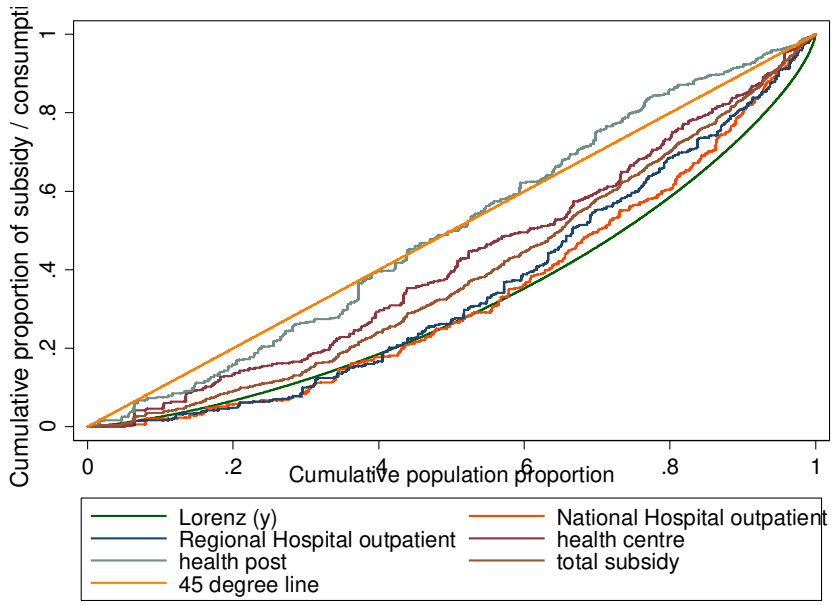
	Equivalent household consumption	National Hospital Outpatient	Regional Hospital Outpatient	Health center Visits	Health Post Visits	Total subsides Visits
Quintile 20%	6.65%	5.74%	4.83%	13.29%	15.87%	9.06%
Quintile 40%	18.51%	17.75%	16.66%	29.35%	39.60%	24.05%
Quintile 60%	35.28%	36.11%	38.79%	49.59%	62.19%	44.57%
Quintile 80%	58.56%	60.65%	68.50%	73.42%	85.98%	70.16%
Test of dominance						
Against 45° line		Dom1[a]	Dom1	Dom1	n-Dom1[b]	Dom1
Against Lorenz		Dom2[c]	Dom2	n-Dom 2[d]	Dom2	Dom2
CI		0.3279	0.2973	0.1559	0.0010	0.2218
(Robust		0.0385	0.0281	0.0639	0.0367	0.0243
Kakwani index		-0.0196	-0.0501	-0.1916	-0.3465	-0.1257
(Robust		0.0469	0.0324	0.0613	0.0383	0.0249
Subsidy share		50.25%	33.29%	8.79%	7.67%	100%

Notes: [a]Dom 1: The 45-degree line dominates the concentration curve at the 5 percent significance level. [b]n-Dom2 : Non dominance or curves crossing. [c]Dom2: The concentration curve dominates the 45-degree line. [d]n-Dom2: Non-dominance or curves crossing.

Except for health post subsidy (0.001), the concentration indices are significantly greater than zero indicating a pro-rich distribution, for national hospital, regional hospital and health center care.

The test of dominance against 45° line indicate that the 45-degree line dominates both concentration curves for national and regional hospital outpatient visits and health center visits. However, test of dominance against 45° line does not dominate health post visits subsidies curve. Subsidy concentration curves and the Lorenz curve are graphed in the figure 63. The concentration curve for the total subsidies follows the national hospital and regional hospital outpatient visits subsidies curves tightly. This shows the fact that hospital (national and regional) outpatient visits receive clearly the bulk of public spending in Mauritania, 50,25% for national hospital and 33,29% for regional hospital.

FIGURE 58 CONCENTRATION CURVES FOR HEALTH SECTOR SUBSIDIES AND LORENZ CURVE OF HOUSEHOLD



The dominance tests and the Kakwani indices indicate that the subsidies are weakly progressive. However, only the subsidy for health post is pro-poor. The subsidy to national and regional hospitals, health center care and the total subsidy are pro-rich.

The comparison of benefit incidence analysis results with the previously conducted study in 2000[19], shows that the poorest quintile benefits from government health spending has been slightly improved.

TABLE 38. COMPARAISON OF DIDSTRIBUSTION OF PUBLIC SUBSIDIES 2000 VERS 2014 [19]

	Health Post		Health center		Hospital (national and regional)	
	2000	2014	2000	2014	2000	2014
Poorest Quintile	9.4%	15.87%	9.4%	13.29%	2%	5.74%
Richest Quintile	31%	85.98%	35.5%	73.42%	47.1%	60.65%

As shown in Table 37, in 2002 the poorest 20% got only 9.4% of the benefits from both health post and health center subsidies, while in 2014 the benefits of the poorest quintile had increased to 15.87% for health post care services and 13.29% for health center care services. However, the richest quintile benefits have more than doubled during this period. In 2002, the richest quintile got 31% of the benefits from the subsidies for health post care services and

35.5% for health center care services as against 85.98% for health post care services and 73.42% for health center care services in 2014.

At hospital level, in 2000 the public subsidy benefits for outpatient care were only 2% for the poorest quintile. This has increased to 4.83% in 2014. The richest secured 47.1% of the benefits for outpatient care services at the level of hospital in 2000 against 60.65% in 2014.

The pro-poor distribution of Public Health Care Subsidies in Mauritania at the level of health post care is consistent with service utilization pattern in table 43 and others studies from similar countries.[135] This can be attributed to nearby health facilities to the poor and rural communities. Indeed, health posts represent the main strategy of Ministry of health to make services available to remote areas. Their number has doubled since 2000, from 324 to more than 620 in 2014.[66,19] In contrast, regional hospitals are located in the capital city of the region while national hospitals are located in Nouakchott. The latter focused on specialized services that are more expensive and not usually affordable to the poor. Access to regional and national hospitals is a major challenge particularly for rural population which represent more than 48%[96] of the population. The poor roads and the distance to Nouakchott which is located at the extreme west of the country are a major challenge to access of hospital care.

