An Evidence-Based Policy Brief

Application of equitable impact sensitive tool (EQUIST) in evidence informed policymaking to improve Maternal and Child health outcomes in Senegal

This policy brief was prepared for the West African Health Organization (WAHO) MEP Project by the African Institute for Health Policy & Health Systems Ebonyi State University Abakaliki Nigeria.

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Who is this policy brief for?

Policymakers, their support staff, and people with an interest in the problem that this policy brief addresses

Why was this policy brief prepared?

This policy brief was prepared to summarize the best available evidence about the problem which it addresses and solutions to that problem

! This evidence-based policy brief includes:

- A description of a health system problem
- Viable options for addressing this problem
- Strategies for implementing these options

Key Messages

A shorter version of this Full Report is available in the Key Messages section.

What is an evidence-based policy brief?

Evidence-based policy briefs bring together global research evidence and local evidence to inform deliberations about health policies and programmes

Key messages

The Policy Issue

With a population of about 15.1 million in 2015, the life expectance in Senegal at birth in 2015 was 66.7 years, neonatal mortality was 20.6 per 1000 live births, under-five mortality rate of 47.1 per 1000 live births, infant mortality rate of 34.8 per 1000 live births and maternal mortality ratio of 315 per 100 000 live births. Among the most critical health systems components that requires strengthening to improve MNCH outcomes in Senegal is the concept of equity. UNICEF has designed the EQUitable Impact Sensitive Tool (EQUIST) to enable the global health community improve equity in MNCH and reduce health disparities between the most marginalized mothers and young children and the better-off. Using the latest available DHS data sets, we conducted EQUIST Situation Analysis of maternal and child health outcomes in Senegal by sub-national categorization, wealth and by residence. We then identified the poorest population class within the country with the highest maternal and child mortality and performed EQUIST Scenario Analysis of this population in order to identify the intervention package, the bottlenecks and strategies to address them, the cost of the intervention and strategies as well as the number of deaths avertible.

Magnitude of the problem

Under-five mortality was highest in Diourbel region. The number of under-five deaths was considerably higher among the poorest and rural population in Senegal. Neonatal causes, malaria, pneumonia and diarrhoea were responsible for most of the under-five deaths. Highest maternal mortality was recorded in the Dakar region. Ante-partum, intra-partum, and post-partum haemorrhages, and hypertensive disorder, were responsible for highest maternal deaths. The percentage national average for WASH (improved water source) was 81%. ITN ownership percentage national average for Senegal was 43%. The percentage of the ITN ownership was lower among the poorest compared to the national average in the country (38% vs. 43%). The percentage of national average of exclusive breast feeding was 326%. In Senegal, the percentage coverage of DTP3 immunization among the poorest (86%) was lower than the national average (89%) (Table 7). In terms of the curative services (essential care and case management of premature babies), the percentage national coverage was 27% and 7% respectively. The percentage coverage among the poorest was generally lower than the national average. Delivery by skilled professional is a major intervention capable of averting the highest number of under-five and maternal deaths in Senegal. Redeployment/relocation of existing staff and Task-shifting/task sharing were the intervention strategies with the highest costs in the country and cost per capita was recorded was $2.0.

Policy Options and strategies

Policy Option 1: Scaling up integrated packages of essential interventions across the continuum of care.

Policy Option 2: Increasing budget allocation to the health sector to address the significant material and human resource shortages in the health systems.

Policy Option 3: Making the Health sector market attractive to private sector.

Policy Option 4: Establishing effective Health insurance schemes through strong health systems reforms.

Policy Option 5: Focusing the health systems on diseases and risks that affect the largest number of people and the poorest.

Policy Option 6: Curbing population growth and making the improvement of the status of women an utmost priority.

Policy Option 7: Establishing accountability mechanisms in order to restore confidence in health services and increase efficiency in the delivery of health care services.

COMPLETE REPORT

Introduction and Background Information

Senegal is located on the west of the African continent and lies between latitudes 12° and 17°N, and longitudes 11° and 18°W. The country covers a land area of almost 197,000 square kilometres and externally bounded by the Atlantic Ocean to the west, Mauritania to the north, Senegal to the east, and Guinea and Guinea-Bissau to the south [1]. With a population of about 15.1 million in 2015, the life expectance in Senegal at birth in 2015 was 66.7 years, neonatal mortality was 20.6 per 1000 live births, under-five mortality rate of 47.1 per 1000 live births, infant mortality rate of 34.8 per 1000 live births and maternal mortality ratio of 315 per 100 000 live births (2015) [2].

Senegal health systems performance was ranked 59th in the world in 2000 out of 191 member states making it at that time one of best in West Africa [3]. Senegal's health system is pyramidal, with three main parts: a central level, a regional level, and a peripheral level, while the central level contains the minister's office, branches, and related services [4]. The regional level is known as the "medical region", an administrative region that addresses healthcare services within a given region. The peripheral level is known as the "health district", with each district having at least one health center and a network of smaller centers [4]. Forty-seven percent of Senegal’s population was below the poverty line in 2011, only a slight improvement over the 2005 level of 48 percent [5].

Rising urban migration continues to exacerbate economic inequality with rural areas, particularly between Dakar and the rest of the country, and unemployment stands at 10 percent among the general population [6]. Access to quality health care services is a challenge, particularly for many Senegalese in rural and peri-urban areas. Other potentially limiting factors include low rainfall, degradation of the natural resource base, and a lack of cross-border disease control [5]. In Senegal, up to 26.8% of deliveries are reported to take place at home and the situation is worse in rural areas (39.2%) [7]. This high rate of home deliveries is attributed to many factors including low socioeconomic status, women’s illiteracy, lack of pregnancy monitoring, inaccessibility of health facilities and women’s position in the society, which confers little decision-making power [8,9].

In the area of maternal health, there are major differences between rural and urban areas as well as wealth quintiles. On average, 48 percent of Senegalese women get four or more ANC visits and variation within wealth quintiles ranges from 32 percent of the lowest quintile getting four visits to 73 percent in the highest quintile. People in the lowest quintile are most likely to deliver at home, but all other quintiles are most likely to deliver in public facilities [5]. Some of the greatest barriers to health care utilization include lack of information, lack of communication, low number of health care workers, and social and religious barriers [4].

To increase access to maternal care and improve maternal (and child) health, the Senegalese government implemented the Free Delivery and Cesarean Policy (FDCP) in 2005, entailing that women do not have to pay for delivery in health posts and health centers, and for cesarean sections in health centers and regional hospitals [10]. This intervention and many more reforms introduced by the Senegalese government have led to the decline in maternal mortality in Senegal within the last 20 years more efforts are still required because the current maternal health indicators are still unacceptably poor.

Definition and Magnitude of the Problem using EQUIST Analysis

Introduction to EQUIST

Among the most critical health systems components that requires strengthening to improve MNCH outcomes in Senegal is the concept of equity. The importance of equity consideration in evidence-informed policymaking and interventions to improve MNCH in Senegal cannot be overstated. This is because evidence abound which showed that decrease in maternal and child mortality in low and middle-income countries (LMICs) including the African region has been accompanied by increased inequity in health outcomes between the poor and those better off [11-14]. Consequently, the United Nations Children's Fund (UNICEF) has strongly advocated against the 'mainstream approach' where scaling–up of health interventions is first provided to wealthier groups in the society, but rather is promoting an 'equity–focused' approach in which interventions are targeted at the poorest in the society [15]. In a recent publication [14], UNICEF made a strong case for equitable investment and argued that since most maternal and child deaths in LMIC could have been prevented with practical, high-impact, and, low-cost health interventions, extending services to the most deprived and marginalized communities would not only avert more deaths, but would also do so more cost-effectively.

To this end, a number of tools have been developed to assess the relationship between cost–effectiveness and equitable impact in maternal and child mortality reduction [15]. Some of these tools included the Marginal Budgeting for Bottlenecks (MBB) [16], Choice of Interventions that are Cost–Effective (CHOICE) [17], and the Lives Saved Tool (LiST) [18]. According to Waters and colleagues [15], the major limitation of these tools is that they make no allowance for income-related inequalities in countries and therefore cannot fully address equitable impact considerations. To address this limitation, the UNICEF designed the **EQU**itable **I**mpact **S**ensitive **T**ool (EQUIST) to enable the global health community improve equity in MNCH and reduce health disparities between the most marginalized mothers and young children and the better-off [19,20].

EQUIST is an online tool (http://equist.info/en/pages/home), which has been described as a medium-term strategic planning, modelling and monitoring platform that serves to improve child and maternal health as well as nutrition equity in LMICs [19,20]. A key difference between EQUIST and previous tools is that EQUIST is considerably simpler and more user-friendly, with most of the calculations happening automatically [20]. EQUIST helps policy makers select strategies that balance the principles of equity, effectiveness and efficiency by leading them through a logical process to identify the most rational and cost-effective solutions for their context [21]. EQUIST's structure consists of three modules: situation analysis, scenario analysis, and scenario comparison [22].

The purpose of the policy brief is to use EQUIST to provide reliable evidence, based on available Senegal demographic health surveys (DHS) on cost–effectiveness and equitable impact of interventions that will improve MNCH outcomes in Senegal . The goal is to provide decision makers and Senegal health community with scientific information that will enable them think about issues of equity in MNCH in a more systematic and evidence-informed way, in order to design health intervention strategies that will lead to stronger, more resilient health systems in the country.

EQUIST situational analysis

EQUIST is pre-loaded with Senegal DHS data sets and we used the latest available DHS data sets for the country which is 2014 to perform both profile and frontier situational analysis. The analysis was conducted as instructed in the EQUIST user guide [23]. We conducted a general EQUIST situation analysis of maternal and child health outcomes in Senegal by sub-national categorization, by wealth and by residence. We then identified the poorest population class within the country with the highest maternal and child mortality and performed EQUIST scenario analysis of this population in order to identify the intervention package, the bottlenecks and strategies to address them, the cost of the intervention and strategies as well as the number of deaths avertible and lives saved per US$ invested.

(a). Profile analysis: Using the EQUIST Profile analysis, we assessed the general extent, nature and implications of inequities as they affect MNCH in Senegal . The profile analysis is categorized into Sector and Theme. The Sector Category is further divided into Demographic and Epidemiological Parameters, while the Theme Category is divided into family care practices, preventive services and curative services.

Under the Demographic Parameters of the Sector Category, we examined under-five mortality and neonatal mortality with reference to the key drivers of inequity, the underlying factors that explain

inequities (wealth quintile, geography, and location) and analysed the scale of inequity (deprivation mostly concentrated in poorest quintile and in rural areas). The analysis was used to provide information on the following: (a). The part of Senegal that recorded the highest child (under-five and neonatal) mortality and considered the most deprived in terms of MNCH interventions; (b) The most disadvantaged or vulnerable children; i.e. how deprivation is affected by various drivers such as wealth, geography, and location; (c) The health conditions that cause excess mortality among the most disadvantaged populations; and (d) The health interventions that are linked to this excess mortality in the most deprived areas.

