Effectiveness of the Universal Health Coverage Scheme in Senegal

S. Diagne, F.N. Sylla
and
K.C. Henovi

HCD-CCS-012

AFRICAN ECONOMIC RESEARCH CONSORTIUM
CONSORTIUM POUR LA RECHERCHE ÉCONOMIQUE EN AFRIQUE

Bringing Rigour and Evidence to Economic Policy Making in Africa

Effectiveness of the Universal Health Coverage Scheme in Senegal

By

S. Diagne, F.N. Sylla

and

K.C. Henovi

AERC Working Paper HCD-CCS-012
African Economic Research Consortium, Nairobi
July 2024

THIS RESEARCH STUDY was supported by a grant from the African Economic Research Consortium. The findings, opinions and recommendations are, however, those of the author and do not necessarily reflect the views of the Consortium, its individual members or the AERC Secretariat.

Published by: The African Economic Research Consortium
P.O. Box 62882 - City Square
Nairobi 00200, Kenya

Contents

List of tables

Abstract

The aim of this study is to assess the impact of the universal health coverage (UHC) scheme in Senegal on the use of medical care and employee productivity, and to carry out a cost-effectiveness analysis of the scheme. The data used come from the Harmonized Survey of Household Living Conditions (*Enquête Harmonisée sur les Conditions de Vie des Ménages, EHCVM*) in Senegal conducted in 2018 by the National Statistics and Demography Bureau (*Agence nationale de la statistique et de la démographie, ANSD*). The study used the Endogenous Switching Regression (ESR) model to take account of the self-selection bias. Its findings show that the beneficiaries of the scheme had greater access to medical care and lost fewer days of work due to illness than the non-beneficiaries. They also show that if the non-beneficiaries were covered by the UHC scheme, they would have increased their access to medical care and would have lost fewer days of work. These results are consistent since easy access to medical care enables its beneficiaries to receive treatment quickly when they fall ill. But the study also found that although the UHC scheme improved its beneficiaries' access to medical care and productivity at work, it also increased their medical care costs. Indeed, the cost-effectiveness analysis carried out showed that the scheme was unequivocally ineffective in the case of the 15-60 age group, one which essentially constitutes the working population. In other words, the beneficiaries of the UHC scheme in Senegal incurred more medical care costs and obtained fewer benefits from it than its non-beneficiaries. The study recommends that advocating an extension of the scheme's coverage, while emphasizing its positive effects on its beneficiaries' health and productivity at work would lead to enhanced mobilization on the part of the government. In addition, better knowledge of the medical care package offered as part of the scheme and of its effectiveness would enable its beneficiaries to make better use of the benefits its offers.

Keywords: Universal health coverage, medical care, productivity, impact evaluation, cost-effectiveness.

1. Introduction

Investing in human capital on matters of health, education, and social protection for all is an inclusive sustainable development strategy that can eradicate poverty and inequality within countries. It was with this postulate in mind that the global movement to adopt universal health coverage (UHC) has gathered pace. In 2005, at its 58th General Assembly, the World Health Organization (WHO) adopted a resolution calling on member countries to promote health systems capable of guaranteeing their populations equitable access to quality essential medical care. The international community renewed this plea by recognizing the right to adequate healthcare for every individual, with the adoption of the United Nations' Sustainable Development Goals (SDGs), the third of which enjoins countries to "achieve universal health coverage (UHC), including financial risk protection, access to quality essential health care services, and access to safe, effective, quality, and affordable essential medicines and vaccines for all."

However, at present, one billion people in the world do not have access to basic healthcare. There are many barriers to accessing it, but affordability is one of the main ones. According to the World Bank (2018), most people in low- and middle-income countries incur out-of-pocket expenses for much of their treatment and medical care, and this catastrophic health expenditure pushes some one hundred million people into extreme poverty every year. In Africa and South-East Asia, one in three families must borrow money or sell some property to afford essential healthcare. One of the main reasons for the difficulties in accessing healthcare in Sub-Saharan Africa is the low level of health-related social protection. Most existing social health protection schemes are social health insurance ones that cover only workers in the public sector and the formal private one, while most people earn their living in the informal economy. People excluded from existing health protection schemes generally face significant out-of-pocket payments when seeking healthcare. That is why community-based health insurance was promoted in the 1990s as a substitute for social health insurance, which is difficult to apply in environments with a very large informal sector. Community-based health insurance generally takes the form of a voluntary health insurance scheme offering a defined basket of care in return for payment of a premium. This type of scheme is characterized by the following institutional aspects:

- Health risks and financial resources are pooled within a community or group of people who share certain characteristics, such as geographical location or occupation.
- Membership premiums are often flat-rate and do not depend on the health risks specific to each individual.
- In most cases, entitlement to compensation is linked to contributions.
- Membership is voluntary.
- The scheme is not intended to make a profit.