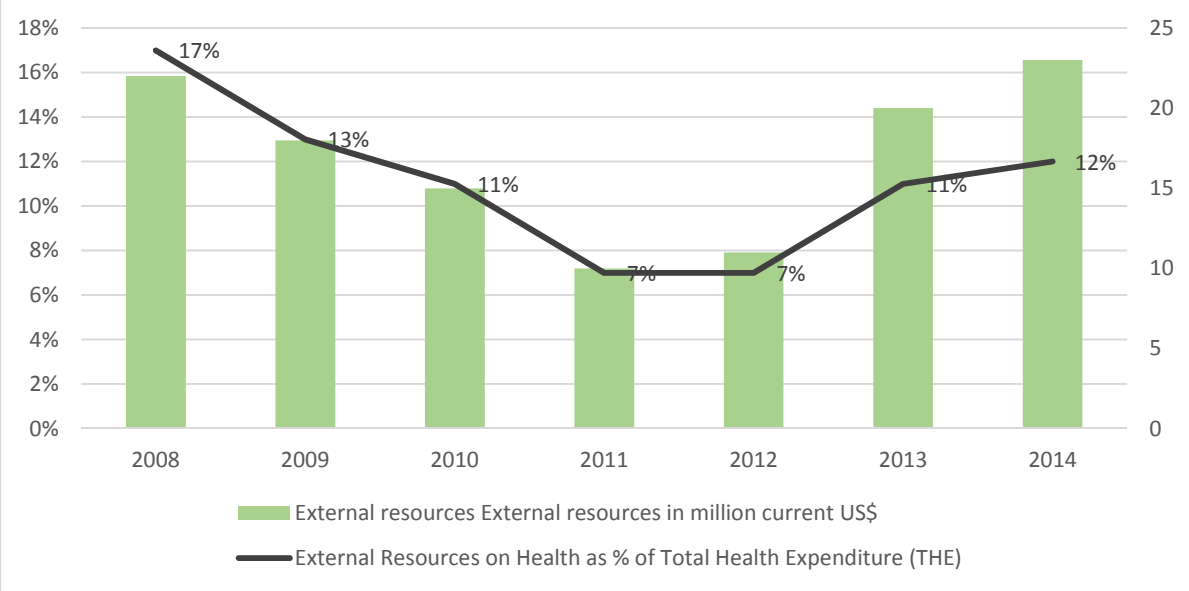
The performance of the Mauritanian health system, in terms of meeting the health needs of the particularly poor population, remains low. The SARA (2016) survey[69] brought to light a myriad of input, process and governance factors hampering access and quality of health care. Key inputs were missing and/or dysfunctional. For example, only 8 percent of facilities were found to meet all the basic infrastructure requirements (availability of clean water, improved sanitation, and electricity). Of the facilities surveyed, only 26 percent of priority drugs were in stock and not expired. Inequitable distribution of both financial and human resources worsens the deficiency in health workforce. There are only 83 health professionals per 100,000 which is far below WHO standards of 230. The existing workforce composition is inefficiently skewed towards urban areas particularly the main big cities (Nouakchott and Nouadhibou),

[135] Kwesiga B et al. Who pays for and who benefits from health care services in Uganda? BMC Health Services Research 2015; 15(44); DOI 10.1186/s12913-015-0683-9

Health Funding Resources: External health funding

The development partners that finance health sector in Mauritania are bilateral cooperation, multilateral cooperation, and international NGOs. The graph below shows the amount and share of external resources in total health expenditure between 2008 and 2014 (Figure 69).

FIGURE 59: EXTERNAL RESOURCES ON HEALTH AS % OF TOTAL HEALTH EXPENDITURE (THE) [124]



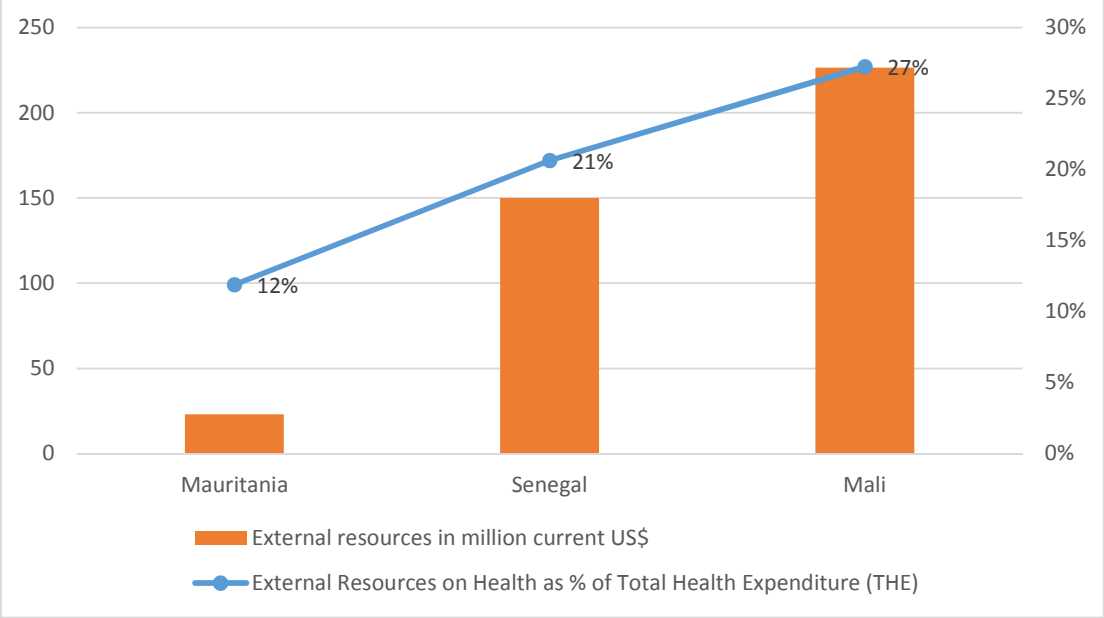
The evolution of the share of external resources in the financing of health sector in Mauritania shows a relatively low contribution and a significant volatility linked to the political instability of the country. Between 2008 and 2014, the share of external financing in total health expenditure varied between 4% and 17%. The period following the coup d'Etat in 2008 show a declining trend between 2008 and 2011. As it was the case in several sub-Saharan African countries, the withdrawal of the Global Fund in 2011 for reasons related to corruption and mismanagement of its grants has resulted in donor funding being down to its lowest level which represent 4% of total expenditure in 2011. In this context, aid volatility and the lack of predictability of aid disbursements is a crucial issue.

Like many low-income countries, in Mauritania the multiplicity of funder requirements and procedures, stretch already limited management capacity. Funders may bypass core government structures, such as procurement committees or indeed the Ministry of Health itself,

rather than strengthening them.[34]¡Error! Marcador no definido.(p199)

Overall, external aid accounts for a smaller share of total health expenditure compared with neighbouring countries as shown in the graph below (Figure 60).

