COST-BENEFIT ANALYSIS OF HEALTH ACCESS IN GHANA

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ACADEMIC ABSTRACT

This paper undertakes a cost-benefit analysis of a range of interventions that are aimed at improving Ghana's health sector. The interventions are the transfer of payment of health insurance premiums from the poor to the non-poor; maintaining and operating emergency ambulance system and implementing incentive schemes to encourage more health services in poor and hard to reach areas. The results of our analysis show that all interventions could prevent significant adverse health outcomes across the country. An expansion of insurance for 2.7m poor Ghanaians who currently lack an insurance card, would avoid 1,728 deaths as well as a staggering 25,500 years lost to disability per year across Ghana. Maintaining and operating the ambulance network in rural areas is expected to avoid 1,918 deaths per year in, mostly from avoided neonatal deaths. Incentive schemes would incentivize between 44 to 207 doctors to move to rural areas in the three northern regions of the country, where 2.3m people reside and are currently served by only 116 doctors. The provision of doctors is expected to avoid 75 to 360 deaths per year in these areas. In terms of benefit-cost ratios, the deprived area incentive schemes have high returns on investment spanning a range of 17-26; ambulance networks also have a large BCR around 21, while insurance targeting has a BCR around 2. The quality of evidence used to estimate these ratios is generally of limited quality. Unfortunately, for the primary effect sizes used in this analysis, we could not identify and draw upon studies that adopted experimental or quasi-experimental research methods. Furthermore in many cases, we had to rely on studies outside of the Ghanaian context. As such, caution is required in interpreting the results of this paper.

Key words: health insurance premiums, rural emergency transportation systems, incentives allowances, disease surveillance, health access

POLICY ABSTRACT

The Problem

The health status of Ghanaians has evolved over time, from predominant inflictions from infectious diseases and negative maternal and child health outcomes that prevailed at the time of independence in the late 1950s, to the addition of non-communicable diseases (NCDs) such as hypertension, stroke, diabetes, cancers, etc. that prevail in present times. Indeed, according to the IHME (2017), stroke was one of the top ten causes of Disability Adjusted Life Years (DALYs) in the country.

Disease patterns in Ghana often differ across age, gender, location and socioeconomic status. Malaria, for example, has led to high mortality among children less than 5 years of age. Maternal health problems have also been more dominant among poorer, rural women and those resident in the northern regions of the country. Although maternal and child mortality rates have decreased over time (e.g. in 1990 the maternal mortality ratio was 600 per 100,000 live births, in 2017, 310 per 100,000 (2017 Ghana Maternal Health Survey); in 1990 the child mortality rate was 128.2 per 1000 live births, in 2017, 55.6 deaths per 1,000 live births), the current rates remain higher than other countries with similar socio-economic backgrounds (MoH, 2015). Other diseases like trachoma, onchocerciasis, lymphatic filariasis (LF), schistosomiasis and soil-transmitted helminthes are also particularly dominant among poor communities in Ghana, with a higher incidence observed among women (Allotey and Gyapong, 2005). Non-communicable diseases (NCD) tend to be more prominent among adults in their reproductive ages; diabetes is more prominent among men in the country while obesity is more pronounced among women (Agyemang et al., 2016).

This co-existence of infectious and non-communicable diseases with differential prevalence and impacts among individuals of varying social classes has implications for health care delivery and indeed, the double burden of infectious and NCDs present a challenge for the current health care system. There is a general consensus in Ghana, and in many other developing country contexts, that majority of health problems observed are experienced by the poor (Bukhman et al., 2015). First, poor households experience the most catastrophic healthcare expenditures (Surhcke et al., 2006); Second, the poor live in less safe and sanitary environments with increased likelihoods of disease infestations; Third, the poor have limited social support systems (de-Graft Aikins and Koram, 2017); Fourth, the poor lack participatory

power in changing community and health systems (Greif et al., 2011; Capewell and Graham, 2010).

The situation has contributed to political and policy responses in an attempt to deal with both changing dynamics of health and its differential impacts. This paper discusses a range of interventions that are aimed at improving Ghana's health sector through the analyses of their corresponding costs and benefits. The results presented will help to provide evidence-based rationale for investments in high-priority areas that are likely to improve both health care and welfare outcomes within the country.

Intervention 1: Improve targeting of NHIS premiums to ensure richer individuals pay higher premiums and abolish user fees and annual premium payments in deprived communities

Overview

The establishment of a health insurance scheme was borne out of the desire to abolish the 'cash and carry' system that characterized the health system where patients were required to make initial payments before receiving health care services. Before the advent of the National Health Insurance Scheme (NHIS), many Ghanaians were unable to access quality health care services as a result of high user fees (Nyonator and Kutzin, 1999; Asenso-Okyere et al., 1998; Hutchful, 2002). The NHIS was introduced to address the inequality in health care access by reducing out-of-pocket payments, particularly among the poor. Recent assessments of the scheme however indicate that poor households are not adequately covered under the scheme despite heavily subsidized premiums (Aryeetey et al., 2011; Kotoh and Van der Geest, 2016). The abolishment of user fees and annual premium payments in deprived communities and among poor households may be expected to affect both the demand for health care and subsequently, health outcomes among this segment of the population.

Standard economic theory posits that health insurance coverage induces greater medical care use by reducing the cost of care to patients . Insurance may also influence the quality of health services through provider accreditation processes, modes of provider payment, and, more generally, by ensuring consistent flows of funding to providers. All other things being equal, therefore, those affected by the removal of health insurance premiums should experience fewer financial barriers to access and therefore use more health care. We further speculate that health status is likely to improve as a result of increased access to health care.

Implementation Considerations

Currently 23% of the country is classified as poor or approximately 7 million people. Of these some 2.7 million people do not have health insurance. The intervention calls for a registration drive to insure the remaining poor, plus the transfer of registration payments of GH¢30 and premium fees of GH¢6 from the 23% of Ghana's population that is poor to the non-poor segment of the population. The costs of the intervention include the initial registration drive, increased premium payment by the rich, in addition to increased expenditure by the National Health insurance Authority (NHIA) as a result of the presumed increased health demand by the poor. Benefits of the intervention include declines in all-cause mortality, in addition to a decline in morbidity.

Costs and Benefits

We use data from a number of different sources in computing the corresponding costs and benefits of this intervention, including claims expenditures from the National Health insurance Authority and mortality and health data from the Institute for Health Metrics and Evaluation.

In the first year, it is assumed that a registration drive to find and enroll the remaining poor will cost GH¢ 27m. After this, the costs of the intervention include the transfer of premiums of GH¢ 212m plus increased health expenditures of the newly enrolled of GH¢ 603m per year. The total cost of the intervention over 10 years is estimated at GH¢ 5.8bn or an equivalent annualized cost of 872m per year. Increased health expenditures by the newly enrolled dominate the cost profile.