Many African countries, Senegal among them, which are characterized by a very large informal sector, have implemented Community-Based Health Insurance (CBHI) schemes to extend their health coverage. However, the coverage rate of the CBHI target population has remained low in most countries (Vialle-Valentin, 2008; Soors et al., 2010), mainly due to the voluntary nature of membership of such schemes. Indeed, CBHI schemes have many limitations, mainly because those who cannot afford to pay membership fees do not join them. Vulnerable or economically deprived people, who are the primary targets of such community-based initiatives, therefore often find themselves excluded from them (Acharya, 2012; Carrin, 2005; Vialle-Valentin, 2008). In addition, membership fees are very low to encourage the enrolment of as many people as possible from a relatively poor target population, which limits a CBHI scheme's financial capacity. This means that the level of financial protection and the basket of healthcare covered are relatively restricted, which limits the attractiveness of these schemes. Research has shown that a CBHI scheme's capacity to improve its members' financial protection is low (Chuma et al., 2013; Geng et al., 2018). Nevertheless, many studies have highlighted the CBHI's positive impact on healthcare utilization (Gruber et al., 2014; Ravit et al., 2020) and improved health status (Mensah et al., 2010; Bagnoli, 2019), although the results are highly dependent on the context of the study. This positive impact on healthcare utilization produces externalities on adults' employee productivity. In the context of developed countries, some studies have shown that a health insurance scheme increases its beneficiaries' productivity at work by reducing the number of days they lose to illness (Lee and Torm, 2017; Bai, 2021). However, the benefits derived from the CBHI alone are not sufficient to establish its profitability. It is important to weigh them up against the CBHI costs. A health insurance scheme would be cost-effective if it improved its beneficiaries' health while at the same time reducing their healthcare expenditure (Muenning et al., 2005). Very few studies have assessed the cost-effectiveness of health insurance schemes, though. The few studies that exist concern developed countries (Chevreul et al., 2013). Moreover, while the externalities of a health insurance on employee productivity seem to be relatively well known in the case of developed countries, little is known about them in the case of developing countries.

Senegal provides an appropriate backdrop against which to find more about those externalities. In 2013, Senegal's government launched its national Universal Health Coverage (UHC) (*Couverture maladie universelle, CMU*) scheme, a voluntary community-based health insurance scheme targeting workers in the informal sector and in rural areas, who are excluded from the traditional mandatory insurance schemes. The Senegalese UHC scheme is seen as a means of achieving universal health coverage by improving access to healthcare for poor and vulnerable populations, but the impact of the scheme is not yet known. That is why the following questions arise: Is there a significant change attributable to the country's UHC scheme that causes its beneficiaries to have easier access to healthcare and to be more productive at work than its non-beneficiaries? Does the UHC improve the health of its beneficiaries while at the same time reducing their healthcare costs?

This study contributes to the existing literature by shedding light on the profitability of investing in a community-based health insurance (CBHI) and on its effect on employee productivity in the context of developing countries. From a policy perspective, the study identifies areas for intervention to improve the CBHI scheme by providing evidence that its expected effects are being achieved or are not.

The aim of this study is therefore to verify whether the expected effects of the UHC scheme in Senegal have been achieved or not. The study's specific objectives are to determine the influence of the scheme on its beneficiaries' use of medical care, to assess its beneficiaries' gain in their productivity at work, and to estimate how much a year of healthy life costs them.