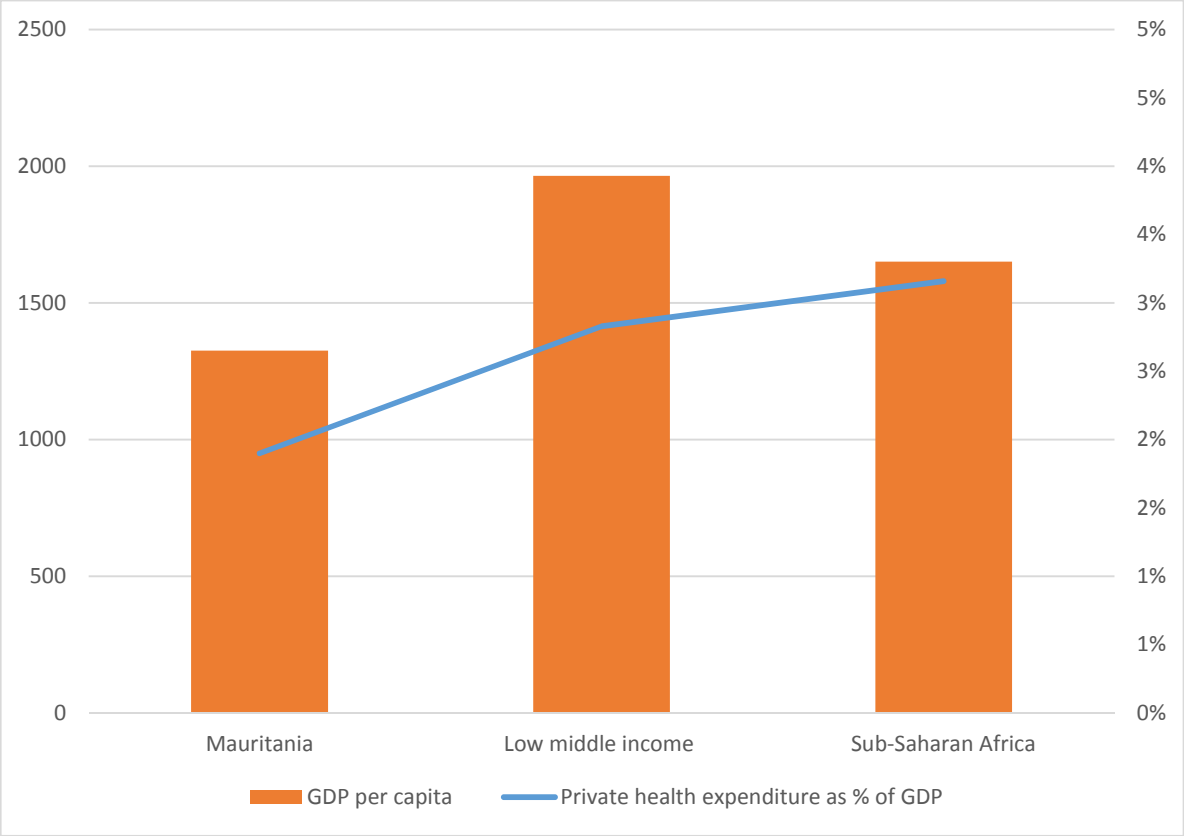
FIGURE 61. EXTERNAL RESOURCES ON HEALTH AS % OF TOTAL HEALTH EXPENDITURE (THE) IN NEIGHBOURS COUNTRIES



Private health expenditure

Private health expenditure includes households through direct Out of Pocket payment, private prepayment schemes, and contributions from the private sector. In 2014, private health expenditure in Mauritania represented 50.63 percent of total health spending[126(p20)] and 1.9 percent of GDP.[38] In per capita term, this is below the average of Middle income as well as the Sub-Saharan Africa, 2,83% and 3,16% respectively (Figure 62)

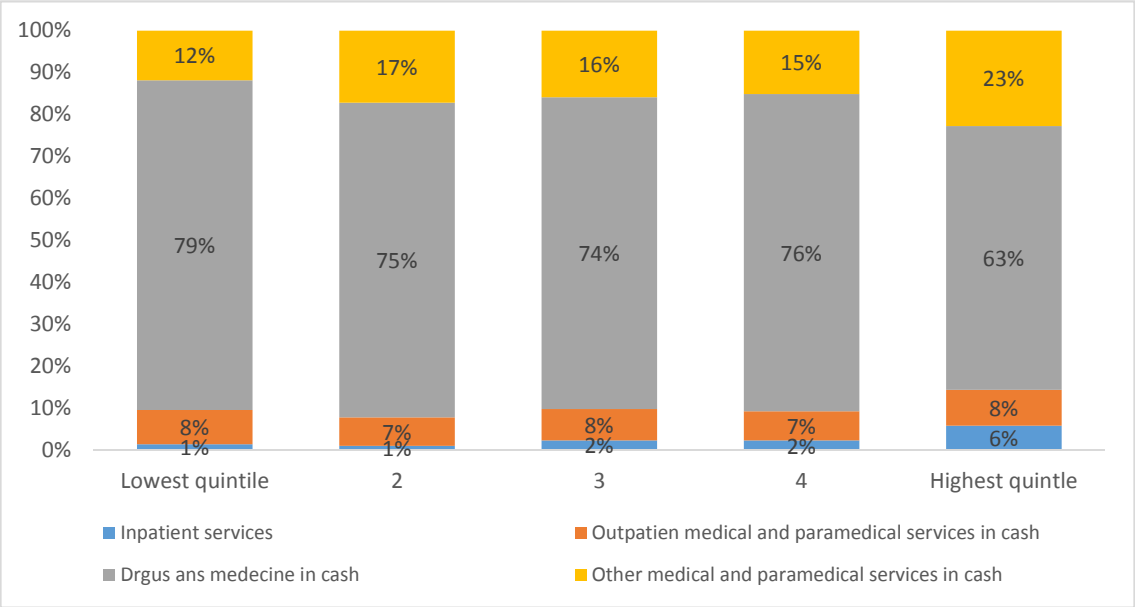
FIGURE 62 GDP PER CAPITA AND PRIVATE HEALTH EXPENDITURE AS PERCENTAGE OF GDP IN MAURITANIA AND LOW-INCOME COUNTRIES AND SUB-SAHARAN COUNTRIES[38]



Out-of-pocket health expenditures are defined as direct purchases of health services or goods by households. The content of Out-of-pocket health expenditure includes spending on medicines, hospital room charges, consultation fees and diagnostic tests. The Out-of-pocket payments directly impact the household's financial status and can push households into poverty. Private insurance expenditure, on the other hand, provide some financial protection through the pooling of risks and their redistribution between healthy and sick individuals and households. The NHA 2011 and 2015 indicate that Out of pocket expenditure constitutes the major source of private health expenditure in Mauritania and represented on average 95% of private health spending. As a share of total health expenditure this constituted 48% in 2015.

The decomposition of Out-of-pocket spending on health care shows that the main OOP expenditure item is medicines. Among the poorest quintile, the share was even higher at 79 per cent, compared to 63 per cent among the wealthiest quintile. The difference may, at least in part, reflect the higher expenditure among the rich on other areas of health spending such as consultations and inpatients care.