Under the Epidemiological Parameters of the Sector Category, we performed EQUIST Profile analysis to determine the key epidemiological causes and the specific number of under-five, neonatal and maternal mortality in Senegal. The diseases analysed responsible for under-five and neonatal mortality included diarrhoea, malaria, measles, pneumonia, injuries, meningitis, pertussis, asphyxia, prematurity, sepsis, tetanus and congenital disorders. The diseases analysed responsible for maternal mortality included ante-partum haemorrhage, intra-partum haemorrhage, post-partum haemorrhage, hypertensive disorders, maternal sepsis and complicated abortion. We related these to the various zones in Senegal to identify the population that is mostly affected by sub-national categorization, wealth and residence. Under the Theme Category, we also performed EQUIST Profile analysis of the percentage of Effective Coverage of maternal and child health interventions including: (i). Family care practices (WASH, ITNs/Environmental safety, neonatal/infant care); (ii). Preventive services (immunization plus); (iii). Curative services (IMNCI, delivery by skilled professionals, EMONC). We related these interventions and effective coverage to the country by wealth (poorest and richest) and by residence (rural and urban).

(b). Frontier analysis: Using the EQUIST Frontier analysis, we identified the factors most likely to drive inequity, and compared the number of Under-five and maternal deaths that could be averted in the poorest wealth quintile in Senegal under the Frontier, we performed two analyses.

First, we performed the Equity Frontier analysis to identify how many under-five and maternal lives that could have been saved if Senegal equalizes coverage values for the least disadvantaged within the most disadvantaged population (poorest quintile). This was to enable us know the number of deaths that will be averted if the coverage gaps for the most disadvantaged population was equivalent to that of the richest in the country's context.

Second, we performed the Operational Frontier analysis to determine the number of under-five and maternal deaths that could be averted if effective coverage of evidence based high impact interventions are implemented and if their bottlenecks are reduced with the same proportion as observed in the most disadvantaged quintiles in best- performing countries.

EQUIST scenario analysis

We conducted EQUIST scenario analysis for Senegal by wealth focusing on the poorest quintile.

(a). Analysis of epidemiological priorities: Because our key interests were on the under-five mortality and maternal mortality, using the EQUIST epidemiological priorities we identified three categories of mortality and their main causes in the poorest quintile as follows: (i). Neonatal mortality (asphyxia, prematurity, sepsis, pneumonia, diarrhoea, tetanus); (ii). Post-neonatal and child mortality (diarrhoea, malaria, meningitis, pneumonia, asphyxia, sepsis, measles, tetanus, pertussis, prematurity); (iii). Maternal mortality (antepartum haemorrhage, complicated abortion, obstructed labour, postpartum haemorrhage, sepsis infection). We analysed simultaneously the absolute burden of diseases (the disease specific mortality rate for the targeted population), as well as the relative "excess" mortality in the group (the gap in relative disease burden between the targeted population and the least disadvantaged group).

(b). Analysis of interventions: We identified the priority interventions with which to address the epidemiological issues we selected. The interventions are grouped in nine "packages" further grouped into three service delivery modes: family care practices, preventive services, and curative services (Table 2).

(c). Analysis of bottlenecks, causes & recommendations: We identified the priority bottlenecks to implementing the interventions we selected. We related the priority bottle necks with the eight EQUIST scenario coverage determinants including: (i) Availability of commodities, (ii) availability of human resources, (iii) geographical accessibility, (iv) financial affordability, (v) sociocultural acceptability, (vi) initial utilization, (vii) adequate coverage, and, (viii) effective coverage. The bottleneck analysis framework in EQUIST assumes that eight conditions (coverage determinants) must be met to provide effective coverage of any health intervention [23]. Using the EQUIST bottleneck analysis, we determined the severity of bottlenecks based on the indicators used to measure the level of compliance with each condition for utilization, as well as the relationship between initial utilization, adequate coverage. For each intervention, we identified the coverage determinant, bottleneck, cause of the bottleneck and recommendations to address them (Table 3).

(d). Analysis of enabling environment and strategies to address bottlenecks and their causes:

We performed the analysis of the enabling environment which is classified into four (social norms; legislation/policy; budget/expenditure; management/coordination) and identified the direct causes (Table 4). We also performed the analysis of the strategies classified into five health systems

building blocks (financing; service delivery; medical products, vaccines and technologies; health workforce; governance/leadership; information) to address the bottlenecks (Table 4).

(e). Analysis of impact and cost: The EQUIST impact and cost analysis was performed to determine the following: (i). The operational frontier for maternal, under-five and neonatal mortality: that is amenable deaths if the deprived population coverage value was equal to the best performing countries, (ii). The equity frontier for maternal, under-five and neonatal mortality: that is amenable deaths if the deprived population coverage value was equal to the non-deprived population coverage value; (iii). Amenable under-five and maternal deaths among the poorest by intervention package in Senegal; (iv). The cost of strategies to avert both maternal and under-five mortality; (v). The cost per capita averting the number of deaths.

Outcome of EQUIST situational analysis

The EQUIST profile analysis of under-five mortality by sub-national regions under the demographic parameters of the sector category in Senegal showed that the Diourbel region recorded the highest mortality. The number of deaths/1000 live births in the region was more than twice the number recorded in the Dakar, which is the region with the lowest number of deaths/1000 live births and the value were considerably higher than the national average (Table 5). The number of under-five deaths/1000 live births was considerably higher among the poorest compared to the richest and among the rural compared to the urban population (Table 5). The outcome of profile analysis of neonatal mortality by sub-national regions, wealth and residence under the demographic parameters of the sector category is summarized in Table 5. The Diourbel regions also recorded the highest neonatal mortality (2,897). The number of neonatal deaths/1000 live births was consistently higher among the poorest compared to the richest and among the rural compared to the urban population. (Table 5).

The Diourbel Senegal recorded the highest neonatal mortality by epidemiological cause under the Sector Category. The poorest and the rural dwellers across the country had the highest number of neonatal deaths (Table 6). The four diseases responsible for the highest neonatal mortality included sepsis, asphyxia, prematurity and congenital disorders (Table 6). Prematurity was the major killer of the neonates in the country with the mortality considerably higher among the rural compared to the urban population in Senegal (2,951 vs. 1,125) (Figs 2-4).

The under-five mortality by epidemiological cause under the Sector Category is also presented in Table 6. The four diseases responsible for most of the deaths are neonatal causes, malaria, pneumonia

and diarrhoea. The Diourbel recorded the highest number of under-five mortality by epidemiological cause, while the least number of mortality was recorded in the Dakar region. Most of the under-five deaths in Senegal occurred in the rural compared to the urban areas and majority of the deaths resulted from neonatal causes (10,359 vs. 3,327). The poorest had higher under-five mortality numbers in the country (Table 6). (Figs 5-7).

The Dakar of Senegal recorded the highest maternal mortality by epidemiological cause (Table 6). The six diseases responsible for the highest maternal mortality included ante-partum haemorrhage, intra-partum haemorrhage, post-partum haemorrhage, hypertensive disorder, maternal sepsis and complicated abortion. Higher maternal mortality was recorded in the rural compared to the urban population in the country. The poorest compared to the richest population also recorded considerably higher maternal mortality (Table 6). (Figs 8-10).

The percentage national average for WASH (improved water source) was 81%. ITN ownership percentage national average for Senegal was 43%. The percentage of the ITN ownership was lower among the poorest compared to the national average in the country (38% vs. 43%) (Table 7). The percentage of national average of exclusive breast feeding was 326%. In Senegal, the percentage coverage of DTP3 immunization among the poorest (86%) was lower than the national average (89%) (Table 7). In terms of the curative services (essential care and case management of premature babies), the percentage national coverage was 27% and 7% respectively. The percentage coverage among the poorest was generally lower than the national average.

The outcomes of the analysis of avertible deaths by epidemiological cause and equity/operational frontier for under-five children in Senegal are shown in Table 8. The three main diseases responsible for the highest number of avertible under-five deaths by equity and operational frontiers are prematurity, asphyxia, and diarrhoea. A total of 1,231 and 998 under-five diarrhoea deaths are avertible by equity and operational frontiers respectively (Table 8).

The outcomes of the analysis of avertible deaths by epidemiological cause and equity/operational frontier for maternal mortality are also shown in Table 8. The three main diseases responsible for the highest number of avertible maternal deaths by equity and operational frontiers are sepsis, hypertensive disorders, and post-partum haemorrhage. In Senegal a total of 16 and 31 maternal deaths due to hypertensive disorders are avertible by equity and operational frontiers respectively (Table 8).

Outcome of EQUIST scenario analysis

The number of amenable under-five deaths if the deprived population coverage value was equal to (i). the best performing countries (operational frontier) and (ii) the non-deprived population coverage value (equity frontier) are shown in Table 9. Diarrhoea, asphyxia and prematurity were responsible for the highest number of amenable under-five deaths by operational and equity frontiers (Table 9) (Fig 11).

Ante-partum haemorrhage, intra-partum haemorrhage, post-partum haemorrhage and hypertensive disorders are the diseases responsible for the amenable maternal deaths among the poorest quintile in Senegal (Table 9). The amenable maternal deaths caused by ante-partum haemorrhage by operational and equity frontiers are 14 and 2 respectively (Table 9) (Fig 12).

The number of amenable neonatal deaths by operational and equity frontiers are shown in Table 9. Asphyxia is responsible for the highest number of amenable neonatal deaths by equity and operational frontiers in the country (200 vs. 393 respectively). Prematurity is responsible for the second highest number of amenable deaths by operational and equity frontiers (Table 9) (Fig 13).

Amenable deaths among the poorest by intervention package and equity/operational frontier for under-five and maternal mortality are shown in Table 10. Delivery by skilled professional is a major intervention capable of averting the highest number of under-five and maternal mortality in Senegal. IMNCI, ITNs/Environmental safety, WASH and Immunization plus are capable of averting under-five deaths ranging from 67 to 426 in Senegal (Table 10). Up to 10 (by equity frontier) and 61 (by operational frontier) maternal deaths respectively are avertible through delivery by skilled professional intervention package (Fig 14, Fig 15).

The cost of intervention strategies to avert the mortality as provided by the EQUIST impact and cost analysis are presented in Table 11. The strategies with the highest costs in Senegal are Redeployment/relocation of existing staff ($2,209,502) and Task-shifting/task sharing ($1,104,751). The cost per capita of $2.0 was recorded (Table 11) (Fig 16, Fig 17).