The intervention is expected to avoid 1,728 deaths as well as a staggering 25,500 years lost to disability annually. The total benefits of the intervention over a 10 year period are estimated at GH¢ 12.1bn or an annualized value of GH¢ 1.8bn.

Intervention 2: Maintain ambulance and emergency transportation systems in rural communities

Overview

Access to formal health care is a critical characteristic of an efficient and well-integrated health care delivery system. In most developing countries, however, there may be interruptions that hamper access to such care. These interruptions, according to Thaddaeus and Maine (1994) may be due to delays in the decision to seek formal care, delays in reaching the health facility

or delays in receiving appropriate treatment at the health facility. Overcoming the second delay of reaching health centres is particularly challenging for the rural population due to the long distance to health facilities and the absence of efficient public transportation in these difficult to reach terrain in remote communities (Sulemana and Dinye, 2014). Moreover, Thind et al. (2015) highlight the potential of such prehospital emergency transportation in addressing the burden of diseases particularly for maternal and child health conditions, as well as trauma and injuries given their high prevalence in such rural communities.

To address this challenge, other developing countries in sub-Sahara Africa have intervened with the use of terrain suitable emergency transportation systems in rural communities, which have yielded positive results, according to the systematic review conducted by Hussein et al. (2012). Evidence from such interventions suggests that improving access to formal health care provides significant benefits with regards to reducing maternal and neonatal mortality. Also, fatalities associated with injuries and acute diseases show significant reductions from such interventions.

Implementation Considerations

The recent distribution of the ambulances to every constituency in the country makes the current analysis timely. Given that the ambulances have already been purchased, the analysis focuses on their maintenance to ensure an effective delivery of health care, particularly to the rural population which is the focus of the analysis. As at 2019, the rural population is estimated at about 44.5 percent of the Ghanaian population.

In this analysis, we consider costs associated with the operation of the ambulance system, including fuel, maintenance and repairs. Also, the analysis considers costs related to the training and remuneration of drivers and paramedics who play a central role in the emergency transport system. To ensure an efficient running of the emergency transport system, the study considers cost associated with the establishment of ambulance stations. These stations serve a dual purpose of being the central holding points of ambulances when they are not in use and for routine maintenance.

Besides these costs which are directly associated with the provision of the emergency transport system, it also anticipated that improved access to health facilities will increase demand for health care and, therefore, health care costs.

Concerning the benefits, we consider reductions in maternal, neonatal mortality and deaths from trauma and injuries based on information provided in studies from Ghana and abroad.

Costs and Benefits

In the first year, the cost of the intervention is GH¢ 385m, of which GH¢ 338m are for the ambulance houses. Thereafter, the annual cost of the intervention is GH¢ 46.5m for continued maintenance and operations, as well as increased health care expenditure. Based on this, the total cost projection for this intervention for the entire rural population in Ghana over 10 years is GH¢ 646 m, or an annualized cost of GH¢ 96m.

The intervention is expected to avoide 1,918 deaths per year due to improved and faster transfer of birthing mothers and trauma victims to health care facilities. The total benefits from the intervention are valued at GH¢ 13,297m across the 10-year projection, for an annualized benefit of GH¢ 1,981 million.

Intervention 3: Implement incentives schemes (such as the Deprived Area Incentive Allowance) to encourage more health services in poor and hard to reach areas.

Overview

Adequate delivery of health care would be difficult without an adequate health workforce. The population density of health care providers in a country directly impacts the provision of health services such as immunization and skilled birth attendance (Anand and Barnighausen, 2004; WHO 2006), and leads to a reverse correlation between health worker density and health outcomes such as infant mortality, maternal mortality and various disease-specific outcomes (Khann et al. 2003). In Ghana, the distribution of health workers is skewed in favor of the more affluent regions, most of which are found in the southern half of the country. In rural areas, the quality of health care delivery is compromised by low staff competencies, poor life-saving skills, poor record keeping, among others (MoH, 2011). There are also rural/urban variations in the coverage of skilled birth attendance: while it is 82% in urban Ghana, it is only 43% in rural Ghana.

Given that close to 50% of Ghana's population resides in rural areas, ensuring access to health care services in these parts of the country is essential to achieving national goals of universal health coverage and equity in the distribution of care. In Ghana and in many other parts of the

developing world, health policymakers and managers are searching for ways to improve the recruitment and retention of staff in remote and deprived areas. The intervention described here assesses the cost-effectiveness of providing various incentives to attract and retain health workers in deprived and rural areas of Ghana.

Implementation Considerations

The intervention seeks to encourage doctors to work in the rural areas of the three northern regions of Ghana where 2.3 million Ghanaians live. Incentives considered include salary top-ups, housing allowances and education scholarships. The analysis assumes that currently the doctor to patient ratio in these areas is 20,000. In other words, there are currently only 116 doctors serving these communities.

Costs and Benefits

The various incentives have different costs and effects. Increasing the base salary by 30% is expected to cost GH¢ 2.3m per year and incentivize 44 more doctors to work in these areas. Providing superior housing is expected to cost GH¢ 13.4m per year and incentivize 207 more doctors to work in the rural north. Lastly, an incentive that provides an education scholarship for four years service, is expected to cost GH¢ 5.0m per year and incentivize 76 more doctors to work in the remote north.

Each new doctor in these regions is assumed to avoid 0.27 and 1.45 maternal and infant deaths respectively (Saluja et al., 2020) within the target population per year. Therefore increasing the base salary by 30% would lead to 75 deaths avoided, providing superior housing would also lead to 357 deaths avoided and an education scholarship, 131 deaths avoided. The benefits are valued at **GH¢59m, GH¢282m** and **GH¢103m** respectively**.** Corresponding BCRs are therefore 25.8, 21.0 and 20.8 for these incentives.

Table 1: Summary BCR Table from all Interventions – Annualized benefits and costs

Interventions	**Annualized Benefit (millions of GH¢)**	**Annualized Cost (millions of GH¢)**	**BCR**	**Quality of Evidence**
NHIS Premiums	1,814	872	2.1	Limited
Maintain emergency transportation systems in rural communities	1,981	96	20.6	Limited
Deprived Area Incentive schemes				
Salary top-ups	59	2	25.8	Limited
Superior Housing	282	13	21.0	Limited
Education scholarship after 4 years	103	5	20.8	Limited

Notes: All Cost and Benefit figures in millions and assume BCR at an 8% discount rate

1 Introduction

The health status of Ghanaians has evolved over time, from predominantly inflictions from infectious diseases and poor maternal and child health outcomes that prevailed at the time of independence in the late 1950s, to the addition of non-communicable diseases (NCDs) such as hypertension, stroke, diabetes, cancers, etc. that prevail in present times. Indeed, according to the IHME (2010), stroke and ischemic heart disease are within the top ten causes of death and disease in the country, as measured by Disability Adjusted Life Years (DALYs).