FIGURE 63: OUT-OF-POCKET SPENDING BY CATEGORY AND QUINTILE (IN PERCENTAGE), BY QUINTILE, 2014 [56]



Out-of-pocket spending is a measure of financial protection. In the context of Mauritania characterized by the existence of the preconditions for catastrophic payments such are: i) the availability of health services requiring payment; ii) the lack of prepayment mechanisms where less than 14% of the population benefit from a health insurance system; and ii) low capacity to pay and high level of poverty rate where more than one third of the population lives below the poverty line. Moreover, large amount of out-of-pocket expenditure on health emphasises inequities, increases concerns about the vulnerability of the poorest to catastrophic expenditure, and the impoverishing effects of health spending.

Overall, Out-of-Pocket health expenditure is considered as involuntary expenditure. It moves resources available for other goods and services. Households without full health coverage, face a risk of large expenditures on medical care in the event of illness. This uninsured risk reduces well-being. Furthermore, if a member of the household becomes ill, the purchase of medical care by households would disrupt the material living conditions of the family. If health care spending is large in relation to the resources available to the household, this disturbance in the standard of living can be considered catastrophic. A concept of equity in health financing is that households should be protected against such catastrophic medical expenses (World Health Organization 2000).[14 (p203)]

Catastrophic Health Expenditures

The analysis of catastrophic health care payments follows the approach by O'Donnell et al. (2008) which defines health spending as "catastrophic" if it exceeds some fraction or threshold of total expenditure, or of total non-food expenditure, in a given period. Incidence of Catastrophe health spending is measured using various thresholds to demonstrate the sensitivity of catastrophic measures. Catastrophic health expenditures are defined as health care payments that exceed a predetermined percentage of total household expenditure or non-food expenditures. When total expenditure is used as the denominator, the threshold used is 25 per cent. When non-food expenditures are used as the denominator, the threshold used is 40 per cent. The justification is that these thresholds are ones of the indicators of sustainable development goal for catastrophic expenditures. Moreover, theses thresholds represent an approximate threshold during which the household is forced to sacrifice other basic needs, sell productive assets, incur debts, or become poor (Russell 2004). A regression analysis was conducted to explore variables associated with catastrophic health expenditure. Data comes from Permanent Household Living Conditions Survey 2014.

Incidence of Catastrophic Health Payments

Incidence of Catastrophic Health Payments measured as a share of both total household expenditure

The table below shows measures of the incidence and intensity of catastrophic payments for health care in Mauritania estimated from the 2014 Permanent Survey on living condition of Household. Catastrophic payments are measured as a share of total household, using several threshold budget shares. As the threshold is raised from 5% to 25% of total expenditure, the estimate of the incidence of catastrophic payments (H) falls from 26.48% to 2.83 %, and the mean overshoot increased from 0.07% percent of expenditure to 0.47%. Standard errors are small relative to the point estimates, which is to be expected for a reasonable sample size (9,472). Unlike the head count and the overshoot, the mean overshoot among those exceeding the threshold (MPO) need not decline as the threshold is raised. Those spending more than 25 percent of total expenditure on health care, on average spent 14.76 percent (0.41% + 14.35%).

TABLE 39. INCIDENCE AND INTENSITY OF HEALTH PAYMENT, MAURITANIA 2014

Catastrophic payments measures	thresholds budget share					
	5%	10%	15%	20%	25%	40%
Out-of-pocket health spending as share of total expenditure						
Head count (H)	26,48%	11,31%	6,06%	3,97%	2,83%	
standard error	0,49%	0,35%	0,26%	0,22%	0,18%	
Overshoot (O)	0,07%	1,24%	0,82%	0,57%	0,41%	
standard error	0,07%	0,06%	0,05%	0,04%	0,04%	
Mean positive overshoot (MPO)	7,97%	10,92%	13,53%	14,43%	14,35%	
Concentration index, C_E	-0,038	-0,033	0,013	0,087	0,170	

Incidence of Catastrophic Health Payments measured as a share of both total household expenditure

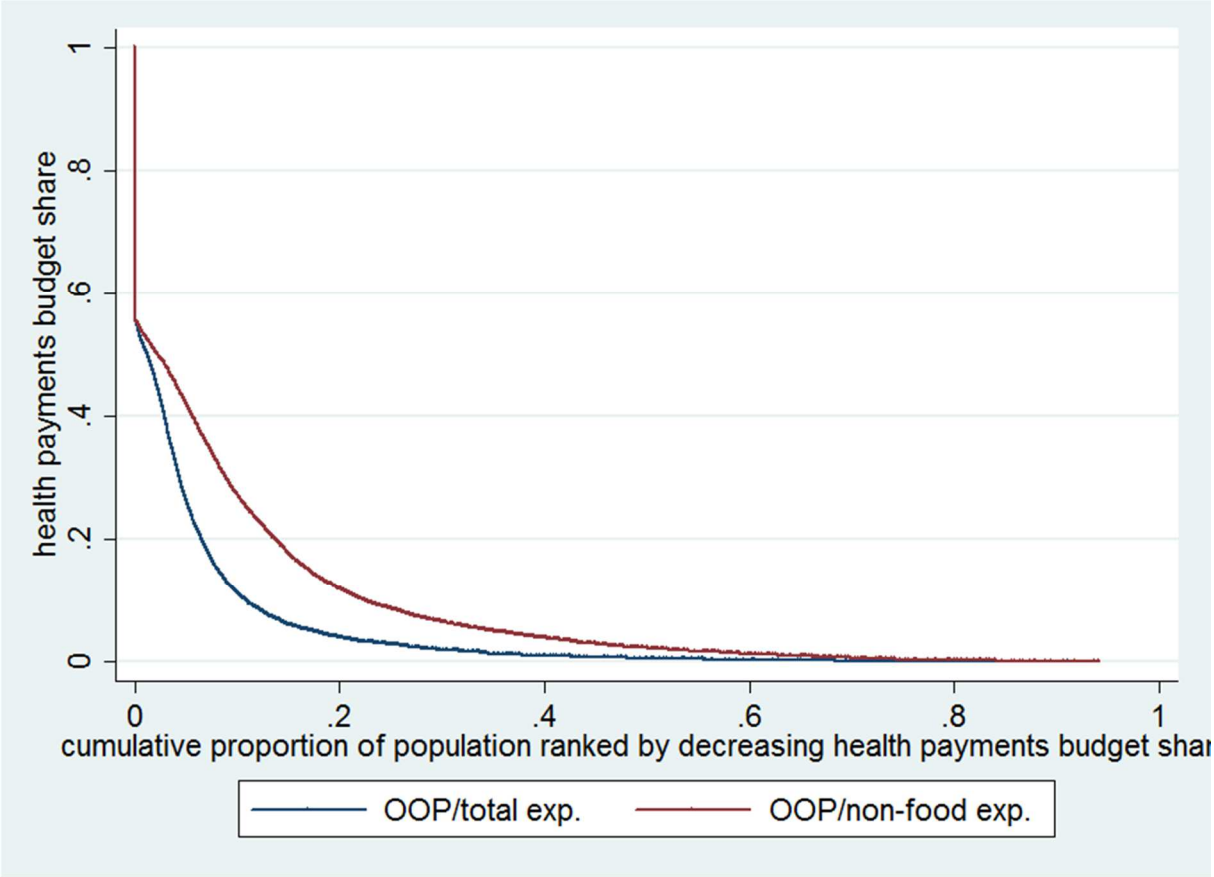
The table below shows measures of the incidence and intensity of catastrophic payments for health care in Mauritania estimated from the 2014 Permanent Survey on living condition of Household. Catastrophic payments are measured as a share of non-food expenditure, using several threshold budget shares.