Policy Options and Implementation Strategies for Addressing the Problem

In this policy brief, different policy options are suggested to improve MNCH outcomes in Senegal based on the results of the EQUIST analysis. These suggestions are based on the evidence provided by Black and colleagues [24], Santi and Weigert [25] and UNICEF EQUIST publications [14,19,20] and from EQUIST online tool [http://equist.info/en/pages/home].

Policy Option 1: **Scaling up integrated packages of essential interventions across the continuum of care.**

Progress could be accelerated and achieved by scaling up integrated packages of essential interventions across the continuum of care for MNCH. The intervention packages described in EQUIST capable of improving MNCH include: (i). Family Care Practices (WASH, ITN/Environmental safety, Neonatal and infant feeding and care); (ii). Preventive Services (Family planning, Antenatal care, Immunization plus); (iii). Curative services (Integrated management of neonatal and childhood illness IMNCI, Delivery by skilled professional, Emergency obstetrics and neonatal care EMONC). According to Black and colleagues, scaling up all interventions in the packages of maternal and newborn health, plus folic acid before pregnancy, and child health from the existing rate of coverage to 90 percent would avert 149,000 maternal deaths; 849,000 stillbirths; 1,498,000 neonatal deaths; and 1,515,000 child deaths [24]. It is important to determine coverage determinant, identification of the causes of bottleneck and strategy to address them. These are outlined in Table 3.

Interventions and strategies for improving MNCH outcomes are closely related and must be provided through a continuum of care approach [26]. This is because when linked together and included as integrated programs, these interventions can lower costs, promote greater efficiencies, and reduce duplication of resources [27]. Efforts must be made to identify synergies and integrate these interventions across the continuum of care and consensus must be developed on the content of MNCH packages of interventions at each level of the health system across the continuum of care; facilitating the scaling-up of these interventions; and identifying research gaps in the content of core packages of interventions [26].

Instead of competing calls for mother or child, policy and programme attention should shift towards an MNCH continuum of care with focus on universal coverage of effective interventions, integrating care throughout the lifecycle and building a comprehensive and responsive health system [28]. The MNCH continuum of care can be achieved through a combination of well-defined polices and strategies to improve home care practices and health care services throughout the lifecycle, building on existing programmes and packages [28].

Policy Option 2: **Increasing budget allocation to the health sector to address the significant material and human resource shortages in the health systems:**

The EQUIST analysis indicated that the rural and the poorest have the worst maternal and child health indicators, implying that sufficient resources are not invested in health in the rural and

underserved areas. According to Santi and Weigert, the poor health and medical infrastructure network in West African countries reflects the inequalities in terms of access to health, especially between the rural and urban areas and between the poorest and the richest [25]. Adequate funding must be allocated to the health sector to engage more health workers in order to attain the critical threshold of 23 health workers (physicians, nurses, midwives) per 10,000 inhabitants stipulated by WHO as necessary to deliver essential maternal and child health services [29].

The health sector is known to be skilled-labour-intensive and the increase in human resources for health is critical to the overall improvement in the performance of the health systems. In this domain, emphasis must be laid on territorial equity in order to address the human resource shortage in rural areas, where the poorest people live but which still harbour the greatest health risks [25]. Underfunded investments in maternal, newborn, and child health (MNCH) are part of the impediment towards the implementation of feasible and cost-effective interventions exist to reduce maternal, newborn, and child mortality [30,31].

Effective interventions are not consistently used or available in LMICs, and accelerated investments are needed in health system infrastructure, intervention implementation, health worker training, and patient education to improve health outcomes for mothers and newborns [32]. In order to address the insufficiently diversified and autonomous financing of health, it is important to invest the growth dividend in health and look for more diversified and more stable financing sources like taxation (taxes on air traffic, mobile telephony, alcohol and tobacco) [25].

Policy Option 3: **Making the Health sector market attractive to private sector**

One of the ways to address the equity issue and bridge the gap among the wealth quintiles as indicated by the EQUIST analysis, is to encourage more private sector investment in health since the government sector cannot meet all the health needs of the population. It is important to develop a modern and structured private sector that works in tandem with government authorities. The government should provide enabling environment that will be attractive enough to private investors in the modern medicine sector so they can invest in it. Santi and Weigert, argued that the main obstacle to the involvement of private investors is the low solvency of demand, despite the growing need for increasingly diversified healthcare [25]. One of the ways to encourage private sector investment in the healthcare is to establish a robust health insurance mechanism.

Differences in essential newborn care at birth between private and public health facilities are well established [33]. In some countries including Kenya and Nigeria, available reports show that considerably more deliveries occur in private clinics and hospitals and in public ones [34-37]. Among the mandates of the newly launched Every Newborn Action Plan is coordinated support and effort

amongst private sector providers of delivery services and newborn care [38]. In Nigeria, private maternity care was the preferred place of delivery because of the problems associated with public owned hospitals including low quality of facilities, absence of staff, poor perceived quality, long waiting times, and high costs [34]. It is therefore imperative for the enactment of policies that will facilitate the engagement of the private sector to increase accessibility to reproductive and child health care [33].

The Forum on Engaging the Private Sector in Child Health in an earlier report advised governments of low income settings to take urgent steps to engage the private sector in order to achieve health goals especially as the affect the child health [39]. The Forum made the following recommendations [39]: (1). Identify a suitable global-level host to act as a catalyst for developing public-private partnerships; (2). Carry out evidence-based advocacy at all levels to stimulate public-private partnerships for child health; (3). Develop a policy environment to support implementation at scale; (4). Include public-private partnerships in all health sector and multi-sectoral development plans; (5). Support implementation at scale by strengthening capacities of both public and private sectors; (6). Support improved organization of professional associations and coalitions; (7). Increase funding available to develop public-private partnerships for child health; (8). Monitor the effect of private sector partnerships on reaching the hard to reach and underserved; (9). Pay particular attention to incentives / motivating factors; (10). Conduct interventions to influence consumer demand for quality services; (11). Invest in better testing, monitoring, evaluation and operational research.

Policy Option 4: **Establishing effective Health insurance schemes through strong health systems reforms.**

Health insurance scheme is one of the intervention packages with a very high potential of improving the MNCH as shown by EQUIST. The objective of establishing functional and effective health insurance schemes is not to follow a universal coverage model that exists elsewhere, but rather to design one that is adapted to the needs of the region and evolves as progress is achieved [25]. In Africa, irrespective of the existence of multi-ethnic, cultural, tradition, lingual and religious diversity and differences, there is still a very strong social bonding which manifests in the establishment of homogenous social groups. The social groups are formed principally for the social benefits of members. Hence the existence of some sort of social insurance established by the groups to help members when they are need especially in case of ill-health.

In Senegal as in any other African country, any health insurance scheme that is anchored on social bonding culture of the population is most likely to succeed. This is important because available

reports have indicated that the so-called formal health insurance scheme has not really worked in most of the African countries [40-42]. Of all the types of health insurance schemes, the Community-Based Health Insurance (CBHI) and Mutual Health Insurance (MHI) schemes have been shown to have the highest potential of success in a population where strong social bonding exists [43-45]. A typical example of success is the case of Senegal where the pooling of resources helps to increase the solvency of the poorest patients, especially in rural areas, where mutual health organizations *(les mutuelles de santé)* have fuelled attendance in health institutions and a decline in health expenditure among the poorest members of the various communities [25,46].

Policy Option 5: **Focusing the health systems on diseases and risks that affect the largest number of people and the poorest.**

Through EQUIST, the diseases and risks that are responsible for the largest number of maternal and child deaths have been identified. It is important to concentrate on high-impact operations that have proven their worth, because although such operations have been identified, they are still under-utilized and inadequately financed [25]. Special attention has to be paid to the reduction of inequalities to ensure that the most disadvantaged communities benefit from public investments, considering income, gender and geographical (urban-rural and region) inequalities [25].

It is crucial to understand main the causes of deaths to enable improved planning and targeting of interventions. EQUIST analysis indicated that the four diseases responsible for most of the under-five deaths are neonatal causes, malaria, pneumonia and diarrhoea, while the six diseases responsible for the highest maternal mortality included ante-partum haemorrhage, intra-partum haemorrhage, post-partum haemorrhage, hypertensive disorder, maternal sepsis and complicated abortion. Targeting interventions toward major causes of death and risk factors is a critical step toward achieving success [47]. Because much of the burden of maternal and child mortality and ill health is concentrated among the poorest populations, the highest mortality is observed among the marginalized and poor, who frequently reside in remote and rural areas with limited access to health care services [47]. Bhutta and Black [47] noted from an earlier study of Bocquier and colleagues [48] that the clustering of deaths among the rural and the poorest population also reflects the lack of access to quality health services in both rural and urban settings for a number of reasons, including the paucity of trained medical personnel and transportation facilities in rural populations and the lack of knowledge about health services among marginalized, socially isolated migrant families in urban slums.

In a recent Fact sheet on reducing mortality among children [49], the WHO calls on Member States to address health equity through universal health coverage so that all children irrespective of status (whether among the rural or poorest population) are able to access essential health services without

undue financial hardship. WHO further noted that strategic direction and an optimal mix of community and facility-based care would be required to move from "business as usual" to innovative, multiple, and tailored approaches to increase access, coverage, and quality of child health services will [49]. Two very important ways of achieving this are: (i). provision of appropriate delivery platforms for scaling up coverage, especially in circumstances in which there is a widespread shortage of health workers [50]; (ii). removal of financial barriers that preclude the seeking of care and access to health services in areas in which such care is not freely available within the public health system [51].

Contributing to this discourse, Filippi and colleagues [52] suggested using the WHO health systems perspective to address maternal mortality and morbidity, noting that the maternal mortality level is one of the best criteria for assessing the relative performance of health systems. According to them focusing the health systems on diseases and risks that affect the largest number of people and the poorest entails ensuring the following [52,53]: (i). quality of service delivery and referral system; (ii). number, distribution, and training of the types of providers required, including midwives and obstetrician-gynecologists; (iii). completeness and responsiveness of the health information system, including the adequacy of the Maternal Death Surveillance and Response; (iv). ease of access to essential medications, such as magnesium sulfate, misoprostol, and oxytocin, and the supplies necessary for blood transfusions; (v). leadership and financing, a particularly relevant issue in several Sub-Saharan African countries that have ended user fees; and (vi). governance, including the capacity of authorities at various levels of the health system to put policies and management systems in place so that women's health can improve.