Disease patterns in Ghana often differ across age, gender, location and socioeconomic status. Malaria, for example, has led to high mortality among children less than 5 years of age. Maternal health problems have also been more dominant among poorer, rural women and those resident in the northern regions of the country. Although maternal and child mortality rates have decreased over time (e.g. in 1990 the maternal mortality ratio was 600 per 100,000 live births, in 2010, 350 per 100,000; in 1990 the child mortality rate was 128.2 per 1000 live births, in 2010, 72 deaths per 1,000 live births), the current rates remain higher than other countries with similar socio-economic backgrounds (MoH, 2015). Other diseases like trachoma, onchocerciasis, lymphatic filariasis (LF), schistosomiasis and soil-transmitted helminthes are also particularly dominant among poor communities in Ghana, with a higher incidence observed among women (Allotey and Gyapong, 2005). Non-communicable diseases (NCD) tend to be more prominent among adults in their reproductive ages; diabetes is more prominent among men in the country while obesity is more pronounced among women (Agyemang et al., 2016).

This co-existence of infectious and non-communicable diseases with differential prevalence and impacts among individuals of varying social classes has implications for health care delivery and indeed, the double burden of infectious and NCDs present a challenge for the current health care system. There is a general consensus in Ghana, and in many other developing country contexts, that the majority of health problems observed are experienced by the poor (Bukhman et al., 2015). First, poor households, because of their low income, often experience health care expenditures that are catastrophic (Surhcke et al., 2006); Second, the poor live in less safe and sanitary environments with increased likelihoods of disease infestations; Third, the poor have limited social support systems (de-Graft Aikins and Koram, 2017); Fourth, the poor lack participatory power in changing community and health systems (Greif et al., 2011; Capewell and Graham, 2010).

The situation has contributed to political and policy responses in an attempt to deal with both changing dynamics of health and its differential impacts. This paper discusses a range of interventions that are aimed at improving Ghana's health sector, through an analysis of their corresponding costs and benefits. These interventions were chosen by a Reference Group of senior Ghanaians as part of the *Ghana Priorities* initializing process. These are:

1. Expanding insurance by transferring the cost of premiums from the poor to the non-poor
2. Expand and maintain terrain appropriate ambulance networks in rural areas
3. Incentivize health care workers to move to remote areas via deprived area allowance schemes

These interventions fall under the broad umbrella of 'improving health systems and access' (and differ, for example from disease specific investigations such as those focusing on malaria, tuberculosis or hypertension). During the course of the study, ambulances purchased under the Infrastructure for Poverty Eradication Program (IPEP) were delivered to all constituencies across the country.[1] As such, the second intervention was adjusted to focus only on maintaining these ambulances and ensuring their continued operation.

The results of our analysis show that all interventions could prevent significant adverse health outcomes across the country. An expansion of insurance for 2.7m poor Ghanaians who currently lack an insurance card, would avoid 1,728 deaths as well as 25,500 years lost to disability per year across Ghana. It would also help around 4.3m poor and already insured Ghanaians collectively save GH¢ 129m in premiums. Annualized benefits are estimated at GH¢ 1.8bn per year.

Maintaining and operating the ambulance network in rural areas is expected to avoid 1,918 deaths per year in rural Ghana, mostly from avoided neonatal deaths, with also some reduction in deaths from trauma and injury and, maternal mortality. The estimated benefits are GH¢ 2.0bn per year.

The paper examines three different deprived area incentive schemes to incentivize doctors to move to remote areas in the three northern regions of the country: increasing the base salary by 30%, providing free housing and providing education scholarships after four years of service.

[1] See: https://www.ghanaweb.com/GhanaHomePage/NewsArchive/Government-ready-to-distribute-307-Ambulances-on-Tuesday-Oppong-Nkrumah-848737

The results indicate that these would incentivize between 44 to 207 doctors to move to rural areas in the three northern regions of the country, where 2.3m people reside and are currently served by only 116 doctors. The provision of doctors is expected to avoid 75 to 360 deaths per year in these areas. The estimated annual benefits are between GH¢ 60-280m per year.

In terms of benefit-cost ratios, the deprived area incentive schemes have high returns on investment spanning a range of 17-26; ambulance networks also have a large BCR around 21, while insurance targeting has a BCR around 2. The quality of evidence used to estimate these ratios is generally of limited to medium quality. Unfortunately, for the primary effect sizes used in this analysis, we could not identify and draw upon studies that adopted experimental or quasi-experimental research methods. Furthermore in many cases, we had to rely on studies outside of the Ghanaian context. As such, caution is required in interpreting the results of this paper.

While the impacts of each intervention are of limited quality, many of the costs adopted in the study are from Ghana. And despite the uncertainty, there is good reason to believe that the BCR with the lowest ratio, insurance retargeting, indeed has the lowest BCR of the three interventions studied. That intervention requires a large transfer from the insured non-poor insured to the poor, and large transfers of this nature naturally drive BCRs lower (since the value of the transfer appears as a benefit and a cost, diluting any other benefits and costs).

Overall, based on the findings of this study, we suggest that Ghana maintains and operates the ambulances already purchased since the BCR could be quite large. Further investigations into the effects of incentives should be conducted, perhaps even with a discrete choice study with Ghanaian doctors, before deploying it as a broad based intervention.

2 Targeting of NHIS Premiums

2.1 Intervention Context and Background Literature

The difficulties with providing equitable and affordable healthcare in Ghana have been acknowledged and documented over time. The establishment of a health insurance scheme was borne out of the desire to abolish the ‘cash and carry’ system that characterized the health system where patients were required to make initial payments before receiving health care services. The national health insurance scheme is financed from a pool of resources of which the individual premium payments range from GH7.2 to 48.0 (roughly USD 1.60 to USD 10.30)

per person per year. With respect to its benefit package, the health insurance scheme covers almost all outpatient and inpatient services which targets over 90% of the disease burden including essential medicines (as included in the NHIS approved list) without any co-payments. The Free Maternal Component (FMC) of the scheme was introduced in 2008 to eliminate all forms of out-of-pocket payments associated with maternal and child health services, with the aim of improving maternal and child health outcomes in the bid to achieve the MDG goals 3 and 4. The new component enabled pregnant women to access free health care from conception through to delivery. These included free antenatal care, delivery as well as post-natal checks. In addition, all people are entitled to free health care until the age of 18 years.