TABLE 40. INCIDENCE AND INTENSITY OF HEALTH PAYMENT, MAURITANIA 2014

Catastrophic payments measures	Tthreshold budget share					
	5%	10%	15%	20%	25%	40%
Out-of-pocket health spending as share of non-food expenditure						
Head count (H)	42.13%	27.34%	17,81%	11,94%	8,64%	3,87%
standard error	0.54%	0.49%	0,42%	0,36%	0,31%	0,21%
Overshoot (O)	5.56%	3.84%	2,73%	2,00%	1,49%	0,62%
standard error	0.13%	0.11%	0,10%	0,08%	0,07%	0,04%
Mean positive overshoot (MPO)	13.20%	14.06%	15,31%	16,74%	17,29%	15,90%
Concentration index, C_E	0,020	-0,034	-0,041	-0,002	0,041	0,093

When catastrophic health payments are labelled in relation to non-food expenditure, both the head count and the overshoot are higher, in comparison with catastrophic payments as share of total household expenditure. This is also demonstrated graphically in the Figure 64, which illustrates the health spending curves for both non-food expenditure and total household expenditure. As figure below illustrates the OOP/non-food expenditure curve is always to the right of the OOP/total expenditure curve.

FIGURE 64. HEALTH PAYMENTS TOTAL AND NON-FOOD SPENDING AGAINST CUMULATIVE PERCENTAGE OF HOUSEHOLDS RANKED BY DECREASING CONSUMPTION, MAURITANIA 2014



Impoverishment linked to out-of-pocket health payments

We estimated the incidence of households impoverished (moving from non-poor to poor) because of catastrophic health expenditures by calculating poverty levels using consumption before and after households make healthcare spending. We assessed both the head count (the proportion of a population living below the poverty line) and the poverty gap or intensity of poverty which assess the extent to which the standards of living of the poor household in under the poverty line.

To assess the poverty levels before and after healthcare spending in 2014, we used the national poverty line of 169 445 MRO or equivalent to (US$ 3.6 a day at 2011 PPP). The result shows that 31 percent of Mauritanian were living below the poverty line before paying OOP for healthcare. After paying OOP, the head count increased by 2.9 percent. This represents an increase of 9 percent of the population below the poverty line, or 105 478 people falling into poverty as a result of paying for healthcare. The average shortfall from the poverty line (i.e., the poverty gap) was MRO 16 061 before accounting for healthcare payments and MRO 18 123 afterward, representing an increase of 13 percent.

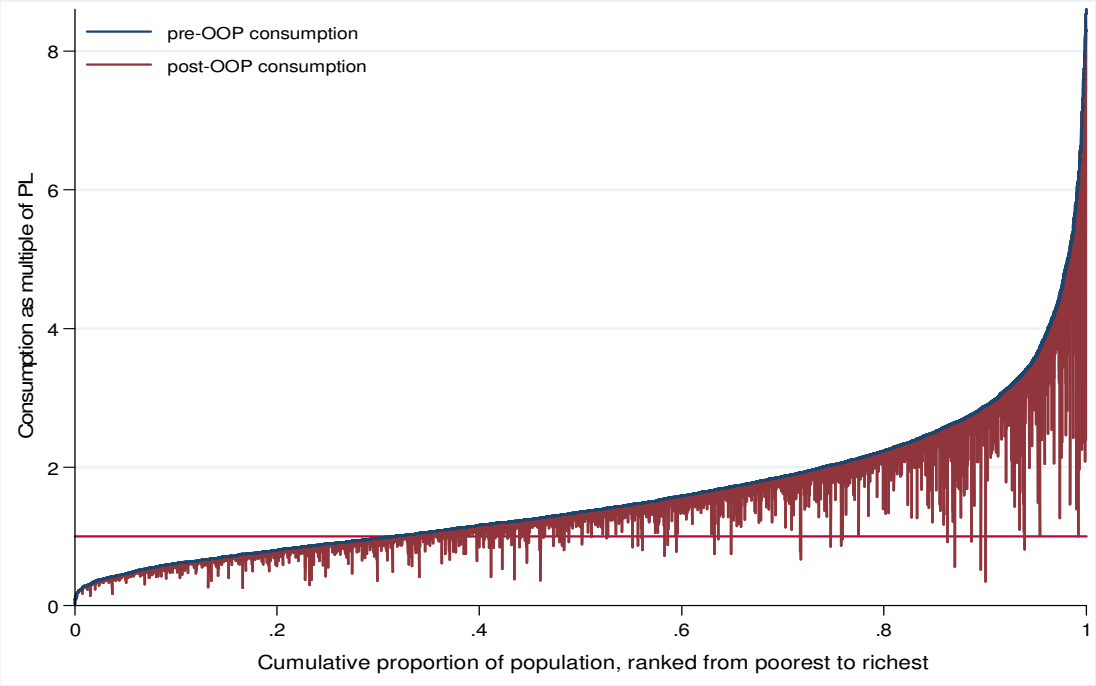
To estimate incidence of households impoverished using the extreme poverty levels before and after healthcare payments in 2014, we used the national extreme poverty line of MRO 126 035 or equivalent to (US$ 1.90 a day at 2011 PPP). In 2014, 16.5 Percent of Mauritanian were living below the extreme poverty line before paying for healthcare. After paying, the head count increased by 2.3 percent. This represents an increase of 14 percent of the population below the poverty line, or 83 655 people falling into extreme poverty as a result of paying for healthcare. The average shortfall from the extreme poverty line (i.e., the extreme poverty gap) was MRO 5 720 before accounting for healthcare payments and MRO 6 674 afterward, representing an increase of 17 percent.