Policy Option 6: **Curbing population growth and making the improvement of the status of women an utmost priority**

Empowerment of women through access to health and education will facilitate the reduction of the fertility rate. Creating opportunities for women to be socially and economically empowered will enable them to lead meaningful careers and earn resources to adequately take care of their health. According to Santi and Weigert, the demographic dividend would have increased considerably if women had greater access to education and health and the goals to be achieved are the reduction of fertility and procreation risks, increase of the average age of marriage and the introduction of women into the labour market [25]. In an earlier report, UNICEF argued that helping governments provide a quality primary school education, a UNICEF priority, will benefit maternal and infant health – particularly education for girls [54]. UNICEF also noted the following [54]: (i). educating girls for six years or more drastically and consistently improves their prenatal care, postnatal care and childbirth survival rates; (ii). educating mothers also greatly cuts the death rate of children under five;

(iii). educated girls have higher self-esteem, are more likely to avoid HIV infection, violence and exploitation, and to spread good health and sanitation practices to their families and throughout their communities; and (iv). an educated mother is more likely to send her children to school.

In a recent report by the United Nations Foundation (UNF) on private sector action for women's health and empowerment, a call was made for the recognition of the centrality of gender equality and the health and rights of girls and women—as emphasized in SDG 5 [55]. As part of efforts to improve the health of women, the UNF made a strong case for the following [55]: (i). investment in women's health and empowerment information; (ii). investment in women's health and empowerment through expanded services and improved policies; (iii). incorporating women's health into corporate women's empowerment and gender equality initiatives; and (iv). integrating gender and women's health into corporate codes, assessments, supplier guidance, and checklists.

Policy Option 7: **Establishing accountability mechanisms in order to restore confidence in health services and increase efficiency in the delivery of health care services.**

it is very important for accountability mechanisms to be established. This is imperative because most maternal deaths are not simply biological phenomena; many are in part explained by the lack of freedom and entitlements experienced by women and service providers, as well as by the lack of accountability of providers, health systems, and countries toward women and their families [56,57]. To achieve the target of decreasing the maternal mortality ratio to less than 70 per 100 000 live births under the Sustainable Development Goals (SDGs), renewed focus and accountability toward ending preventable maternal deaths are needed [58]. Accountability has been defined as a process that allows governmental and other stakeholders to assess progress, identify problems, and take corrective action where necessary, it ensures that these same actors are held responsible for the commitments they have made towards achieving health agenda [59]. Improving health sector accountability is primordial for several reasons: it would lead to better management of health structures, improve the performance of health staff, build community confidence in the health system and ensure more efficient use of the financial, technical and human resources allocated to the sector [25]. Like political will, health sector accountability, is a part of a larger construct or health systems thinking that depends on structural, managerial, and financial, as well as power interests (among others) to transform the health sector to deliver better quality of MNCH care [60].

Accountability mechanisms are important for the improvement of maternal and newborn health, but they cannot stand alone, because it requires a context in which it can function—democracy, functional institutions, reliable evidence, and effective advocacy are all needed [61]. Improving MNCH quality of care and outcomes is seen as dependent not only on commitments and investments

generally, but also increasingly on the strength of accountability for investments in relevant, evidence-based strategies [60,62]. Accountability remains a central part of United Nations global strategy to accelerate progress for women's, children's, and adolescent's health (http://www.everywomaneverychild.org/global-strategy-2). The accountability framework, developed under the 2010 global strategy to accelerate women's and children's health, included recommendations for improvements in resource tracking; international and national oversight; and data monitoring, including maternal mortality [63,64]

The health of a country's women and children is a moral, political, economic, and social imperative [64]. Therefore, accountability mechanisms can be political, legal, social, financial, managerial, or professional; formal or informal; and vary in strength depending on the reach of their recourse or sanction processes [60]. Consequently, a continuous monitor–review–act cycle is recommended, which includes national oversight, monitoring of results, multi-stakeholder reviews, and action—all ingredients of surveillance and response systems [65,66]. To ensure the success of the accountability process which can improvement of the MNCH outcomes, two national functions are critical. First, a sound health information system to collect and report health data. Second, a national deliberative mechanism to review these data, measure progress for country decision-makers, hold those decision-makers accountable to their people and to the global community, hold the global community accountable to countries, and devise remedies for remaining predicaments and barriers [64].

Fig 1. Map of Senegal showing the sub-national regions. Source: EQUIST

Table 1. Health profile of Senegal

Country parameters	**Senegal**
World bank income group	Low income
Total population in thousands (2015)	**15,129.3**
% Population under 15 (2015)	43.8
% Population over 60 (2015)	4.5
Life expectance at birth (2015)	66.7 (Both sexes), 64.6 (Male), 68.6 (Female)
Neonatal mortality per 1000 live births (2016)	20.6 [15.9-26.7]
Under-five mortality rate per 1000 live births (2016)	47.1 [37.4-59.9]
Infant mortality rate per 1000 live births (2015)	34.8 [30.2-40.2]
Maternal mortality ration per 100 000 live births (2015)	315 [214 - 468]
Lifetime risk of maternal death (1 in N) (2010)	54
Total fertility rate (per woman) (2011)	4.7
Stillbirth rate (per 1000 total births) (2009)	34
Adolescent birth rate (per 1000 women) (2010)	93
% DTP3 Immunization coverage among 1-year-olds (2016)	93
% Births attended by skilled health workers (2006)	53.2 (2006)
Infants exclusively breastfed for first 6 months of life (%) (2006)	33.3 (2006)
Density of physicians per 1000 population (2010)	0.061 (2010)
Density of nurses and midwives per 1000 population (2010)	0.43
Total expenditure on health as % GDP (2014)	4.66
General govt. expenditure on health as % of total government expenditure (2014)	8.04
Private expenditure on health as % of total expenditure on health (2014)	48.17
Adult (15+) literacy rate total (2007-2012)	50
Population using improved drinking-water sources (%) (2012)	74 (Total), 60 (Rural), 92 (Urban)
Population using improved sanitation facilities (%) (2017)	48 (Total), 65.4 (Urban), 33.8 (Rural)
Poverty headcount ratio at $1.25 a day (PPP) (% of population) (2011)	29.6
Human Development Index rank (2014)	170

Table 2. Summary of intervention package to address the epidemiological issues responsible for maternal and under-five mortality among the poorest population in Senegal

Intervention package	Description
Family care practices	
WASH	Improved water source Hand washing with soap
ITNs/Environmental safety	ITN/IRS - ownership of insecticide treated bednets (ITN) or household protected by indoor residual spraying
Neonatal & infant feeding & care	Exclusive breastfeeding
Preventive services	
Immunization plus	DTP3 Measles
Curative services	
Integrated Management of Neonatal & Childhood Illness (IMNCI)	Oral antibiotics for neonates
Delivery by skilled professional	Clean birth practices
Emergency Obstetric and Newborn Care (EMONC)	Case management of severe neonatal infection

Table 3. Description of the EQUIST coverage determinants, bottleneck, cause of the bottleneck and recommendations to address them.

Coverage Determinant	**Bottleneck**	**Cause of bottleneck**	**Strategy to address bottleneck**
Supply condition for utilization			
Availability of commodity	Availability of commodities	Delayed or insufficient procurement	Ensure timely and adequate procurement
		Inadequate storage and distribution	Ensure adequate storage and distribution
		Inadequate equipment for local storage and distribution	Improve equipment for local storage and distribution
Availability of human resources	Accessibility	Inadequate numbers/distribution of access points/ facilities	Increase the number and improve distribution of access points/facilities
		Inadequate accountability	Ensure accountability mechanisms
Geographical accessibility	Accessibility	Contextual challenges (insecurity, informal settlements, difficult terrain, nomadism)	Strategies for accessing hard-to-reach areas
Demand conditions for utilization			
Financial affordability	Affordability	Direct financial barriers (OOP at point of service)	Reduce direct financial barriers (OOP at point of service)
		Indirect financial barriers (transport, opportunity costs, etc.)	Reduce indirect financial barriers
Sociocultural acceptability	Acceptability	Lack of awareness and misconceptions regarding interventions/practices	Improve knowledge and awareness about key health behaviours
		Weak social support for desirable practices (traditional beliefs and social norms)	Improve social support for desirable practices
Measures of coverage			
Initial utilization	-	-	-
Adequate coverage	Continuity	Lack of awareness/ misconceptions about the importance of timely and continued care-seeking	Improve knowledge and awareness about timeliness and continuity of care seeking and family practices
		Inadequate management/ incentives for providers	Incentive mechanisms for providers for continuity and timeliness
Effective coverage	Quality	Provider lacking required equipment or infrastructure	Adequate equipment or infrastructure
		Provider lacking motivation to ensure quality of care	Monitoring, motivation and accountability mechanisms to ensure quality of care

Table 4. Description of the EQUIST coverage enabling environment and strategies to address bottlenecks.

EQUIST coverage enabling environment	
Enabling environment	**Causes**
Social Norms	Limited decision power of pregnant women and mothers Misconceptions about origin of disease and effectiveness of interventions Entrenched preference for traditional methods/practitioners
Legislation / Policy	Outdated policies/strategies (excludes current technologies/good practices) Inadequate/unclear policies/strategies Ineffective regulation for private providers
Budget / Expenditure	Insufficient/inadequate allocation due to low political priority Unpredictable/ insufficient flow of funds to lower levels Excessive dependency on donors
Management / Coordination	Inadequate/lacking mechanisms for coordination of partners/stakeholders Weak management capacities and processes Unclear institutional leadership and accountabilities
EQUIST strategies to address bottlenecks and their causes	
Strategies	**Description**
Financing	Vouchers Health insurance Supply-side financial incentives Conditional cash transfers
Service Delivery	Service integration Building/rehabilitations of facilities Quality improvement Community education and outreach
Medical products, vaccines and technologies	Pharmaceutical stock management Ensure timely procurement of key commodities Pharmaceutical cost control
Health workforce	Redeployment/relocation of existing staff Pre-service training and recruitment of new staff Task sharing/task shifting Leadership and Management training
Governance/ Leadership	Health System Accountability
Information	Patient reminders Health information systems strengthening

Table 5. Under-five and Neonatal mortality by Sub-National Regions, Wealth and Residence (IGME) in Senegal (2014 DHS)

Parameter	National Average Deaths/1000 live births	By Sub-National Region Deaths/1000 live births (Number of deaths)		By Resident Deaths/1000 live births (Number of deaths)		By Wealth Deaths/1000 live births (Number of deaths)	
		Highest	Lowest	Rural	Urban	Poorest	Richest
Under-five mortality	50	Diourbel: 86(5,922)	Dakar: 38(3,660)	71(25,950)	41(7,938)	85(11,328)	26(2,397)
Neonatal mortality	22	Diourbel: 42(2897)	Ziguinchor: 18(599)	28(10359)	17(3326)	28(3785)	12(1158)