2. Review of the literature

Impact assessments of health insurance schemes have focused on schemes that differ according to the package they offer, the populations they target and their scope. Some insurance schemes offer a wide range of benefits, while others offer a more limited package. Similarly, the target populations differ according to the schemes and their contexts of application. In Ghana, for example, the national health insurance scheme targets workers in the informal sector, who must pay a premium of between US$ 8 and US$ 53 a year, depending on their income. Contributors and their dependents under the age of 18 are partially covered by a relatively comprehensive package of benefits (Mensah et al., 2010). In other contexts, there are insurance schemes that target a single category of the population and offer a limited package of services. This is the case in Mauritania, where there is a health insurance scheme targeting only pregnant women and covering their obstetric care only. Premiums paid by the insured are set at US$ 18 in Nouakchott, the capital city of Mauritania, and US$ 16 in other localities. According to Achadi et al. (2014), a similar scheme has been set up by the Rwandan government and is entirely financed by public revenue. This insurance scheme is specifically aimed at pregnant women who are not covered by any other health insurance scheme, regardless of their socio-economic status (Achadi et al., 2014).

Although the various health insurance schemes differ from one context to another, researchers have generally used the same impact variables to measure their effects. These have mainly been measured in terms of medical care use (Gruber et al., 2014; Wagstaff et al., 2018; Ravit et al., 2020), of improvement in health status (Mensah et al., 2010; Bagnoli, 2019), or of reduction in catastrophic health expenditure (Geng et al., 2018; Wagstaff et al., 2018). Other researchers have measured the impact of health insurance on employee productivity (Nguyen and Zawacki, 2009; Dizioli and Pinheiro, 2016; Lee and Torm, 2017) and on students' education level (Acton et al., 2021).

The results obtained from this research are mixed and depend heavily on the context in which the health insurance scheme was implemented (Ridde and Morestin, 2011). Numerous studies have shown that health insurance schemes reduce catastrophic health expenditure (Geng et al., 2018; Wagstaff et al., 2018), increase the use of medical care (Giedion and Diaz, 2010; Jütting, 2004; Wagstaff, 2007; Spaan et al, 2012; Gruber, et al., 2014), and improve their beneficiaries' health status (Mensah et al., 2010; Bagnoli, 2019). These findings are corroborated by those of Miller et al. (2009), who found that

the positive impact on health was related to healthcare providers' strong motivation in the context of Colombia. However, this positive impact was contradicted by results from some studies. For example, Fink et al. (2013) found that implementation of a health insurance scheme in Burkina Faso led to an increase in the mortality rate among the elderly. The authors believe that this negative result could be attributed to a lack of motivation on the part of the healthcare staff. In the context of Mexico, Barros (2008) found that health insurance had a negligible impact on its beneficiaries' health status due to the poor quality of healthcare. This finding was supported by Mate et al. (2013), who observed that the quality of healthcare offered was an essential element in the success of a health insurance scheme. Nonetheless, more studies have established that health insurance does improve employee productivity (Nguyen and Zawacki, 2009; Dizioli and Pinheiro, 2016; Lee and Torm, 2017). For example, Dizioli and Pinheiro (2016) report that the number of working days lost due to illness reduced by 76.54% among employees who had a health insurance, compared to those who did not.

Researchers have mainly used impact assessment methods to measure the effects of health insurance schemes. These methods have evolved considerably over the years (Brodaty, 2013). The first such method developed involved assessing the impact of an intervention on a group of beneficiaries by comparing their situation before the intervention with that after. This method has some limitations, mainly because it does not enable us to isolate the effects induced by exogenous factors and to obtain the impact attributable solely to the intervention. This has led to the development of a new method, which involves comparing a target group affected by the intervention with a control group whose observable characteristics are as similar as possible to those of the target group. Such an approach makes it possible to better identify the impact of an intervention and to reveal mechanisms and behaviours in response to incentive policies. However, the relevance of this method is limited by the fact that it does not enable causal relationships to be deduced unambiguously. To overcome this limitation, experimental methods have been developed. These make it possible to unequivocally identify causal relationships, and hence the specific effects of an intervention. The principle of an experimental method is to randomly select the beneficiaries of the intervention from among the eligible beneficiaries. This random selection creates a target group and a control group that are statistically equivalent, provided that the sample sizes are appropriate. The impact of a health scheme is then measured simply by the difference between the sample means of the target and the control groups (Grossman, 1994; Newman et al., 1994). Although this approach is often considered optimal, it raises some problems in practice (Duflo and Kremer, 2003). This is why quasi-experimental methods have been developed in parallel. They enable the researcher to construct comparison groups a posteriori and to use data on beneficiaries and non-beneficiaries before and/or after the implementation of the intervention. Quasi-experimental methods are based on the "Rubin approach", which consists in systematizing the use of a hypothetical counterfactual to compare the situation of a health scheme's beneficiaries with their situation if they were not beneficiaries of it. This counterfactual is not observable, but it can be estimated based