TABLE 41 MEASURES OF POVERTY BASED ON CONSUMPTION GROSS AND NET OF SPENDING ON HEALTH CARE

	Gross of health payments (1)	Net of health payments (2)	Differences	
			Change in points % (3=2-1)	Change in (%) (3 /1) *100
Poverty line = 169445				
Poverty headcount	31.3	34.2	2.9	9%
Poverty gap	16 061	18 123	2 062.2	13%
Extreme Poverty line = 126035.0				
Poverty headcount	16.5	18.8	2.3	14%
Poverty gap	5 720	6 674	954	17%

This finding is demonstrated graphically in the Figure 65, which illustrates the effect of Out-of-pocket healthcare expenditures on poverty using the Pen's parade of households based on their consumption expenditure distribution, gross and net of Out-of-pocket healthcare payments. For each household, a vertical bar or "paint drip" shows the extent to which the subtraction of OOP healthcare payments reduces consumption. The "paint drip" shows how much subtracting out-of-pocket health payments reduces consumption for each household. If the drip falls below the poverty line, then the household is not counted as poor based on gross consumption expenditure but is poor based on net consumption (because of OOP healthcare payments). Apparently, as Figure 65 shows, a substantial proportion of households have been impoverished by paying OOP for healthcare in Mauritania.

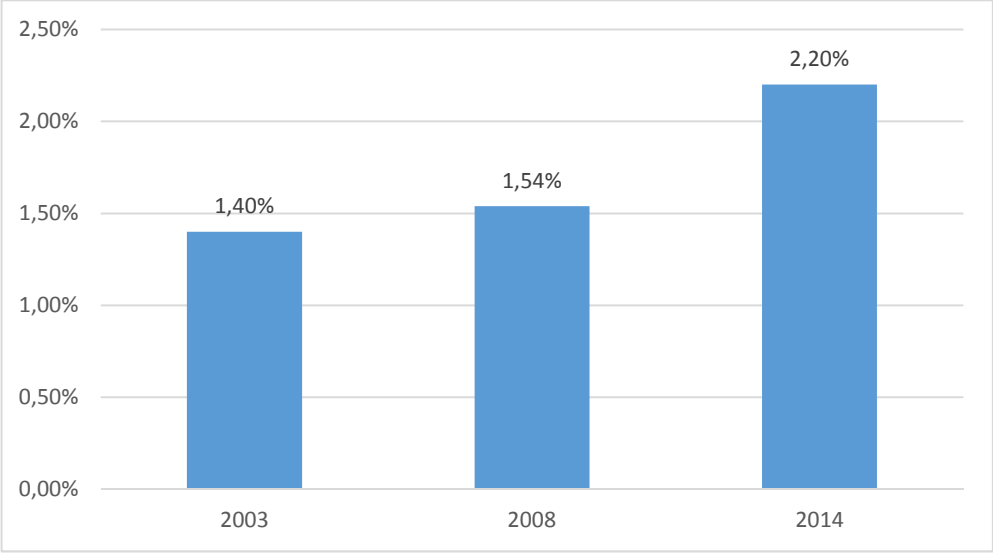
FIGURE 65. EFFECT OF HEALTH PAYMENTS ON PEN'S PARADE OF THE HOUSEHOLD CONSUMPTION



The graph also indicates that many already poor households are experiencing a deepening poverty because of their health spending. The graph suggests that OOP are the largest among the better off households. However, it is mainly households that live near poverty that are the ones pushed into poverty. The figure also suggests that even households near the top of income distribution could also end up in poverty because of OOP.

Overtime, the incidence of households impoverished because of catastrophic health expenditures has increased by 0.8 points over the period 2003-2014 (Figure 66)

FIGURE 66 : PERCENT OF POPULATION IMPOVERISHED DUE TO OOP EXPENDITURES, 2003-2014[136,137]



Discussion

Catastrophic health spending and impoverishment health payment provides an insight into the level of financial protection that health financing system provides for the Mauritanian population. It showed the financial burden endured by household and the financial barriers for the access to health care services. The results showed that the incidence of catastrophic healthcare expenditure reduced over time while the proportion of Mauritanian pushed into poverty increased. This increase in the impoverishment health payment rate is explained by the increase of the proportion of poor individuals that accessed healthcare services and paid for the services using OOP payment. The result also revealed that incidence of catastrophic expenditures was higher when estimated as a share of non-food expenditures than as a share of total household expenditure. These findings confirmed the results of previous studies from developing countries[138 ,31]

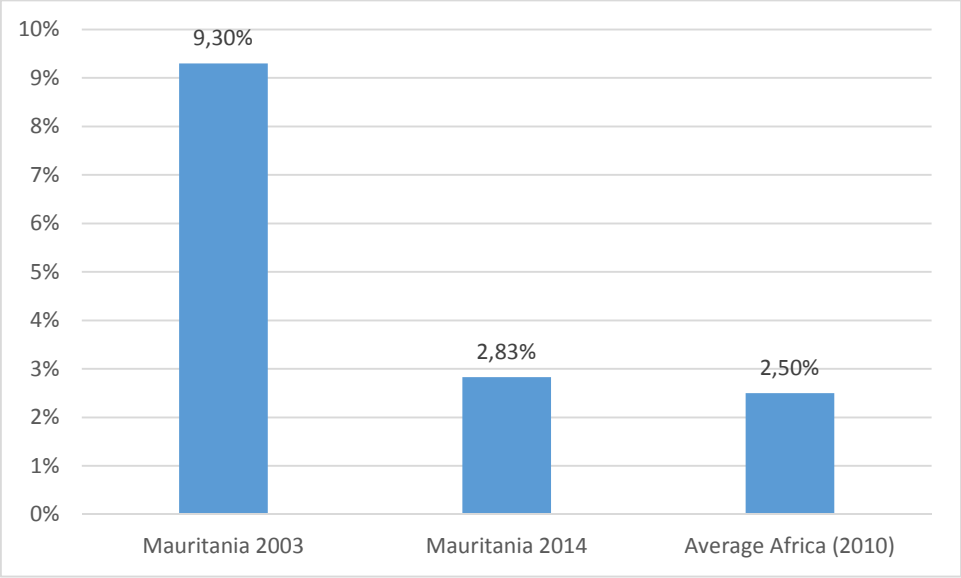
[136] World Bank. the Heath equity and Financial Protection datasheets. Washington DC: World Bank; 2013

[137] Ould Khatry Mohamed Mahmoud, Ould Taleb Ahmedii Taleb Ely and Kelly Aminata Sakho. Report on Catastrophic Expenditure and the Impact of Direct Payments on Household Impoverishment: The Case of Mauritania. [*Rapport sur les dépenses catastrophiques et l'impact des paiements directs sur l'appauvrissement des ménages : Cas de la Mauritanie*]. Brazzaville: World Health Organization; 2013

[138] Barasa Edwine, Nguhiu Peter and McIntyre Di. Measuring progress towards Sustainable Development Goal 3.8 on universal health coverage in Kenya. BMJ Glob Health. 2018;3:e000904

Comparing the incidence of catastrophic health spending patterns internationally, Mauritania has a somewhat higher incidence than the average of Africa region.