Table 6. Under-five, neonatal and maternal mortality numbers by six major Epidemiological Causes in Senegal (2014 DHS)

Under-five mortality numbers by six major Epidemiological Causes

Situational description	Neonatal causes	Injuries	Malaria	Meningitis	Pneumonia (U5)	Diarrhoea (U5)
Diourbel	2317	306	1094	84	843	457
Dakar	1570	188	682	51	515	162
Rural	10359	1340	4566	370	3358	2354
Urban	3327	416	1448	114	1113	416
Poorest	3785	565	1993	171	1654	1576
Richest	1158	113	420	29	321	67

Neonatal mortality numbers by six major Epidemiological Causes

Situational description	Congenital	Tetanus	Prematurity	Asphyxia	Pneumonia	Sepsis
Diourbel	327	94	890	861	145	431
Kedougou	23	5	65	64	19	48
Rural	1069	326	2951	2867	674	1981
Urban	447	112	1125	1005	100	329
Poorest	344	114	987	979	296	906
Richest	158	35	398	347	32	113

Maternal mortality numbers by six major Epidemiological Causes

Situational description	Ante-partum	Intra-partum	Post-partum	Hyperten-sive	Maternal sepsis	Complicated abortion
Dakar	29	28	28	44	34	25
Kedougou	2	2	2	3	2	2
Rural	108	106	106	166	127	93
Urban	58	57	57	89	68	50
Poorest	39	39	39	61	46	34
Richest	27	27	27	42	32	24

Table 7. Percentage of health intervention effective coverage by residence and wealth in Senegal (2014 DHS)

Situational description	Family Care Practices			Preventive Services	Curative Services		
	WASH (Improved water source)	ITNs (ITN ownership)	NIF (Excl breast feeding)	Immunization Plus (DTP3)	IMNCI (Oral antibiotic case mgt)	Delivery by skilled professionals (Essential care)	EMONC (Case Mgt of prematurity)
National average	81	43	32	89	33	27	7
Rural	72	44	33	89	40	28	3
Urban	91	42	32	89	28	27	4
Poorest	56	38	28	86	34	27	2
Richest	97	33	23	92	40	26	9

Table 8. Avertible deaths among the poorest by epidemiological cause and equity/operational frontier for under-five and maternal mortality in Senegal (2014 DHS)

Main causes of deaths avertible	Frontier	
	Equity	Operational
Under-five mortality		
Malaria	0	1240
Measles	58	16
Pneumonia (U5MR)	250	450
Diarrhoea (U5MR)	1231	998
Tetanus	37	10
Prematurity	509	521
Asphyxia	217	536
Sepsis	547	687
Maternal mortality		
Complicated abortion	10	16
Sepsis	14	19
Hypertensive disorders	16	31
Post-partum haemorrhage	13	22
Intra-partum haemorrhage	2	20
Ante-partum haemorrhage	2	20

Scenario Analysis

Table 9. Amenable deaths among the poorest by epidemiological cause and equity/operational frontier for under-five, neonatal and maternal mortality in Senegal (2014 DHS)

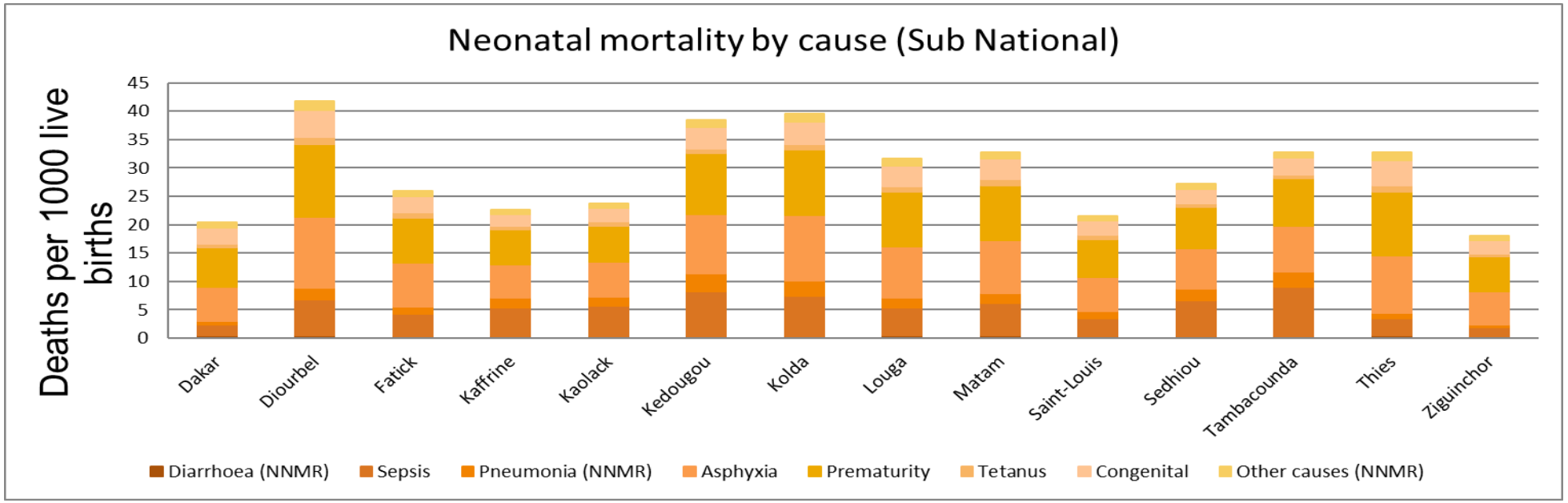
Main causes of deaths avertible	Frontier	
	Equity	Operational
Under-five mortality		
Pneumonia (U5MR)	9	4
Diarrhoea (U5MR)	245	101
Asphyxia	200	393
Malaria	-	-
Sepsis	-	-
Prematurity	54	34
Measles	32	46
Tetanus	-	-
Pertussis	38	40
Neonatal mortality		
Asphyxia	200	393
Sepsis	-	-
Prematurity	54	34
Pneumonia (NNMR)	-	-
Diarrhoea (NNMR)	-	-
Tetanus	-	-
Maternal mortality		
Ante-partum haemorrhage	2	14
Intra-partum haemorrhage	2	14
Post-partum haemorrhage	2	14
Hypertensive disorders	3	15
Sepsis	-	-

Table 10. Amenable deaths among the poorest by intervention package and equity/operational frontier for under-five and maternal mortality in Senegal (2014 DHS)

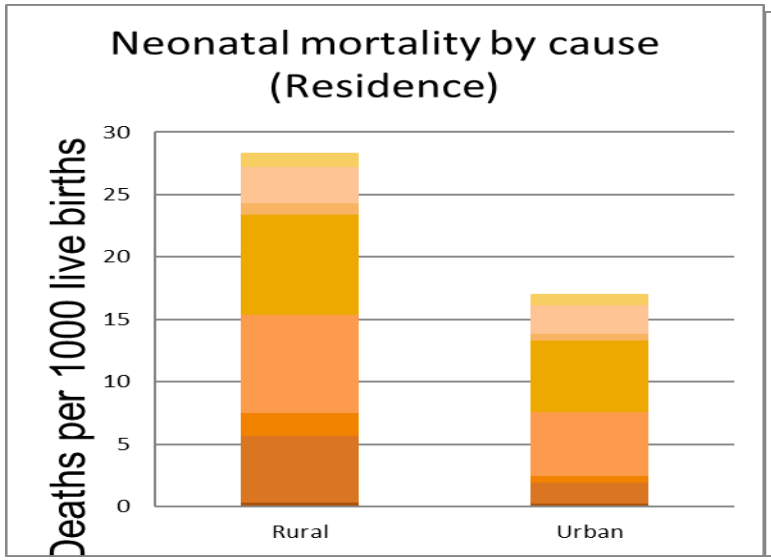
Main intervention package	Frontier	
	Equity	Operational
Delivery by skilled professional	254	426
IMNCI	-	-
ITNs/Environmental safety	-	-
WASH	265	109
Immunization plus	67	86
Amenable maternal deaths by package and equity/operational frontier among the poorest		
Delivery by skilled professional	10	61

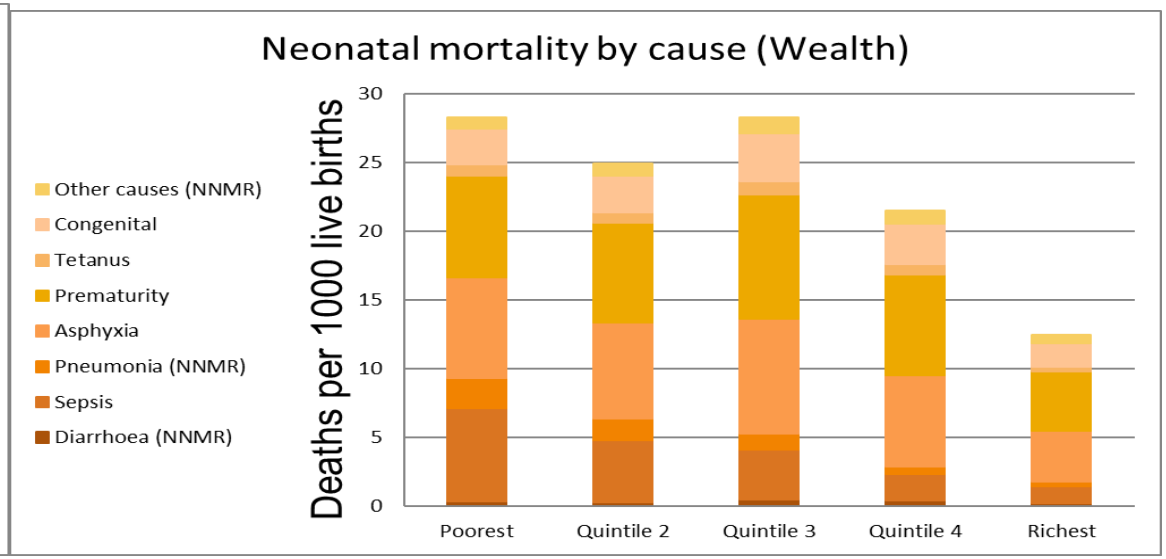
Table 11. Cost of intervention in USD ($) to avert mortality among the poorest by in Senegal (2014 DHS)