on a control group. This is a group of individuals who did not benefit from the health insurance scheme but who are otherwise similar to those who did. In general, the difficulty in this type of measurement lies in the presence of selection bias among the target population (Lecocq et al., 2016). The beneficiaries are generally those for whom the scheme is essential. They may have specific socio-economic profiles, regardless of the scheme in question. This entails the risk of attributing to the effect of the scheme being assessed what is attributable to the beneficiaries' particular characteristics. Many authors have used quasi-experimental methods, such as the propensity score matching (PSM) method and the double differences method, both of which make it possible to correct for observable selection bias (Givord, 2014; Wang et al., 2016; Navarrete, 2018; Ravit et al., 2020; Anindya et al., 2020). But these methods have one main drawbacks: they match individuals based on observable characteristics associated with the probability of those individuals participating in an intervention. Consequently, if unobserved characteristics have an influence on their participation and change over time, there is a risk that the measurements will be biased and thus affect the observed results. Other methods have been developed to correct for unobservable bias, including the instrumental variables method, the discontinuity regression (Givord, 2014; Hsu and Yang, 2017), and the logistic regression (Lu et al., 2012).

3. Presentation of Senegal's UHC scheme

Main features

Senegal's UHC scheme was launched by the country's government in September 2013 to achieve its goal of making health promotion an essential driver of human development and of the Emerging Senegal Plan (*Plan Sénégal émergent, PSE*). The aim of the scheme is to ensure a universal health coverage for the Senegalese population through the development of free healthcare initiatives for vulnerable groups (children, the elderly, the disabled, etc) and through the promotion of community-based health mutuals. The main objective was to extend the basic health cover to 75% of the country's population by 2021.

The scheme rests on two main strategic axes:

- the development of a community-based health insurance, with priority being given to rural areas, to the informal economy and to destitute individuals and families;

- the implementation of assistance policies, with an emphasis on free health care for children aged under five years, people aged 60 and above, pregnant women requiring caesarean sections, and people suffering from chronic renal failure and requiring dialysis sessions.

Community-based health mutuals are voluntary, not-for-profit insurance systems based on an ethos of mutual help, solidarity, and collective assumption of health risks. Members of such mutuals participate effectively in their management and running; they pay for the package offered in health centres and posts, and delegate to the district unions the responsibility for paying for the additional package offered by hospitals.

The Union of County Health Mutuals (*Union départementale des mutuelles de santé, UDMS*) brings together community-based health mutuals established in the geographical area of a county. It is an important body in the architecture for implementing the basic UHC through mutual health organizations. In their current configuration, all the mutual health organizations belong to a county network based on Senegal's administrative divisions. In Senegal, there are 43 county networks,

14 regional unions and 1 national union of community-based health mutuals. Membership of a county network, the bulk of which was set up in the last quarter of 2016, is a condition for receiving government aid. The government has experimented with the creation of a single county-wide mutual health insurance scheme that provides the two healthcare packages to its members. The county health insurance union (*Union départementale d'assurance maladie, UDAM*) of Kougheul and that of Sokone were set up in 2013. The UDAMs are professionalized mutual insurance companies. Under experimentation in the counties of Kougheul and Sokone, the two UDAMs offer the two basic healthcare packages. This experimentation has not yet been extended to other counties.

Beneficiaries

A community-based health insurance scheme is primarily aimed at the following categories of people:

- people who can pay their own contributions and those of their families: these are the traditional beneficiaries;
- students under the student-UCH (*CMU-Elève*) scheme: this is an insurance scheme based on mutual health insurance funds, which covers 80% of student health expenses;
- beneficiaries of a family security grant (*bourse de sécurité familiale, BSF*); and holders of the Equal Opportunities Card (*carte d'égalité des chances, CEC*).

Packages of services

Those packages are the following:

- a basic package, including getting medicines at the health post or health centre level; the package is paid for by health mutuals;
- a supplementary package, including getting medicines at the hospital level; the package is paid for by the county health mutual unions (*UDMSs*); and
- medicines that can be obtained from private pharmacies.