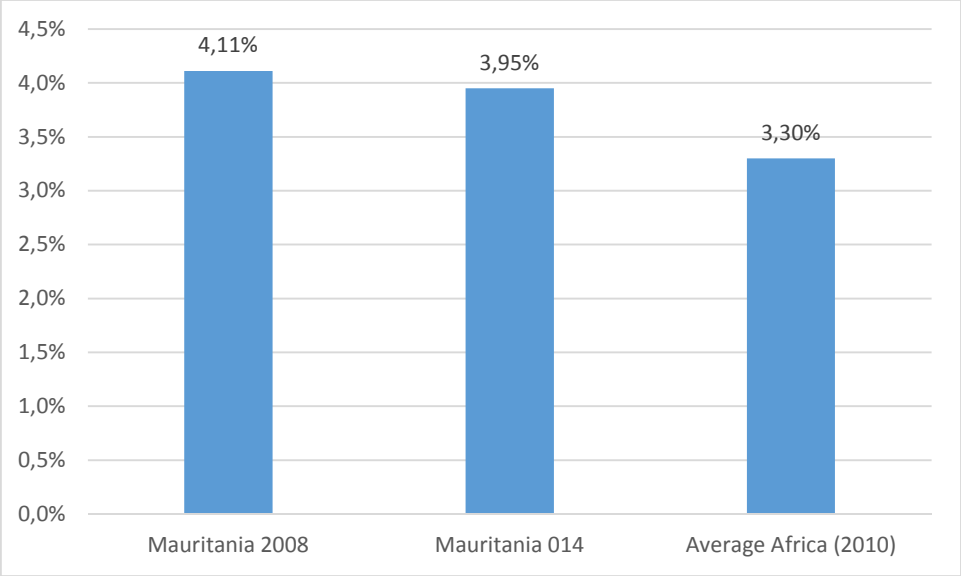
FIGURE 67 CATASTROPHIC DEFINED USING 25% OF TOTAL EXPENDITURE



In absolute term, in 2014, about 102 932 people or 2.83% of the Mauritania's population incurred catastrophic spending at the 25% of total household expenditure threshold. Both the percentage and the size of the population facing catastrophic payments have decreased at this threshold since 2003.

Using 40% of nonfood consumption as threshold, the incidence of catastrophic health spending patterns internationally indicates also that Mauritania has a somewhat higher incidence than the average of Africa region.

FIGURE 68 CATASTROPHIC DEFINED USING 40% OF NONFOOD CONSUMPTION [137]

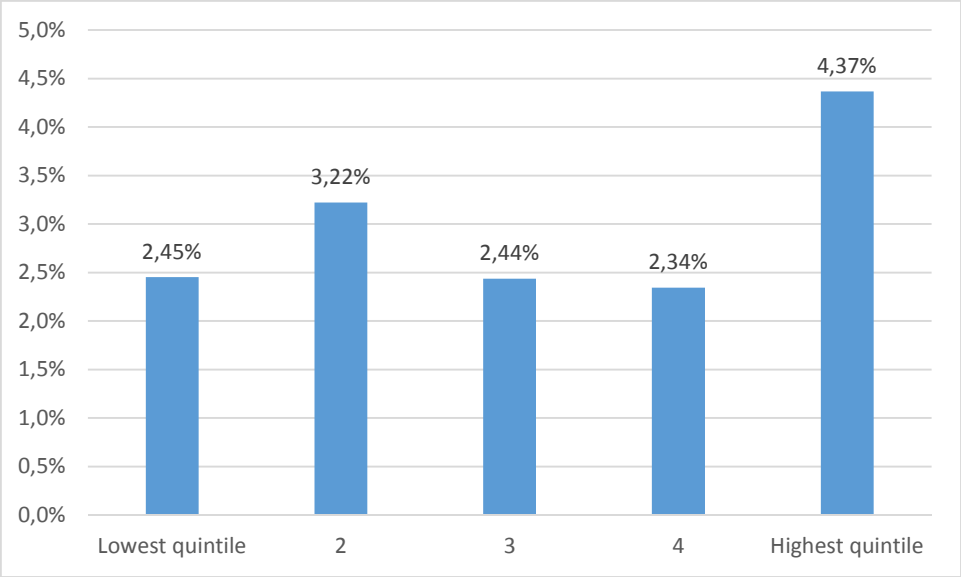


Overtime, catastrophic payment incidence has been decreasing between 2008 and 2014.

The analysis also showed that the better off have a greater tendency to experience catastrophic health spending than the less well off (Figure 69). This finding confirms the results from previous studies. [139]

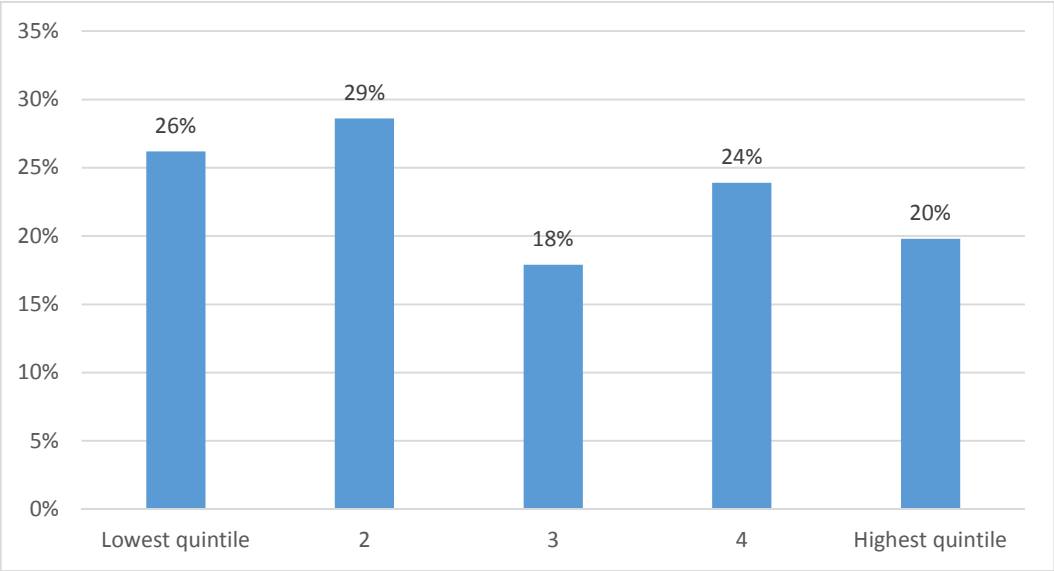
[139] Ghosh Soumitra. Catastrophic Payments and Impoverishment Due to Out-of-Pocket Health Spending: The Effects of Recent Health Sector Reforms in India. Stanford : Walter H. Shorenstein Asia-Pacific Research Center Freeman Spogli Institute for International Studies. Stanford University ; 2010

FIGURE 69 INEQUALITIES IN CATASTROPHIC HEALTH SPENDING USING 25 % OF TOTAL EXPENDITURE AS THRESHOLD



Lower percentages of households with catastrophic expenditures in the poorest quintiles are usually indicative of "system failure"; In other word, the poor just do not seek care. In 2014, the proportion of people not seeking care when ill is high, an average of 24.5 percent, across all the quintiles. This practice is more common among the poor than the rich 27% versus 18% respectively. Therefore, low utilization (rather than high cost) is a plausible explanation for the low incidence of catastrophic expenditure. When looking at people who do not seek care for financial reasons, the poorest quintile clearly stands out, at 27 percent, while the range in the other quintiles varies from 10 (richest quintile) to 15 (second and third quintile) (Figure 70).