Before the advent of the National Health Insurance Scheme, many Ghanaians were unable to access quality health care as a result of high user fees (Nyonator and Kutzin, 1999; Asenso-Okyere et al., 1998; Hutchful, 2002). The NHIS was introduced to address the inequality in health care access by reducing out-of-pocket payments, particularly among the poor. Recent assessments of the scheme however indicate that poor households are not adequately covered under the scheme despite heavily subsidized premiums (Aryeetey et al., 2011; Kotoh and Van der Geest, 2016). Witter and Garshong (2009) have described the NHIS as 'pro-rich and pro-urban', arguing that the poor are marginalized through a number of different avenues: First, the NHIS is heavily financed through a Value-Added Taxation (VAT) system which may be perceived as regressive, given that the poor may not be able to limit their consumption of these taxable goods. Second, although membership of the NHIS is meant to be universal, the premiums (around $5 per year per person) and enrolment fee ($1.50) often serves as a deterrent to enrolment for extremely poor households. Third, there are limited health facilities and opportunities for seeking health care in the poorest communities, even if they were to enroll onto the scheme. Although indigents are exempt, the definition of indigents in Act 2003 of the country's constitution is restrictive and therefore, despite the quarter of Ghanaians living under the poverty line, according to the 2012/13 Ghana Living Standards Survey, only 18% of the core poor has valid NHIS cards (Kotoh and Van der Geest, 2016). By 2017 however, estimates from the Ghana Living standards survey indicate that about 62% of the poor (including the core poor) have a confirmed valid NHIS card (see Appendix 1). Therefore out of a total 7m poor, about 4.3m have health insurance while 2.7m do not.

The intervention calls for the abolishment of user fees and annual premium payments in deprived communities and among poor households. In addition to this, the intervention envisages an initial registration drive that will identify and enroll the remaining 2.7m poor. The

premiums that would have been paid by the existing 4.3m enrolled and the newly 2.7m enrolled are transferred to the insured non-poor.

Enrolment may be expected to affect both the demand for health care and subsequently, health outcomes among this segment of the population. There are various pathways through which insurance may ultimately affect health outcomes. First, insurance may encourage greater use of health services through the reduction in the price, which should, in turn, reduce mortality and other related adverse health outcomes. This reasoning follows standard economic theory, which posits that health insurance coverage induces greater medical care use by reducing the cost of care to patients. Insurance may also influence the quality of health services through provider accreditation processes, modes of provider payment, and, more generally, by ensuring consistent flows of funding to providers. All other things being equal therefore, those affected by the removal of health insurance premiums should experience fewer financial barriers to access and therefore use more health care. We further speculate that health status is likely to improve as a result of increased access to health care.

2.2 Calculation of Costs and Benefits

2.2.1 Costs

The analysis focuses on two main costs to be incurred from this intervention- increased premium payments by the non-poor and higher health expenditures as a result of increased demand for health services. Additionally, we assume an initial registration drive that identifies non-insured poor and registers them at no cost to the beneficiary. Statistics from the 2017 wave of the Ghana Living Standards Survey (GLSS) indicate that approximately a quarter of Ghana's 30million population is poor. The 2017 Ghana Living standards Survey also indicates that 62% of this group has valid NHIS cards. Based on these figures, we estimate 4.3m are currently enrolled, with 2.7m poor that are uninsured. After the initial registration drive all premiums that are paid by the 7m poor are transferred to the insured non-poor.

The initial registration drive is estimated to cost GH¢ 10 per person. This is based on current costs of providing seasonal malaria chemoprevention (SMC) to children in the three northern regions of the country. We use this as comparator since the programmatic approach is likely to be similar. For SMC provision, community volunteers go door-to-door to administer the medicines. A similar, community driven, door-to-door approach could be used for the insurance registration drive. For SMC, the health worker costs equate to around GH¢ 1.5 to 2

per child provided with one round of medication (personal communication, National Malaria Control program). Given the extra challenges of appropriately identifying the indigent, we estimate a cost per person that is at least 5x as much for this intervention. The estimated cost therefore to register 2.7m poor is GH¢ 27m. Because the larger annual transfers and increased health utilization of the newly insured dominate the cost profile of this intervention, the BCR is not sensitive to the costs of initial registration. For example if the registration cost is actually GH¢ 100 per person rather than GH¢ 10, then the BCR changes from 2.1 to 2.0 at an 8% discount rate.

Health insurance premiums are GH¢30 per person. The abolishment of insurance premiums for the 7 million poor Ghanaians and transferring this to the non-poor population would imply a cost to be incurred by the latter of approximately GH¢ 213 million in 2018 Ghana cedis. Note it is not equitable or perhaps even feasible to isolate only the newly insured so we assume that the fees for all 7 million poor will be waived.

The second category of costs computed are related to the increased NHIA spending on the poor when claims are made by providers as a result of the likely increased demand for health care from being insured. The total number of subscribers in 2017 was about 10.57 million Ghanaians. Data on total claim payments disbursed by the NHIA were available only from 2009- 2013. Given an average 25% increase in claim payments within the period, we calculate total claims for 2017 to be about GH¢ 2.1 billion. The average claim made by an NHIS subscriber was therefore GH¢ 203 in 2017; equivalent to GH¢ 224 in 2018. With the 2.7m newly insured Ghanaians who are classified as poor and given an average claim amount of GH¢ 224 per person, we compute an increase in NHIA expenditures of GH¢ 603 million per year. Note even though insurance is now free for the original 4.3m poor Ghanaians we do not assume any change in their health-seeking behaviour, since they already had health insurance prior to the intervention.

A summary of costs of the intervention is presented in Table 2. Over a 10-year period the total costs of the intervention are GH¢ 5,848 million, with approximately 75% of costs from increased health care utilization, and the remaining in increased premiums and the registration drive.

Table 2: Summary of Costs

Cost Category	Costs (GH¢ millions)
Initial registration drive (first year only)	26.9
Increased premiums for the non-poor	213.6
Increased NHIA spending by the newly insured poor	603.2
Total costs over a 10 year period (8% discount rate)	**5,848.4**

2.2.2 Benefits

Two benefits were calculated for this intervention- the reduction in amenable deaths (i.e. deaths from lack of access and low-quality access to health care) and reduction in disability. According to Kruk et al. (2018), 43,048 deaths can be prevented in Ghana by increasing access to universal health care, through appropriate health financing efforts (such as the provision of health insurance among financially challenged individuals). Of these deaths, 23,615 are from deaths due to poor quality of health services, while 19,433 are deaths due to non-utilization of health care services. Given the proportion of the poor in Ghana, and assuming conservatively that deaths from inadequate healthcare are not higher among the poor, 1,728 deaths of the poor who have no health insurance coverage can be avoided from access to universal health care. Using information on life expectancy and valuation of life years remaining, we calculate that the avoidance of these deaths provide an economic benefit of GH¢ 812m to the country.