The table below details the content of the packages of services offered under the UHC scheme.

Table 1: Senegal's UHC scheme's coverage rates

Type of healthcare provided at health posts and centres	Coverage rate
Outpatient care (consultations, treatment, and minor surgery)	80%
Generic medicines	80%
Speciality drugs	50%
Maternity (pre-/post-natal consultations, family planning)	80%
Maternity (simple childbirth)	80%
Hospitalization	80%
Transport (for referrals)	50%
At hospitals	
Outpatient care (consultations, treatment, and minor surgery)	80%
Outpatient care (tests and examinations)	80%
Outpatient care (X-rays)	80%
Generic drugs	50%
Speciality drugs	50%
Maternity (pre-/post-natal consultations, family planning)	80%
Maternity (simple childbirth)	80%
Maternity (caesarean section)	100%
Surgical procedures	100%
Hospitalization	100%
Transport (for referrals)	100%

Source: Strategic Plan for the Development of the Universal Health Coverage (Plan stratégique de développement de la couverture maladie universelle), Ministry of Health and Social Action, 2013.
Note: The UHC scheme excludes the following: antiretrovirals, spectacles, contact lenses, prostheses (including dental ones), orthoses, treatment outside Senegal.

Paying for the scheme

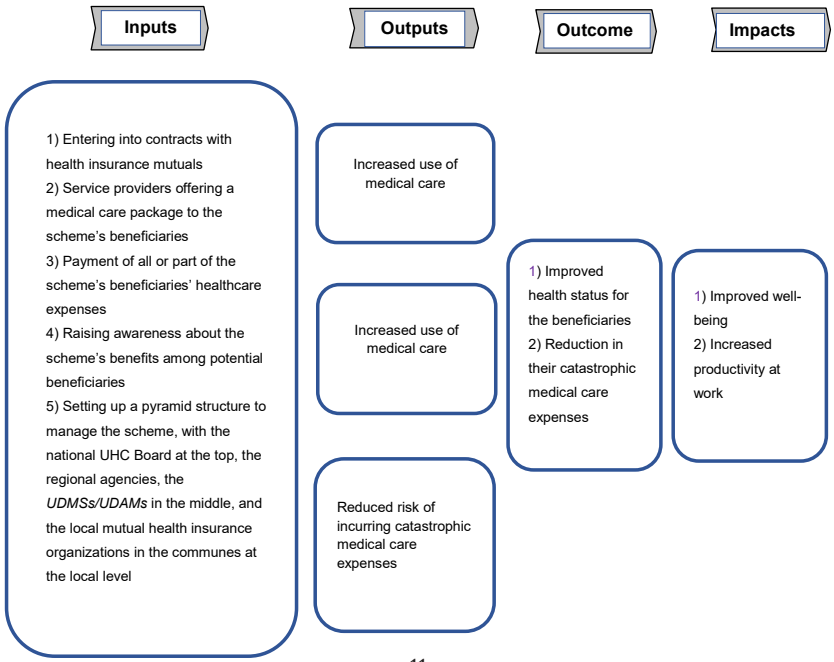
The membership fee is 7,000 CFA francs per person per year. The government, through the UHC Board, gives the mutual health insurance fund a subsidy of 50% as its contribution for each traditional member, who in turn is required to pay CFAF 3,500 per year. In addition to their contributions for access to medical care, the UHC's traditional beneficiaries also contribute to its financing through a co-payment corresponding to their share of the cost of medical care. Table 1 shows that, depending on which service is offered, this share varies from 100% to 50%. The government covers the cost of the package of services at the rate of 76%, with the remaining 24% being paid as the beneficiaries' share. People aged 60 and above, children aged under 5, and the poor people living below the poverty line, whose number is estimated at 10% of

the beneficiaries of the UHC scheme, are excluded from co-payment. Concerning the households that benefit from government family security grants (*bourse de sécurité familiale, BSF*) and those benefitting from equal opportunities cards (*carte d'égalité de chances, CEC*), the government pays the full cost of their membership of mutual health insurance schemes through the national UHC Board. This means that BSF beneficiaries and other members of their households are covered at 100%. As for the holders of equal opportunities cards (*CEC*), they are the only ones to benefit from a 100% coverage by the mutual health insurance scheme. Under the student-UHC (*CMU-élève*) scheme, when a student falls ill, either at school or at home, 80% of the cost of treatment in public health establishments is covered by the mutual health insurance. For medicines bought at private pharmacies, the mutual health insurance organization pays half the cost.