FIGURE 70 DISTRIBUTION OF PEOPLE WHO DO NOT SEEK CARE FOR FINANCIAL REASONS, 2014



To address the high OOP health payment that are leading to catastrophic health expenditure and impoverishment health payment, the government of Mauritania launched in 2019 an Individual and Voluntary Health Insurance. The voluntary insurance is open to all people not covered by the compulsory health insurance. This insurance formula may offers an opportunity to population engaged in the informal sector: people working in the sector of service (trade, transport, various services, etc.), livestock, agriculture, emigrants wishing to ensure their families who have remained in the country, communities wishing to insure its members and, in general, any Mauritanian citizen, whatever the nature of its activities.

However, evidence suggest that when participation is voluntary, sicker people tend to join, while healthier people do not. The adverse selection problem threatens voluntary fund pools over time, forcing increased premiums or exclusions to maintain financial balance for voluntary schemes. [140(p14)]

In addition to individual and voluntary health insurance launched by National Health Insurance Fund there are two main voluntary health insurance schemes : obstetrical risk insurance scheme managed by Ministry of health and supported by The French development agency and health of Dar Naim and Barkeiwel managed by local NGO. Whether managed by the private or public

[140] McIntyre Diane and Kutzin Joseph. Health financing country diagnostic: a foundation for national strategy development. Geneva: World Health Organization; 2016

sector, voluntary health insurance in Mauritania contributes very little to overall health system funding. Moreover, evidence suggest that when participation is voluntary, sicker people tend to join, while healthier people do not. The adverse selection problem threatens voluntary fund pools over time, forcing increased premiums or exclusions to maintain financial balance for voluntary schemes. Waelkens Maria-Pia et al 2017[141] found that on average 35% of the beneficiaries of health mutual are excluded annually for reasons related to the payment of premiums.

Over the last decade, there has been little progress in coverage under both voluntary and compensatory Health Insurance schemes. In 2018, the number of people covered under the voluntary and compensatory Health Insurance schemes is estimated at just over half a million (571311 beneficiaries). Thus only about 14% of the Mauritanian population are covered, leaving the remaining 86% exposed and vulnerable to catastrophic and impoverishing out-of-pocket payments. This level of coverage falls short of the goal of achieving UHC.

[141] Waelkens Maria-Pia, Criel Bart, Laokri Samia and Coppieters Yves. Stagnation of the low membership rate of the Dar Naïm Mutual, Mauritania: a thorough causal analysis [Stagnation du faible taux d'adhésion à la mutuelle de Dar Naïm, Mauritanie : une analyse causale approfondie]. Montréal: Cahiers Scientifiques REALISMENuméro 13, Juin 2017. Institut de recherche en santé publique de l'Université de Montréal (IRSPUM). 2017

CHAPTER V: General Conclusion

Evidence from developing countries shows that the poor suffer higher rate of mortality and morbidity than the rich, Mauritania is no exception. For example, the risk of a baby dying between birth and one year of age show that the poorer have the highest under-5 mortality rates (70 per 1000 live births) then those in the highest quintile (38 per 1000 live births). Despite their greater need, the poor tended to use health care services to lesser extent than the rich. The concentration indices were significantly different from zero showing a pro-rich distribution for all health indicators covered by the research. Time-trend revealed a narrowing of the gap between the rich and the poor in some health indicators, such as contraceptive use and skilled birth attendant but a widening of the gap in others, such as vaccination. Moreover, time-trend of inequities patterns showed no progress in prenatal and postnatal care visits. The main contributors to the pro-rich healthcare use inequities were non-need factors such as: income, geographic location, the mother level of education and the ethnicity women. Income widely affects maternal and child health care use. The place of residence of women and the level of education influence maternal and child health care use to an important but lesser extent than income. The ethnicity showed a small contribution to the inequities.

The distribution of public health subsidies across wealth quintile at different health facilities level brought to light a similar pattern with the distribution of health care use. Benefits from government spending on health were mostly pro-rich. Except for health post subsidy (0.001), the concentration indices were significantly greater than zero showing a pro-rich distribution. The dominance tests and the Kakawin indices revealed that the public health subsidies were weakly progressive. Greatest share of public subsidy went to hospital care (84%) and this dominated the distribution of total public health subsidy.

In the context marked by the dominance of out-of-pocket payments and the lack of prepayment and risk pooling mechanisms, such as tax and health insurance, the inequalities in health care payments, focused more on the extent of catastrophic health payments and impoverishing consequences of out-of-pocket payments. Time-trend revealed a decline in the incidence of catastrophic health spending while its impoverishing effects tended to increase slightly over the period 2003-2014. Both the levels of incidence of catastrophic health spending and impoverishing payment were high especially among the poor. Every day more than 214 people

incurred catastrophic health spending and 92% of them fall below poverty line due to catastrophic health expenditures.

Inequity in healthcare use and financial protection analysis leads to three important implications for health policymakers. First, primary health care should be strengthened, and more emphasis should be placed on removing the barriers that affect access to health services, especially for the poor, lower educated and rural population. A focus should be done on the factors influencing health-seeking behaviour, quality of care, availability of essential medicines and equitable distribution of health workers will improve coverage and utilization of healthcare services for the poor and most vulnerable households. Secondly, a consideration should be given to ensure more equitable distribution of government health spending by allocating more resources to primary health care level and made more effective the reference and counter-reference system. Third, to ensure equity, there is a need for intervention mechanisms to protect vulnerable population against financial risk and reduce the incidence of catastrophic healthcare spending. User fee removal policy may contribute to increase financial risk protection among the poor. More emphasis should be placed on mandatory pre-payments schemes and development of supplementary health insurance. The health financing policy currently being prepared should extend the interventions targeting rural population to reduce the likelihood of catastrophic health expenditure. Broadly, reduction of multidimensional poverty will certainly help to reduce the extent of catastrophic health spending.

Government health funding is important to moving closer to UHC and should be increased on a medium-term on regular basis. Develop a national health financing policy with a vision of universal health coverage focusing on mandatory pre-payments scheme.

This research found that inequalities are still high. Further research are needed to measures vertical equity and analysis the benefit incidence of inpatient care when the complete data will be available.

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