We also calculate the reduction in morbidity from increased access to healthcare. According to the Institute for Health Metrics and Evaluation (2017), Ghana has a morbidity rate of 9,836 per 100,000 from general illnesses and disease. Assuming that access to health insurance reduces morbidity by the same size as mortality as per Kruk et al. (2018), we estimate the avoided YLDs from improved insurance to be 25,500 per year.[2] The economic benefits of reduced morbidity are GH¢ 348m per year.

Finally, we included increased premiums received from the non-poor, as a result of the transfer to the poor. This is similar to costs calculated above and is valued at GH¢ 213m Together, all

[2] Kruk et al. (2018) assumes that for Ghana 19,433 deaths can be avoided with proper health insurance. This equates to approximately 9.6% of total deaths in Ghana. For the population of 2.7m newly insured we therefore estimate YLDs avoided as 2.7m * 9,836 / 100,000 * 9.6% = 25,500.

economic benefits yield a sum of **GH¢ 12,175 million** at 8% discount rate over a period of 10 years (Table 3).

Table 3: Summary of Benefits

Metric	Value
Avoided deaths among poor per year	1,728 people
Years of Life lost (YLL) per death avoided	34
Value of YLL in first year (rising with projected GDP per capita)	GH¢13,635
Economic benefit of lives saved	GH¢ 813m
Total years lost to disability YLDs avoided	25,524
Economic benefit of reduced disability	GH¢ 348m
Premiums received from non-poor	GH¢ 213m
Total benefits over 10 year period at an 8% discount rate	GH¢ 12,175m

2.2.3 Summary of Results

Costs and benefits of improved targeting of NHIS premiums to ensure richer individuals pay higher premiums, in addition to the abolishing of user fees and annual premium payments in deprived communities, are summarized in Table 4 below. The results show that while the intervention costs GH¢ 6.8bn, total benefits are estimated at GH¢ 12.2bn. The benefits thus outweigh the costs by a factor of 2.1, at an 8% discount rate. Results are similar across discount rates.

Table 4: Summary of Costs and Benefits (in millions GH¢) 10-year intervention period

	Discount rates		
	5%	**8%**	**14%**
Total costs	6,801	5,848	4,471
Total benefits	14,361	12,175	9,066
BCR	**2.1**	**2.1**	**2.0**

3 Rural Emergency Transportation Systems

3.1 Intervention Context and Background Literature

The presence of an efficient ambulance and emergency services system plays a critical role in reducing morbidity and mortality of patients requiring emergency care. The lack of access to such timely emergency health care is a characteristic of rural areas in most low and middle-income countries. In such countries, including Ghana, deprived and hard-to-reach areas are

often far from emergency health services, which compounds the adverse health outcomes recorded in these parts of the country. Hussein et al. (2012) and Zakariah et al (2017) note that deaths, particularly those related to maternal and newborns, as well as injuries, could be prevented if functional emergency referral systems are in place to provide the required emergency health services when emergencies occur. In view of this, many countries have provided various interventions to deal with the delays associated with reaching health facilities in a timely manner when emergencies arise. Such interventions, as documented in the literature, include providing financing and incentive schemes for community members to actively participate in providing transportation means to patients who need emergency care, as well as volunteering vehicles to transport patients to the nearest health post.

Ghana's emergency health services system is mainly informal in both urban and rural areas. Zakariah et al. (2017) note that the majority of patients who are severely injured or ill are transported to the health facilities by commercial vehicles such as taxis or local minibuses. In the rural areas where such commercial vehicles are not common, patients requiring emergency care are transported on bicycles or motorbikes or sometimes, in locally made carts driven by animals. Such heavy reliance on informal means of transportation increases the risk of complications of patients' health conditions, especially where the first aid and emergency response required in formal ambulatory systems are absent in these informal means. However, in the absence of good quality roads and the inaccessibility of roads in most rural areas, most countries in the sub-region such as Mali and Ethiopia have resorted to the use of terrain suitable emergency transportation units as a temporary intervention to improve upon the health outcomes of the rural population. It is expected that transportation interventions reduce travel time particularly in emergency conditions and also makes health centres more accessible.

In recent times, events in the country concerning the state of infrastructure for emergency health care services generated keen public interest and political debate about the provision of ambulances to improve emergency health care services. In view of these developments, in January 2020 the government distributed over 300 previously purchased and modified ambulances to the 275 constituencies in the country. This, therefore, necessitated a modification of the initial intervention (which included the purchase of the ambulance) to focus on the maintenance and continued operation of the entire the ambulance system in the rural areas. The analysis, therefore, excludes the cost of purchasing ambulances since it has already been done.

The primary outcomes of interest are maternal and child health outcomes such as maternal and neonatal mortality as well as mortality and morbidity from trauma and injuries. These outcomes are considered in the present analyses due to their high incidence among the rural population in Ghana. Although existing studies such as Krasovec et al. (2004), Fournier et al. (2009) and Taylor-Smith et al. (2013) have examined the implementation of emergency transportation on health outcomes, particularly on maternal mortality, the empirical evidence provided is mostly weak and non-conclusive as argued by Hussein et al. (2012). While Lungu et al. (2001) find an unexpected adverse effect of bicycle ambulance on maternal mortality, Fournier et al. (2009) confirm decreased rates of maternal mortality in Mali. In the particular context of Ghana, although similar interventions have been implemented in parts of the country, no robust impact evaluation has been carried out to measure the impact on health outcomes. An assessment of the Rural Emergency Health Service and Transport (REST) intervention by the Catholic Relief Services in collaboration with the Ghana Health Service, suggests that the provision of modified motor bicycles in the intervention areas has improved maternal and newborn outcomes. A study by Babiarz et al. (2016) is perhaps the most robustly estimated evidence on the impact of providing ambulances. That study, focusing on two states of India (Andhra Pradesh and Gujurat), used a difference-in-difference estimation technique to assess the impact of ambulance density on infant mortality. Their headline result is that an increase in ambulance density of 0.16 ambulances per million people lead to a reduction in neonatal mortality of 0.75 percentage points (7.5 per 1,000 live births) in Andhra Pradesh and 0.45 percentage points for high mortality regions of Gujarat.

To a large extent, the lack of consensus in the empirical evidence provided by randomized controlled trials, particularly for maternal and neonatal mortality, makes it difficult to assess the likely impact of ambulances. In particular, disentangling the effects of emergency transportation systems on particular health outcomes, given that such interventions are usually part of an integrated package that seeks to address other obstacles of accessing health care is challenging.