4. The theory of change

The theory of change underlying the UHC scheme works as follows: the implementation of the UHC scheme involves the mobilization of different types of resources: entering into contracts with mutual health insurance organizations and service providers for the provision of a package of medical care to the scheme's beneficiaries, the payment of all or part of the healthcare expenses for the beneficiaries, the raising of awareness about the scheme's advantages among its potential beneficiaries, the establishment of a pyramid management system for the scheme – with the National UHC Board at the top, the regional agencies and the county health mutual unions (*UDMSs*) and the county health insurance unions (*UDAMs*) in the middle, and the mutual health insurance organizations in the communes at the local level. A combination of these different resources should result in UHC beneficiaries using health posts and centres and hospitals more frequently, in them making greater use of medical care, and being better protected against catastrophic health spending. All these outputs will improve the UHC beneficiaries' health and reduce their catastrophic health spending. Their outcomes will induce positive effects such as improvement in the beneficiaries' well-being and an increase in their productivity at work.[1]

The various elements are summarized in the diagram below.



5. Data and methodology

The data

This study uses data from the Harmonized Survey of Household Living Conditions in Senegal (*Enquête harmonisée sur les conditions de vie des ménages, EHCVM*), which was conducted by the National Statistics and Population Bureau (*Agence nationale de la statistique et de la démographie, ANSD*) at the instigation of the West African Economic and Monetary Union (*UEMOA*) Commission. The survey was carried out in two waves, each lasting three months. The two-wave approach was chosen because of the seasonal nature of household consumption. The first wave covers the period from September to December 2018, and the second the period from April to July 2019. During either wave, half of the overall sample of 7,156 households was collected. The survey provides data for monitoring/assessing poverty and household living conditions in Senegal. It is also used to assess the country's public policies. Information was collected on people's state of health, medical care, medical care expenditure, health insurance coverage, education, and socio-demographic characteristics. The survey is nationally representative, which ensures the significance of the indicators when disaggregated down to the regional level and by area of residence (*ANSD*, 2020). However, data about the mortality rate were collected from the World Development Indicators.[2]

To assess the effects of Senegal's UHC scheme, we set up two groups of individuals: beneficiaries and non-beneficiaries. The beneficiaries are the individuals who declared that they were solely covered by the UHC scheme's community-based health mutuals. The non-beneficiaries are those who were not covered by any health insurance scheme. To avoid bias arising from confounding factors, we excluded people who benefited from health insurance schemes other than the UHC. The two groups were chosen in a way that the beneficiaries and the non-beneficiaries were as similar as possible. This similarity was measured using propensity-score matching techniques.

Measuring the effects of Senegal's UHC scheme

Two approaches were used in this study:

- the Endogenous Switching Regression (ESR) model, which is a semi-experimental impact assessment method used to evaluate the effect of the UHC on the beneficiaries' use of the scheme's medical care and on their productivity at work;

- the quality-adjusted life-year (QALY) cost-effectiveness analysis method, which makes it possible to analyze and compare the cost of a year of healthy life on the part of the beneficiaries and that on the part of the non-beneficiaries.

The Endogenous switching regression model

Impact assessment consists in studying the changes brought about by an intervention (i.e. treatment) and in demonstrating that this intervention was effective or not. In other words, it involves determining whether the changes observed are attributable to the intervention or not (Janvry and Sadoulet, 2015). We are interested in the assessment of the intervention *T*, and its effect on the variable of interest *Y*. There are people who will have benefitted from this intervention (*T=1*) and those who will not (*T= 0*). Thus, selection effects, which are confounding or heterogeneity factors, may confound the identification of causal effects, and hence the measurement of the impact. The causal effect of the treatment (for the beneficiaries of the medical care scheme) will be given, for each individual, by the difference between what the situation of this individual would be if he/she were a beneficiary and what it would be if he/she were not. The causal effect thus has two important characteristics:

- it is unobservable, since only one of the two potential variables is observed for each individual; and

- it is individual, which means that there is a distribution of the causal effect across the population.