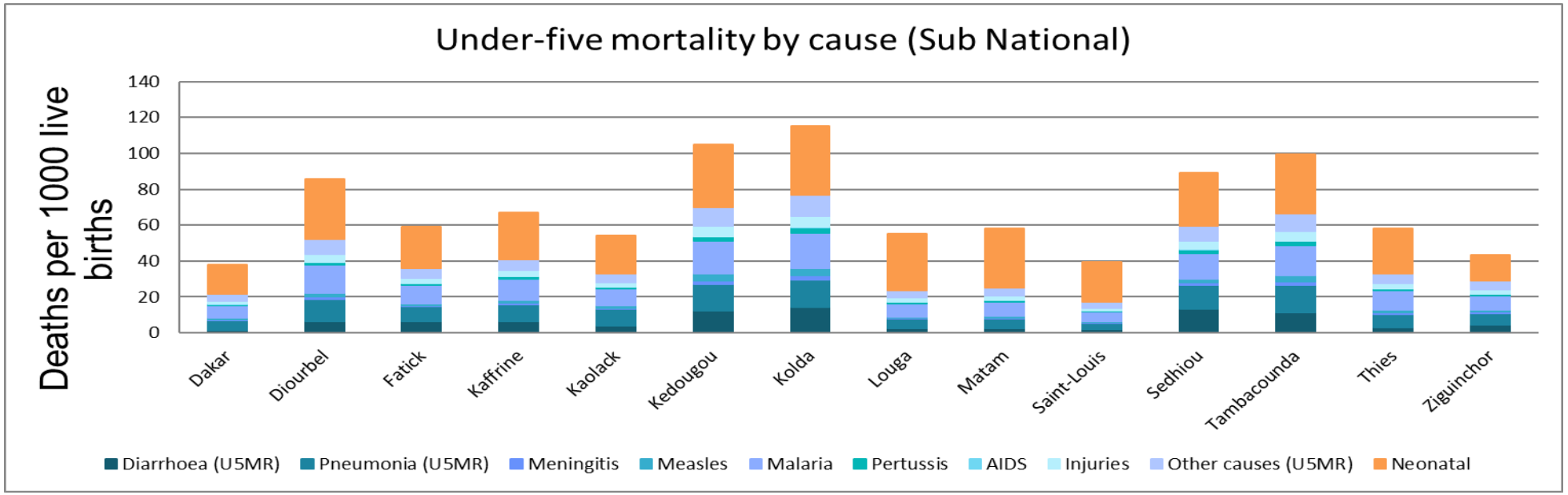
Intervention strategy	**Cost**
Conditional cash transfer	987,425
Vouchers	987,425
Health insurance	987,425
Supply-side financial incentives	21,681
Pharmaceutical cost control	-
Community education & outreach	230,580
Redeployment/relocation of existing staff	2,209,502
Leadership and management training	42,158
Health systems accountability	42,158
Task-shifting/task sharing	1,104,751
Ensure timely procurement of key commodities	3,027
Pharmaceutical stock management	-
Pre-service training/recruitment	-
Pharmaceutical quality regulation	-
Cost per capita	2.0



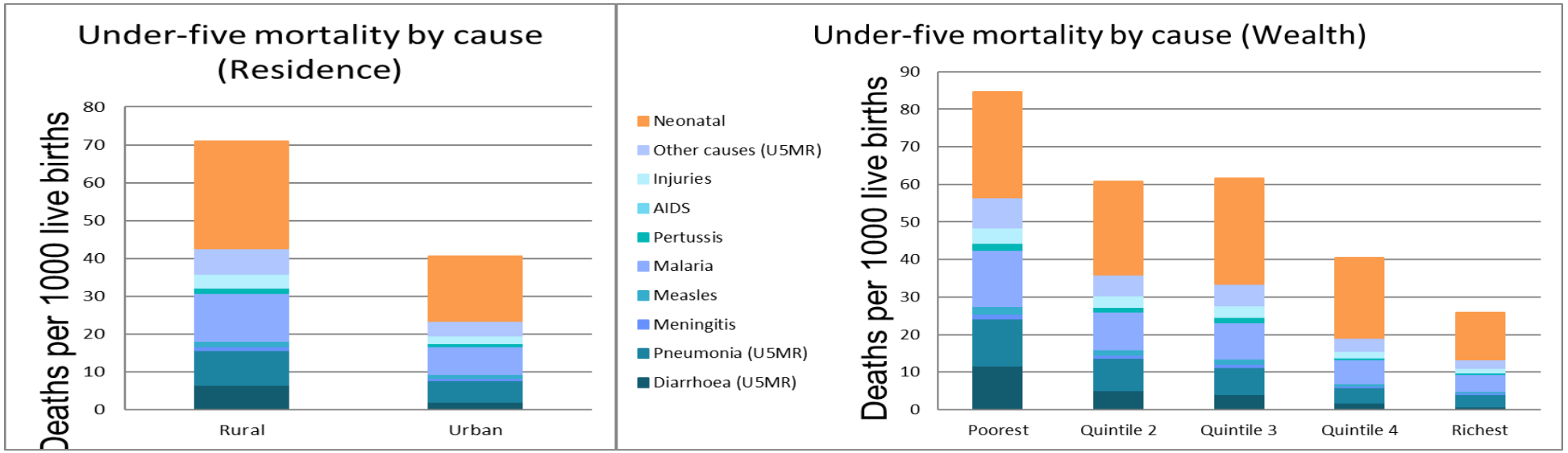
Figures 2-4. Senegal Neonatal mortality by cause (Sub-National) (Figure 2), Residence (Figure 3) and Wealth (Figure 4)

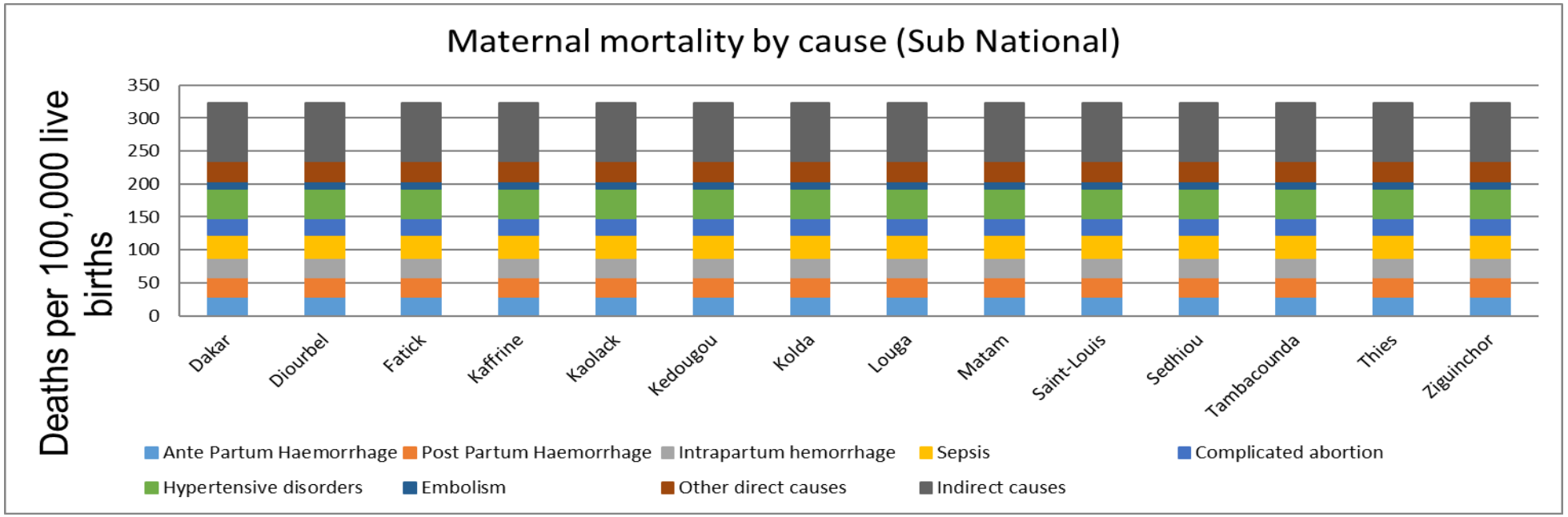




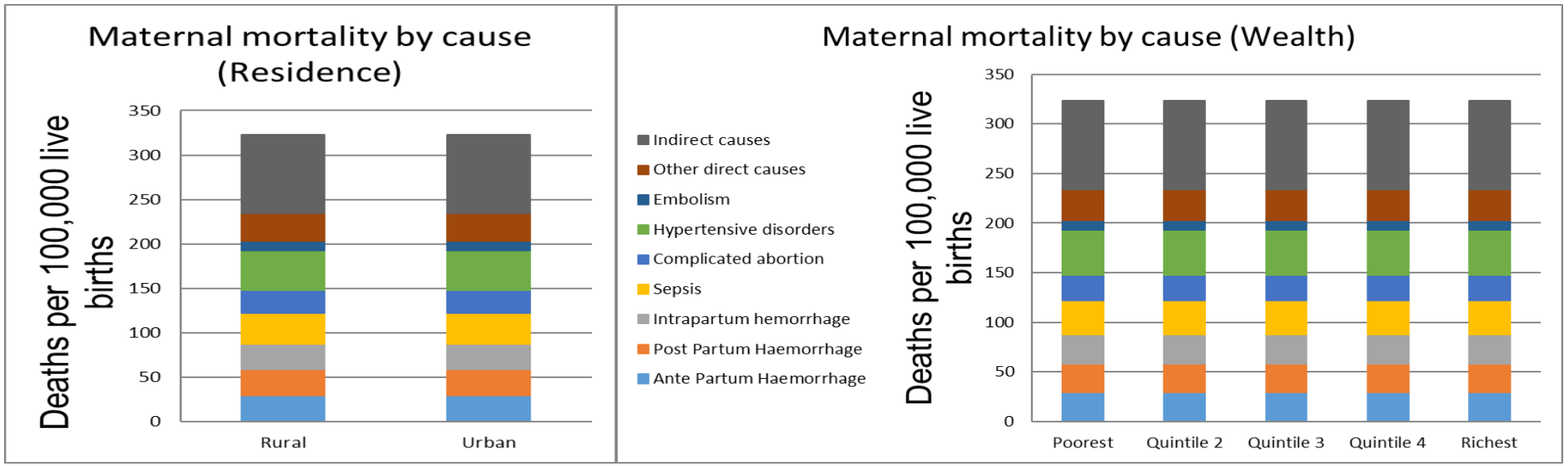


Figures 5-7. Senegal Neonatal mortality by cause (Sub-National) (Figure 5), Residence (Figure 6) and Wealth (Figure 7)





Figures 8-10. Senegal Neonatal mortality by cause (Sub-National) (Figure 8), Residence (Figure 9) and Wealth (Figure 10)