3.2 Calculation of Costs and Benefits

3.2.1 Costs

The analysis focuses on the costs of maintaining and operating the ambulance network in rural Ghana. The total number of ambulances required for the rural population based on the distribution model of ‘one constituency, one ambulance’ comes to a total of 206 ambulances.

These 206 ambulances would serve a rural population of approximately 13m, for an ambulance density of 16 ambulances per million people.

Four types of costs are included in the analysis. The first cost component covers the day-to-day running of the ambulance including fueling, repairs and insurance. Estimates for this component are based on an intervention in rural Ethiopia which focused on providing emergency transportation for the referral of obstetrical and neonatal care (Accorsi et al. 2017) The extrapolated annual cost of fueling and maintaining each ambulance was about USD 14,969 in 2014. This translates to GH¢ 93,375 after the necessary inflation and exchange adjustments. For 206 ambulances the annual cost is therefore GH¢ 19.2m.

The second cost component comprises of costs associated hiring and training of paramedics. Based on international best practice, each ambulance requires two paramedics and two drivers. The training and remuneration of the paramedics amount to about USD 18,276 in 2010, which translates to GH¢ 125,157 in today's figures (Boateng and Kratzer (2010). For 206 ambulances this implies an annual cost of health workers at GH¢ 25.8m.

The third cost component considers the increase in health care costs as a result of the marginal increase in health care utilization due to the availability of an ambulance system. Due to the uncertainty associated with estimating the marginal response, we rely on the 2014 response rate estimates provided by Zakariah et al (2017) which suggests a rate of 0.2 per ambulance per day per 100,000 population. In translating the marginal response rate into increased health care cost, we rely on the average cost of in-patient treatment of a severe case of malaria, estimated at USD 123 as a proxy. In effect the total cost of the third component is estimated at about GH¢ 1.5m in 2019.

Lastly, ambulances require a station to contain them. The Ghana National Ambulance Service puts the installation cost of an ambulance station at USD 240,000 (in 2010) which translates to about GH¢ 1.6m in 2019. Each ambulance station can house 2 ambulances. The one off cost of these ambulance houses is GH¢ 339m, and they are expected to remain operational for 10 years.

Based on the cost components described, it would appear that the largest share of the cost is associated with the construction of the ambulance stations, which constitute around 60 percent of the entire cost of the intervention. The total cost of the intervention over a 10 year period is

estimated at GH¢ 646m. The specific cost elements considered in the cost estimation are shown in table 5.

Table 5: Summary of Costs for 10-year intervention period

Cost Category	**Value**
Cost of fuel, maintenance and repairs per year	GH¢ 19.2m
Cost paramedics salary and training per year	GH¢ 25.8m
Extra health utilization from ambulance network per year	GH¢ 1.5m
Installation of Ambulance Station (first year only)	GH¢ 339m
Total Cost of Intervention over 10 years (at 8%)	**GH¢ 646m**

3.2.2 Benefits

The categories of benefits considered in the analysis are maternal mortality avoided, neonatal deaths avoided as well as avoided deaths associated with trauma and injuries.

To assess maternal deaths avoided, we adopt the 18% reduction in maternal mortality reported by Hussein et al. (2012)'s review of experimental and quasi-experimental studies. Assuming a crude birth rate of 33 per 1000 and a maternal mortality rate of 308 per 100,000 live births, the number of maternal deaths is 1209 per year in the absence of the intervention. An 18% reduction implies 217 avoided maternal deaths among the rural population annually. The average expected life expectancy for women at reproductive ages in Ghana used in the valuing deaths averted is calculated at 39 years and the value of a YLL is GH¢ 13,635 in the first year. The benefit associated with maternal mortality is therefore GH¢ 116m in the first year, rising with projected GDP per capita growth.

To assess neonatal deaths avoided from the intervention we decided to adopt a figure of 2.8 deaths avoided per 1000 births, based on a related study conducted in Ghana by Gabrysch et al (2019). That study examined the association between comprehensive emergency obstetric services and the probability of intrapartum stillbirth conditional on distance to the facility. They identified a reduced risk equivalent to 3.8 intrapartum deaths per 1000 births moving from 20km away from a facility to less than 1km away. This is based on data collected during the period 2005 to 2008 when there were significantly fewer ambulances in Ghana. Since then neonatal mortality has fallen by 26%, and so we adopt a figure 3.8 * (1-26%) = 2.8 deaths per

1000 as the point estimate for a reduction in neonatal deaths associated with the provision of ambulances. The logic underlying the use of this study is that having ambulance network reduces the risk of intrapartum death equivalent to moving 20km away from a health facility to less than 1km away.

Babiarz et al (2016)'s study from India has a methodology that is more likely to identify causal effects of ambulance networks than Gabrysh et al (2019)'s, which is based on associations. However, adoption of the primary finding in Babiarz et al (2016) does not appear to work well in the Ghanaian context. Recall that the study identified that increasing density of ambulances by 0.16 ambulances per million reduced infant mortality by 7.5 per 1000 in Andhra Pradesh. The provision of 206 ambulances to 13 million rural Ghanaians, implies an increase in ambulance density of 16 per million, or roughly 100 times the density from Babiarz et al. A naïve translation from the Indian context would then suggest the complete elimination of neonatal mortality in Ghana from the provision of ambulances, which cannot be true. Therefore, we rely on the methodologically weaker but perhaps more contextually relevant study from Ghana, Gabrysch et al (2019).

Based on this we estimate that 1,101 intrapartum deaths would be avoided from the provision of ambulances in rural Ghana. The implied effect size is an 11% reduction in neonatal mortality. The benefit is GH¢ 952m in the first year rising with projected real GDP per capita growth.

Kobusingye et al (2006) report evidence that first level response in emergency transportation reduces deaths associated with trauma and injury by about 9 per cent. Based on this effect size, the projected deaths avoided in the target population is about 599 per year, for an estimated annual benefit of GH¢ 362m**.**

The total estimated benefits from terrain suitable emergency transportation system for deprived areas, therefore, sums to **GH¢ 1,431m** for the year 2019.

Table 6: Summary of Benefits

Benefit Description	**Number**	**Welfare impact in first year**
Maternal Deaths Averted	218	116m
Neonatal Deaths Averted	1101	953m
Deaths from Trauma and Injuries Averted	599	362m
Total Deaths Averted per year	**1,918**	**1,431m**

3.2.3 Summary of Results

Projections of costs and benefits across a 10-year intervention period are reported below. At various discount rates considered, the BCRs lie between 18 and 22, as shown in Table 7.