To assess the impact of the UHC scheme on its beneficiaries' use of medical care and their productivity at work, we used the Endogenous Switching Regression (ESR) model. The use of this model was best suited to this study because the model enables the endogeneity caused by the self-selection of individuals to be taken into account. The community-based health insurance schemes, membership of which is voluntary, such as the UHC scheme under study, are subject to the phenomenon of adverse selection, as individuals who do not have specific or regular health needs tend not to join on a voluntary basis. People who use medical care frequently are more likely to join than those who do not. Thus, the existence of a selection bias may lead to an

over-estimation of the impact of membership of the scheme on its beneficiaries' use of healthcare facilities, on their use of medical care, and on their catastrophic healthcare expenditure. The ESR model corrects for self-selection, which depends on both the observable and the unobservable characteristics of the individuals. The impact of the scheme will then be assessed by controlling for both the observable and the unobservable sources of bias in the heterogeneity between the beneficiaries and the non-beneficiaries (Alene and Manyong, 2007; Wooldridge, 2010). This heterogeneity bias will be corrected using the instrumental variables method. According to Lu et al (2012), the decision to join the scheme can be instrumented by the UHC scheme's coverage rate at the level of the commune and by the public awareness campaigns about the scheme.

Formalizing the ESR model

Modelling the ESR takes place in two stages:

- the first involves estimating a selection equation using a probit model, with a view to identifying the factors that are likely to influence the decision to join the UHC scheme;

- at the second stage, two utility functions are estimated.

The decision to join the scheme is modelled in a random utility framework (Asfaw et al., 2012). Let P_i^* be the difference between the utility of being covered by the UHC scheme (*UiA*) and the utility of not being covered by it (*UiN*). A rational individual would choose to join the scheme if the benefit $P_i^* = (U_{iA}\text{-}U_{iN})>0$. The two functions are unobservable, as is *P** (Yang, 2016). However, the net benefit (*P**) can be expressed in terms of observable components denoted *Z* in the latent-variable model below:

$$P_i^* = \gamma Z_i + \varepsilon_i$$

$$\text{with } P_i = \begin{cases} 1 \; if P_i^* > 0 \\ 0 \; if not \end{cases} \quad (1)$$

In this equation, P is a binary indicator that equals 1 if the individual joins the scheme and 0 if not. γ is a vector of the parameters to be estimated, Z_i represents the vectors of the exogenous variables determining selection, and ε_i is the error term.

The two equations representing medical care and employee productivity, both of which are dependent on the individual being a member of the UHC scheme, can be expressed as follows:

Possibility 1 (beneficiaries): $Y_{1i} = X_{1i}\beta_1 + W_{1i} if P_i = 1$ (2)

Possibility 2 (non-beneficiaries): $Y_{2i} = X_{2i}\beta_2 + W_{2i}\ if\ P_i = 0$ (3)

Y_{1i} represents the use of medical care and Y_{2i} productivity at work, for both scheme's members and the non-members. X_{1i} and X_{2i} are the vectors of the exogenous variables, β_1 and β_2. the vectors of the parameters to be estimated, and W_{1i} and W_{2i} the error terms. These latter are assumed to have a trivariate normal distribution with mean 0 and the variance-covariance matrix Ω. Y_{1i} and Y_{2i} cannot be observed simultaneously; so, the covariance between W_1 and W_2 is not defined. It is generally assumed that $\sigma_\varepsilon^2 = 1$ (Maddala, 1983). Moreover, the correlation between the error in the selection equation and that in the outcome equation is not zero $cov\ (\varepsilon_i, W_1) \neq 0, cov\ (\varepsilon_i, W_2) \neq 0)$, which creates a selection bias. Indeed, the error structure is such that the error term of selection (1) ε_i is correlated with the error terms of the functions of possibilities 1 and 2, namely W_{1i} and W_{2i}). Under these conditions, the expected value of the conditional errors is defined by:

$$E(W_{1i}|P_i = 1) = E(W_{1i}|\varepsilon_i > -Z_i\lambda) = \sigma_{\varepsilon 1}\frac{\phi(Z_i\lambda)}{\Phi(Z_i\lambda)} = \sigma_{\varepsilon 1}\lambda_1$$