Outcome of EQUSIT Scenario analysis for poorest quintile in Senegal

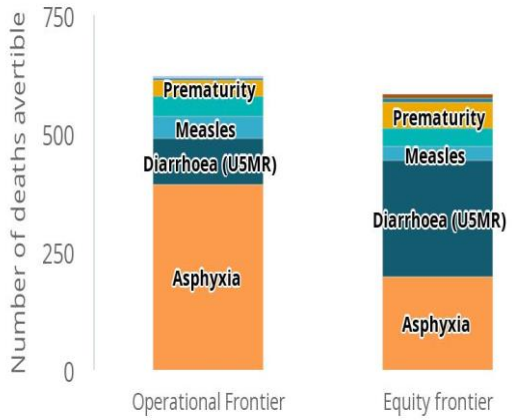


Fig 11. Avertible under-fve mortality by cause

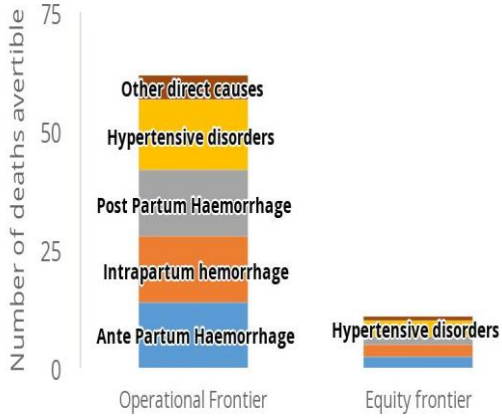


Fig 12. Avertible maternal mortality by cause

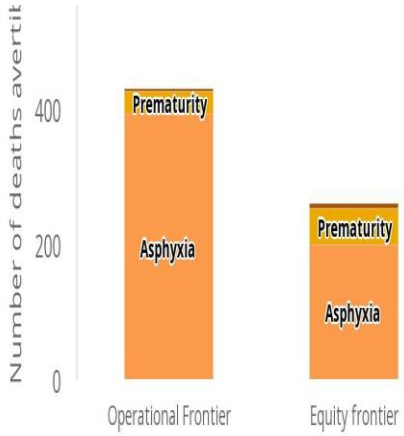


Fig 13. Avertible neonatal mortality by cause

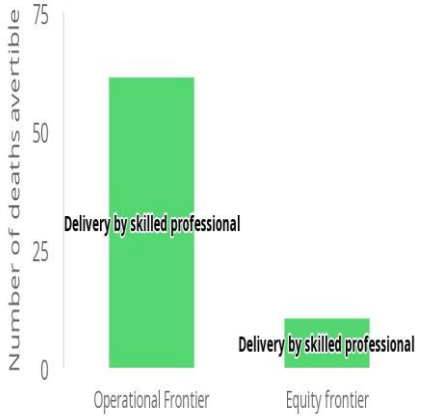


Fig 14. Avertible maternal mortality by intervention package

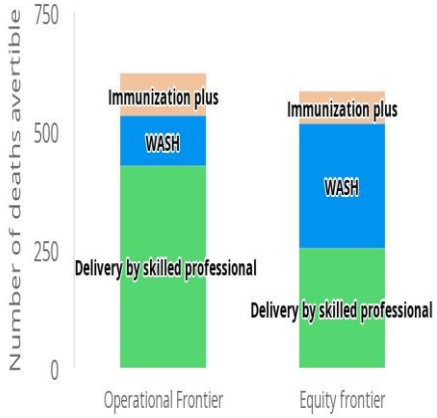


Fig 15. Avertible under-five mortality by intervention package

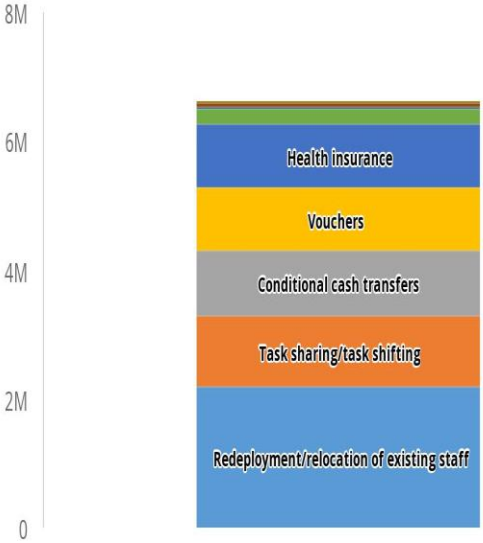


Fig 16. Estimates of cost generation for the analysis

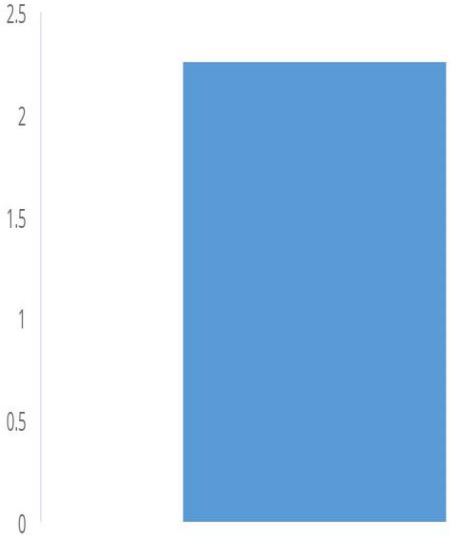


Fig 17. Cost per capta of avertible number of deaths in the scenario

References

1. Wikipedia. 2018. Health in Senegal. https://en.wikipedia.org/wiki/Health_in_Senegal

2. Global Health Observatory. Senegal. May 2016; http://apps.who.int/gho/data/node.cco.ki-MLI?lang=en

3. United Nations Development Programme (UNDP), "MPI (Multidimensional Poverty Index): Headcount (k Greater than or Equal to 3), Population in Poverty (% of population), Human Development Index—2010 Rankings," 2010, http://hdrstats.undp.org/en/indicators/38606.html

4. Technology Integration Division. Senegal in Perspective. 2011. http://fieldsupport.dliflc.edu/products/cip/Senegal/Senegal.pdf

5. World Health Organization (2000). The World health report 2000: health systems: improving performance. Geneva, Switzerland.

6. Dicko H, Konate A. Senegal. WEST AFRICA MONITOR QUARTERLY | ISSUE 5 | JANUARY 2015: 12

7. Fournier P, Dumont A, Tourigny C, Philibert A, Coulibaly A, Traoré M. The free caesareans policy in low-income settings: an interrupted time series analysis in Senegal (2003-2012). PLoS One. 2014 Aug 19;9(8):e105130. doi: 10.1371/journal.pone.0105130. eCollection 2014.

8. Cellule de Planification et de Statistique (Ministère de la Santé), Direction Nationale de la Statistique et de l'Informatique (Ministère du Plan et de l'aménagement du territoire), ORC Macro International(2007). Enquête démographique et de santé du Senegal 2006. Calverton, Maryland, USA: ORC Macro International Inc. 535 p.

9. Ravit M, Philibert A, Tourigny C, Traore M, Coulibaly A, Dumont A, Fournier P. The Hidden Costs of a Free Caesarean Section Policy in West Africa (Kayes Region, Senegal). Matern Child Health J. 2015 Aug;19(8):1734-43. doi: 10.1007/s10995-015-1687-0.

10. El-Khoury, M., Gandaho, T., Arur, A., et al. (2011, April). *Improving access to life-saving maternal health services: The Effect of Removing User Fees for Caesareans in Senegal*. Bethesda, MD: Health Systems 20/20, Abt Associates Inc.

11. You D, Jones G, Hill K, Wardlaw T, Chopra M. Levels and trends in child mortality, 1990 – 2009. Lancet. 2010; 376: 931-933.

12. United Nations Children's Fund, *Progress for Children: Achieving the MDGs with equity*, No. 9, UNICEF, New York, 2010.

13. Carrera C, Azrack A, Begkoyian G, Pfaffmann J, Ribaira E, O'Connell T, Doughty P, Aung KM, Prieto L, Rasanathan K, Sharkey A, Chopra M, Knippenberg R; UNICEF Equity in Child Survival, Health and Nutrition Analysis Team. The comparative cost-effectiveness of an equity-focused approach to child survival, health, and nutrition: a modelling approach. Lancet. 2012 Oct 13;380(9850):1341-51. doi: 10.1016/S0140-6736(12)61378-6. Epub 2012 Sep 20.

14. UNICEF (2017). Narrowing the Gaps: The power of investing in the poorest children. New York, NY 10017, USA. https://www.unicef.org/lac/NarrowingtheGaps_English(4).pdf

15. Waters D, Theodoratou E, Campbell H, Rudan I, Chopra M. Optimizing community case management strategies to achieve equitable reduction of childhood pneumonia mortality: An application of Equitable Impact Sensitive Tool (EQUIST) in five low- and middle-income countries. J Glob Health. 2012;2(2):020402.

16. UNICEF, World Bank. Marginal budgeting for bottlenecks. UNICEF, 2010. Available from: http://www.who.int/pmnch/topics/economics/costingtools_resources/en/index.html Accessed: 15 June 2012.

17. Evans DB, Edejer TT-t, Adam T, Lim SS. Methods to assess the costs and health effects of interventions for improving health in developing countries. BMJ. 2005;331:1137–40. doi: 10.1136/bmj.331.7525.1137. [PMC free article] [PubMed] [Cross Ref]

18. Fox MJ, Martorell R, van den Broek N, Walker N. Assumptions and methods in the Lives Saved Tool (LiST). BMC Public Health. 2011;11(Suppl 3):I1. doi: 10.1186/1471-2458-11-S3-I1. [PMC free article] [PubMed] [Cross Ref]

19. UNICEF Global. EQUIST Equitable strategies to save lives. 2016. Available at: http://www.communitysystemsfoundation.org/uploads/1/9/9/2/19920247/[p0425]_unicef_hq_equist_admt_ii_r2.pdf (Accessed July 4, 2017).

20. UNICEF. EQUIST: a tool to maximize the impact and equity of health policies on children and women in developing countries. 2017. Available at: https://www.ungm.org/UNUser/Documents/DownloadPublicDocument?docId=442257. (Accessed July 4, 2017).

21. United Nations Development Group (UNDG). Equitable Impact Sensitive Tool (EQUIST). 2016. https://undg.org/sdg_toolkit/equitable-impact-sensitive-tool-equist/

22. UNICEF Approach to Health Systems Strengthening- A Resource Paper for the UNICEF Strategy for Health 2016-2030. New York. 2016

23. UNICEF. User guide EQUIST: Equitable impact sensitive tool-Analyst & general user. 2018. http://www.equist.info/files/general_files/User_Guide.pdf

24. Black RE, Walker N, Laxminarayan R, Temmerman M. Reproductive, Maternal, Newborn, and Child Health: Disease Control Priorities, Third Edition (Volume 2). Washington (DC): The International Bank for Reconstruction and Development / The World Bank; 2016.