Table 7: Summary of Costs and Benefits (GH¢ Millions), 10 year intervention period

	Discount rates		
	5%	**8%**	**14%**
Total costs	710	646	551
Total benefits	15,717	13,297	9,861
BCR	**22**	**21**	**18**

4 Deprived Area Incentive Allowances

4.1 Intervention Context and Background Literature

Adequate delivery of health care would be difficult without an adequate health workforce. The population density of health care providers in a country directly impacts the provision of health services such as immunization and skilled birth attendance (Anand and Barnighausen, 2004; WHO 2006), and leads to a reverse correlation between health worker density and health outcomes such as infant mortality, maternal mortality and various disease-specific outcomes (Khann et al. 2003). In Sub-Saharan Africa, there is a recognised need to concurrently increase health workforce, retain them within countries and also deploy health staff to areas where health needs are greatest, while promoting worker competence, satisfaction and productivity (Luoma 2006). Staffing rural health facilities is particularly challenging. For example, in Zambia, there are 20 times more doctors in urban than in rural areas, and Malawian doctors provide services predominantly in urban areas (World Bank 2008). Ghana is a developing country with high degrees of morbidity and mortality, combined with notable differences in health outcomes between rural and urban settings. For example, according to the 2017 Ghana Maternal Health Survey, under-5 mortality rate in urban Ghana is 48 deaths per 1000 live births, in rural Ghana it is 56 deaths per 1000 live births.

In Ghana, the distribution of health workers is skewed in favour of the more affluent regions, most of which are found in the southern half of the country. Highly skilled professionals like medical doctors and specialized personnel (nurses, pharmacists, allied health professionals, etc) are concentrated in Greater Accra region where the Korle Bu Teaching Hospital is located, as well as in the Ashanti region, where the Komfo Anokye Teaching Hospital is found. The two

teaching hospitals (Korle Bu and Komfo Anokye) employ more than 45% of the country's doctors while less than 15% of doctors work in the district hospitals. The southern sector of the country, where social amenities are concentrated, attract most of the trained health staff, thus leading to equity issues in the distribution of care to rural communities. In rural areas, the quality of health care delivery is compromised by low staff competencies, poor life-saving skills, poor record keeping, among others (MoH, 2011). There are also rural/urban variations in the coverage of maternal health services. For example, while 82% of mothers in urban Ghana are able to access skilled birth attendants for delivery, the proportion is only 43% in rural Ghana.

Given that close to 50% of Ghana's population resides in rural areas, ensuring access to health care services in these parts of the country is essential to achieving national goals of universal health coverage and equity in the distribution of care. In Ghana and in many other parts of the developing world, health policymakers and managers are searching for ways to improve the recruitment and retention of staff in remote and deprived areas. Financial incentives for rural service have been attempted in Ghana in the past. The salary top-up scheme called the Deprived Area Incentive Allowance (DAIA) was launched for health workers in deprived areas in 2004. However, retention of health workers in rural areas remains a major challenge (Kwansah et al., 2012; Kaba and Nketiah-Amponsah, 2016). The intervention described here assesses the cost-effectiveness of providing various incentives (salary increases, comfortable accommodation and education scholarships) to attract and retain health workers in deprived and rural areas of Ghana.

4.2 Calculation of Costs and Benefits

4.2.1 Intervention impact

The analysis focused on three sources of incentives, namely: a 30% salary increase, comfortable housing (3 bedroom house with electricity, water and security) and 100% education scholarship after 4 years of service. The population of interest was rural settings in the northern half of Ghana, which has been identified as containing the poorest people in the country. Given a population of 5.2 million people in these areas and applying a 45% share of rural population, yields a target intervention population of 2.3 million residents of deprived areas in Ghana.

Using data from the Ghana Health Service (2018) Factsheet, we estimated indicative doctor-patient ratios for this area of rural Ghana as 1 in 20,000 and for a competing urban area in Ghana as 1 in 5,000. The unconditional odds of a doctor naturally moving to a rural job in the north part of Ghana is therefore 0.25. Additionally, the estimated number of doctors serving the 2.3 million people is estimated at 116 based on the assumed doctor-patient ratios.

Prust et al (2019) report the odds ratios of doctors shifting to rural jobs from urban settings based on a discrete choice experiment in Zambia. We adopt their odds ratios to estimate the effects of the various interventions. The analysis indicates that increasing the base salary by 30% would lead to 44 more doctors moving to these areas. Providing comfortable housing would increase doctors in the area by 207. Lastly, providing a scholarship after four years service would incentivize an additional 76 doctors.

Table 8: Impact of various incentives on doctor movement

	Odds ratio from Prust et al. (2019)	New doctors incentivized	Existing doctors
Base salary increase by 30%	1.52	44	116
Superior housing	5.04	207	116
Education scholarship	1.98	76	116

Source: Estimation by authors

4.2.2 Costs

The incentive schemes would need to be applied to both new and existing doctors. Therefore, the costs are a function of the total number of doctors post-intervention. In all calculations we assume new doctors incentivized by the intervention move from urban areas of Ghana.

For the first incentive, we assumed a base salary of GH¢ 4,000 per month. The incremental 30% cost is therefore GH¢ 14,400 per doctor.[3] Applied to 160 doctors the cost is GH¢ 2.3m per year. According to Prust et al. (2019), the cost of superior accommodation facilities is estimated at US$45,000 or GH¢205,425. We anticipate that a house may have a life of 25 years and included maintenance, utilities and staff cost of 15% to the cost of the house over the period. At an 8% discount rate this implies an annual cost per doctor of approximately GH¢

[3] Note that we assume a shift in doctors from urban jobs to rural jobs. Therefore, only the 30% incentive is a marginal cost of the intervention.

50,000. From this we deduct the cost of renting a standard accommodation in an urban setting of Ghana estimated at GH¢ 10,000 per year. The intervention assumes that existing doctors would also be given this incentive, however their existing rental costs are assumed to only be GH¢ 6,000 per year. With regards to scholarship costs, this would include the cost of the master's degree (approximately GH¢ 25,000 for the year) and the salary (GH¢ 48,000) to be collected in health workers' absences. These values are amortized over 4 years, since the incentive requires 4 years of service as the eligibility criteria. For existing doctors, we assume that the eligibility is back-dated and that on average they already have 1 year of experience in the rural areas. So the cost for existing doctors is spread over 3 years, instead of four.

The various costs are summarized at an 8% discount rate in the table below. The least expensive intervention is raising the base salary. The most expensive intervention is the provision of superior housing. Note that this figure below is annualized at 8% discount rate. Of course, the cost of building a house is incurred up front, rather than in an annual manner. If all doctors were provided a house then the true upfront cost would be 205,000 * 323 doctors = GH¢ 66m.