25. Santi E, Weigert M. The health sector in west Africa. West Africa Monitor Quarterly | ISSUE 5 | JANUARY 2015: 19-37

26. Lassi ZS, Salam RA, Das JK, Bhutta ZA. Essential interventions for maternal, newborn and child health: backgroundand methodology. Reprod Health. 2014;11 Suppl 1:S1. doi: 10.1186/1742-4755-11-S1-S1. Epub 2014 Aug 21.

27. The Partnership for Maternal Health, Newborn and Child Health and the Aga Khan University. Essential Interventions, Commodities and Guidelines for Reproductive, Maternal, Newborn and Child Health. 2011
http://www.who.int/pmnch/topics/part_publications/essential_interventions_18_01_2012.pdf?ua=1

28. The Partnership for Maternal, Newborn and Child Health. Opportunities for Africa's newborns: Practical data, policy and programmatic support for newborn care in Africa. 2006
http://www.who.int/pmnch/media/publications/oanfullreport.pdf

29. WHO (2018). Achieving the health-related MDGs. It takes a workforce!
http://www.who.int/hrh/workforce_mdgs/en/

30. Jimenez Soto E, La Vincente S, Clark A, Firth S, Morgan A, Dettrick Z, et al. (2012) Developing and Costing Local Strategies to Improve Maternal and Child Health: The Investment Case Framework. PLoS Med 9(8): e1001282.

31. Fryatt R, Mills A, Nordstrom A (2010) Financing of health systems to achieve the health Millennium Development Goals in low-income countries. Lancet 375: 419–426.

32. Gülmezoglu AM, Lawrie TA, Hezelgrave N, et al. Interventions to Reduce Maternal and Newborn Morbidity and Mortality. In: Black RE, Laxminarayan R, Temmerman M, et al., editors. Reproductive, Maternal, Newborn, and Child Health: Disease Control Priorities, Third Edition (Volume 2). Washington (DC): The International Bank for Reconstruction and Development / The World Bank; 2016 Apr 5. Chapter 7. Available from: https://www.ncbi.nlm.nih.gov/books/NBK361904/ doi: 10.1596/978-1-4648-0348-2_ch7

33. Waiswa P, Akuze J, Peterson S, Kerber K, Tetui M, Forsberg BC, Hanson C. Differences in essential newborn care at birth between private and public health facilities in eastern Uganda. Glob Health Action. 2015 Mar 31;8:24251. doi: 10.3402/gha.v8.24251. eCollection 2015.

34. Okonkwo J, Ibeh C. The contribution of privately owned hospitals in the provision of essential obstetric care in Nigeria. Niger J Clin Pract. 2006;9:159–63. [PubMed]

35. Osubor K, Fatusi A, Chiwuzie J. Maternal health-seeking behavior and associated factors in a rural Nigerian community. Matern Child Health J. 2006;10:159–69. [PubMed]

36. Limwattananon S, Tangcharoensathien V, Sirilak S. Trends and inequities in where women delivered their babies in 25 low-income countries: evidence from demographic and health surveys. Reprod Health Matters. 2011;19:75–85. [PubMed]

37. Peters DH, Mirchandani GG, Hansen PM. Strategies for engaging the private sector in sexual and reproductive health: how effective are they? Health Policy Plann. 2004;19:i5–21. [PubMed]

38. Mason E, McDougall L, Lawn JE, Gupta A, Claeson M, Pillay Y, et al. From evidence to action to deliver a healthy start for the next generation. Lancet. 2014;384:455–67. [PubMed]

39. Forum on Engaging the Private Sector in Child Health. Meeting Report, 30th November – 2nd December 2005, Munyonyo, Uganda. 2005. London, UK and Arlington, Va., USA: conducted by the Malaria Consortium and the Academy for Educational Development for the United States Agency for International Development, the World Health Organization and the World Bank.

40. Adei D, Osei Kwadwo V, Diko SK (2012). An Assessment of the Kwabre District Mutual Health Insurance Scheme in Ghana. Current Research Journal of Social Sciences 4(5): 372-382.

41. Holzmann, R. and S. Jorgensen, 2000. Social Risk Management: A New Conceptual Framework for Social Protection and Beyond. Social Protection Discussion Paper No. 0006. The World Bank, Washington, DC

42. Uzochukwu BSC, Onwujekwe OE, Eze Soludo, Ezuma Nkoli, Obikeze EN, Onoka CA (2009). Community Based Health Insurance Scheme in Anambra State, Nigeria: an analysis of policy development, implementation and equity effects. Consortium for Research on Equitable Health Systems (CREHS) London School of Hygiene and Tropical Medicine, Keppel Street, London, UK.

43. Bennett S, Kelley AG, Silvers B, Gadhia R and Salamata Ly. (2004). "21 Questions on CBHF: An Overview of Community-Based Health Financing". Bethesda, MD: Abt Associates. Partners for Health Reformplus (PHRplus).

44. Diop, PF, S, Sulzbach, S, Chankova (2006) '*The Impact of Mutual Health Organizations on Social Inclusion, Access to Health Care, and Household Income Protection: Evidence from Ghana,Senegal, and Benin '*. Bethesda, MD; The Partners for Health Reformplus Project, Abt Associates,Inc. www.PHRplus.org.

45. Bhat R, Menezes L, Avila C (2017). Annapurna Pariwar Community/Mutual Health Insurance Program: A Case Study in Maharashtra India. Bethesda, MD: Health Finance and Governance Project, Abt Associates Inc.

46. Jutting, Johannes (2003) 'Do Community-based Health Insurance Schemes Improve Poor People's Access to Health Care? Evidence from Rural Senegal', World Development
Vol. 32, No. 2, pp. 273–288, Elsevier Ltd [http://www.oecd.org/dev/poverty/24670935.pdf]

47. Bhutta ZA1, Black RE. Global maternal, newborn, and child health--so near and yet so far. N Engl J Med. 2013 Dec 5;369(23):2226-35. doi: 10.1056/NEJMra1111853.

48. Bocquier P, Beguy D, Zulu EM, Muindi K, Konseiga A, Yé Y. Do migrant children face greater health hazards in slum settlements? Evidence from Nairobi, Kenya. J Urban Health 2011;88:Suppl 2:S266-S281.

49. WHO. Children: reducing mortality. Fact sheet. 2017.
http://www.who.int/mediacentre/factsheets/fs178/en/

50. Bhutta ZA, Lassi ZS, Pariyo G, Huicho L. Global experience of community health workers for delivery of health related millennium development goals: a systematic review, country case studies, and recommendations for integration into national health systems. Geneva: World Health Organization, 2010.

51. Bassani DG, Arora P, Wazny K, Gaffey MF, Lenters L, Bhutta ZA. Financial incentives and coverage of child health interventions: a systematic review and metaanalysis. BMC Public Health 2013;13:Suppl 3:S30.

52. Filippi V, Chou D, Ronsmans C, et al. Levels and Causes of Maternal Mortality and Morbidity. In: Black RE, Laxminarayan R, Temmerman M, et al., editors. Reproductive, Maternal, Newborn, and Child Health: Disease Control Priorities, Third Edition (Volume 2). Washington (DC): The International Bank for Reconstruction and Development / The World Bank; 2016 Apr 5. Chapter

3. Available from: https://www.ncbi.nlm.nih.gov/books/NBK361917/ doi: 10.1596/978-1-4648-0348-2_ch3

53. WHO (World Health Organization). 2013. Maternal Death Surveillance and Response Technical Guidance: Information for Action to Prevent Maternal Death. Geneva: WHO..

54. MDG. Improve Maternal Health. 2004. https://www.unicef.org/mdg/maternal.html

55. United Nations Foundation. Private Sector Action for Women's Health and Empowerment. How Businesses Can Invest in Women and Realize Returns. 2017. https://www.bsr.org/reports/Private_Sector_Action_For_Womens_Health_Empowerment_Brief.pdf

56. Freedman L P. 2001. "Using Human Rights in Maternal Mortality Programs: From Analysis to Strategy." International Journal of Gynecology and Obstetrics 75 (1): 51–60.

57. PMNCH (Partnership for Maternal, Newborn Child Health). 2013. Human Rights and Accountability. Knowledge Summaries 23: Women's and Children's Health. Geneva: PMNCH.

58. Bandali S., Thomas C., Hukin E., Matthews Z., Mathai M., Ramachandran D.T., et al.Maternal Death Surveillance and Response Systems in driving accountability and influencing change. *Int J Gynecol Obstet*. 135(3): 2016; 358–364

59. Improve Data & Accountability for Girls and Women. Facts, Solutions, Case Studies, and Policy Recommendations. Policy Brief. http://womendeliver.org/wp-content/uploads/2017/09/Deliver_For_Good_Brief_11_09.17.17.pdf

60. Martin Hilber A, Blake C, Bohle LF, Bandali S, Agbon E, Hulton L. Strengthening accountability for improved maternal and newborn health: A mapping of studies in Sub-Saharan Africa. Int J Gynaecol Obstet. 2016 Dec;135(3):345-357. doi: 10.1016/j.ijgo.2016.09.008. Epub 2016 Oct 14.

61. Fortney JA. Editorial: Accountability in maternal and neonatal health programs. Int J Gynaecol Obstet. 2016 Dec;135(3):343-344. doi: 10.1016/j.ijgo.2016.09.009. Epub 2016 Oct 15.

62. World Health Organization. Every Woman, Every Child: a post 2015 vision. The third report of the independent Expert Review Group of the Commission on Information and Accountability for Women's and Children's Health, WHO, Geneva, Switzerland (2014)

63. Filippi V, Chou D, Ronsmans C, et al. Levels and Causes of Maternal Mortality and Morbidity. In: Black RE, Laxminarayan R, Temmerman M, et al., editors. Reproductive, Maternal, Newborn, and Child Health: Disease Control Priorities, Third Edition (Volume 2). Washington (DC): The International Bank for Reconstruction and Development / The World Bank; 2016 Apr 5. Chapter 3. Available from: https://www.ncbi.nlm.nih.gov/books/NBK361917/ doi: 10.1596/978-1-4648-0348-2_ch3

64. Commission on Information and Accountability for Women's Children's Health. 2011. Keeping Promises, Measuring Results. Geneva: WHO.

65. Independent Expert Review Group. Every Woman, Every Child: A post2015 vision. The Third Report of the Independent Expert Review Group on Information and Accountability for Women's and Children's Health. Geneva: WHO; 2014 http://apps.who.int/iris/bitstream/10665/132673/1/9789241507523_eng.pdf.

66. Hounton S, De Bernis L, Hussein J, Graham WJ, Danel I, Byass P, et al. Towards elimination of maternal deaths: maternal deaths surveillance and response. Reprod Health 2013;10:1.