Table 9: Summary of Costs

Incentive	**Cost per new doctor per year** (GH¢)	**Cost per existing doctor per year** (GH¢)	**Total Cost per year** (GH¢ millions)
Base salary + 30%	14,400	14,400	2.3
Superior housing	40,058	44,058	13.4
Education scholarship	22,040	28,326	4.9

4.2.3 Benefits

Two benefits were calculated for this intervention- the reduction maternal and under 5 deaths. Following Saluja et al. (2020), we estimate that the presence of a doctor in an area lacking sufficient physicians, avoids 0.27 and 1.45 maternal and infant deaths per year. Additionally, we assume that in an urban setting the number of doctors is at saturation, and so the marginal impact of a doctor there is zero. Assuming that maternal deaths occur at about 25 years of age and child deaths occur at a year of age, on average, we estimate YLLs per maternal and child deaths avoided at 46 and 64, respectively. We summarize benefits (at 8% discount rate) of the new influx of physicians to these areas in the table below:

Table 10: Summary of Benefits

Interventions	**Avoided deaths**		**Benefits per year** (GH¢ millions)
	Maternal	**Child**	
Base salary + 30%	12	63	59
Superior housing	56	301	282
Education scholarship	21	110	103

Together, at an 8% discount rate, salary increases, accommodation and education scholarships yield economic benefits of GH¢59.4m, GH¢281.7m and GH¢103.3m, respectively. Note that we did not include morbidity effects and this would increase the benefits, perhaps by as much as 30%.

4.2.4 Summary of Results

Costs and benefits of implementing incentives schemes (such as the Deprived Area Incentive Allowance) to encourage more health services in poor and hard to reach areas are summarized in Table 11. The results show the benefits outweigh the costs leading to a BCRs of 17 - 26 depending on the discount rate and incentive applied.

Table 11: Summary of Costs and Benefits (in millions of GH¢)

	Discount rates		
	5%	**8%**	**14%**
Total costs			
Salary	2.3	2.3	2.3
Accommodation	11.9	13.4	16.9
Education Scholarship	4.7	5.0	5.6
Total benefits			
Salary	59.4	59.4	59.4
Accommodation	281.7	281.7	281.7
Education Scholarship	103.3	103.3	103.3
BCR			
Salary	25.8	25.8	25.8
Accommodation	23.7	21.0	16.7
Education Scholarship	22.1	20.8	18.6

5 Conclusions

In this paper, we analyzed the cost and benefits of various interventions that are aimed at improving Ghana's health sector. The various interventions assessed were derived from a nation-wide consultation with academic experts, various government ministries, the National

Development Planning Commission, and a Reference Group of high-level policy specialists. Secondary literature was also reviewed and included government reports and international databases in generating the list of proposed interventions. This process was essential to ensuring that to key challenges of the country were understood and proposed interventions that could address those challenges.

The interventions included: 1) Improve targeting of NHIS premiums to ensure richer individuals pay higher premiums and abolish user fees and annual premium payments in deprived communities; 2) Expand and maintain emergency transportation systems in rural communities; 3) Implement incentives schemes (such as the Deprived Area Incentive Allowance) to encourage more health services in poor and hard to reach areas

We find that benefit-cost ratios for two of the three interventions are quite large. For maintaining and operating the ambulance network the BCR is 21. For various deprived area allowance incentives the BCRs range from 17-26 depending on the specific incentive and the discount rate applied. The BCR for insurance targeting is an order of magnitude lower, around 2.

The quality of evidence used to estimate these ratios is generally of limited quality. Unfortunately, for the primary effect sizes used in this analysis, we could not identify and draw upon studies that adopted experimental or quasi-experimental research methods. Furthermore in many cases, we had to rely on studies outside of the Ghanaian context.

For example, the impacts of improved insurance follow a global study that looked at the associations between mortality estimates from the Global Burden of Disease and health care utilization from population surveys across LMICs (Kruk et al. 2018).

For the impacts of the ambulance network we consulted a range of studies that sought to estimate mortality effects from emergency systems (Babiarz et al. 2016; Hussein et al. 2012; Kobusingye et al. 2006). Of these only Babiarz et al. (2016) adopted a robust estimation methodology (difference-in-difference) to assess the impacts from an ambulance network in two states of India. However, application of their impacts to the Ghanaian context generated non-sensible results probably due to vast differences in population density between India and Ghana. In the end, we used a study examining the association between mortality and distance to a CeMONC facility as a proxy for the effect of an ambulance network (Gabrysch et al. 2019).

For the effects of the deprived area incentive allowance, we used the results of a discrete choice experiment conducted in Zambia (Prust et al. 2019), and estimated the mortality effects of a marginal doctor using a study that examined the association between mortality and doctor density using country-level data, controlling for a number of factors that are known to affect health care quality (Saluja et al. 2020).

While the impacts of each intervention are of limited quality, many of the costs adopted in the study are from Ghana. And despite the uncertainty, there is good reason to believe that the BCR with the lowest ratio, insurance retargeting, indeed has the lowest BCR of the three interventions studied. That intervention requires a large transfer from the insured non-poor insured to the poor, and large transfers of this nature naturally drive BCRs lower (since the value of the transfer appears as a benefit and a cost, diluting any other benefits and costs).

Overall, based on the findings of this study, we suggest that Ghana maintains and operates the ambulances already purchased since the BCR could be quite large. Further investigations into the effects of incentives should be conducted, perhaps even with a discrete choice study with Ghanaian doctors, before deploying it as a broad based intervention.

6 Appendix 1: Valid NHIS Cards, by poverty status, Ghana, 2017

Does (Name) hold a valid NHIS card?	Very poor	Poor	Non-Poor	Total
Yes, card seen	3,450 63.87	3,618 60.32	13,476 64.70	20,544 63.74
Yes, card seen but expired	949 17.57	1,061 17.69	2,129 10.22	4,139 12.84
Yes, card not seen	904 16.73	1,261 21.02	4,913 23.59	7,078 21.96
No	99 1.83	58 0.97	311 1.49	468 1.45
Total	5,402 100	5,998 100	20,829 100	32,229 100

Source: Author Calculations, GLSS 2017

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The Ghanaian economy has been growing swiftly, with remarkable GDP growth higher than five per cent for two years running. This robust growth means added pressure from special interest groups who demand more public spending on certain projects. But like every country, Ghana lacks the money to do everything that citizens would like. It has to prioritise between many worthy opportunities. What if economic science and data could cut through the noise from interest groups, and help the allocation of additional money, to improve the budgeting process and ensure that each cedi can do even more for Ghana? With limited resources and time, it is crucial that focus is informed by what will do the most good for each cedi spent. The Ghana Priorities project will work with stakeholders across the country to find, analyze, rank and disseminate the best solutions for the country.

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