$$E(W_{2i}|P_i = 1) = E(W_{2i}|\varepsilon_i > -Z_i\lambda) = \sigma_{\varepsilon 2}\frac{\phi(Z_i\lambda)}{\Phi(Z_i\lambda)} = \sigma_{\varepsilon 2}\lambda_2$$

where ϕ and Φ are the density and the distribution function of the standard normal distribution, respectively. $\lambda 1$ and $\lambda 2$ are the selection terms or the inverses of the Mills ratios. To eliminate the selection bias, the ESR includes the terms $\lambda 1$ and $\lambda 2$ as auxiliary regressors in equations (2) and (3). If $\sigma_{\varepsilon 1}$ and $\sigma_{\varepsilon 2}$ are significant, the absence of a selection bias is rejected.

In the ESR model, the endogeneity problem is solved by estimating the selection (first stage) and the second-stage equations simultaneously. An efficient method for estimating the ESR is the Full Information Maximum Likelihood (FIML) estimation (Lokshin and Sajaia, 2004). The FIML method simultaneously estimates the probit (the selection equation) and the outcome equations. The ESR model estimations

can then be used to estimate the ATT (the average treatment effect on the treated) and the ATU (the average treatment effect on the untreated). Following Asfaw et al. (2012), the ATT and the ATU are calculated as follows:

For the beneficiaries (observed in the sample)

$$E(Y_{1i}|P_i = 1) = X_{1i}\beta_1 + \sigma_{\varepsilon 1}\lambda_1 \quad (4a)$$

For the non-beneficiaries (observed in the sample)

$$E(Y_{2i}|P_i = 0) = X_{2i}\beta_2 + \sigma_{\varepsilon 2}\lambda_2 \quad (4b)$$

If members had decided not to be members (counterfactual)

$$E(Y_{1i}|P_i = 0) = X_{2i}\beta_1 + \sigma_{\varepsilon 1}\lambda_2 \quad (4c)$$

If non-members had decided to be members (counterfactual)

$$E(Y_{1i}|P_i = 0) = X_{2i}\beta_1 + \sigma_{\varepsilon 1}\lambda_2 \quad (4d)$$

The average treatment effect on the treated (ATT) is calculated as the difference between (4a) and (4c):

$$ATT = E(Y1i|Pi = 1) - E(Y2i|Pi = 1) = X1i\beta1 + \sigma\varepsilon1\lambda1 - (X1i\beta2 + \sigma\varepsilon2\lambda1)$$

$$= X1i\,(\beta1 - \beta2) + \lambda1(\sigma\varepsilon1 - \sigma\varepsilon2)$$

The average treatment effect on the untreated (ATU) is given by the difference between (4d) and (4b)

$$ATU = E(Y1i|Pi = 0) - E(Y2i|Pi = 0) = X2i(\beta1 - \beta2) + \lambda2(\sigma\varepsilon1 - \sigma\varepsilon2)$$

Carter and Milon (2005) and Di Falco et al. (2011) have proposed formulas for calculating baseline heterogeneity for the beneficiaries and the non-beneficiaries.

$$BH_1 = E(Y_{1i}|P_i = 1) - E(Y_{1i}|P_i = 0)$$

$$BH_2 = E(Y_{2i}|P_i = 1) - E(Y_{2i}|P_i = 0$$

Transient heterogeneity is given by $TH = BH_1 - BH_2$.

The following impact variables were constructed for the estimation of the model:

- ***Use of medical care:*** to study the effects of the UHC scheme on an individual's use of medical care, a dummy variable was constructed. It took the value 1 if the individual declared having used medical care and 0 if not. This medical care includes hospital care, consultations, medical tests and examinations, analyses and examinations, X-rays, medicines, childbirth care, surgical interventions, and transport (ambulances)[3].

- ***Productivity:*** reduced employee productivity was measured by the number of working days lost due to illness (Campbell et al., 2018). Data from the EHCVM survey were used to determine the number of days an individual from the employed working population had to be absent from work due to his/her health status.

- ***UHC membership:*** to study the determinants of this membership, a dummy variable was created, which took the value 1 if the individual was a member of the UHC scheme and 0 if not.

- ***Independent variables:*** These were age, gender, household size, area of residence, level of education, and household expenditure quintiles. These variables were deemed likely to account for membership of the UHC scheme.

Measuring the cost-effectiveness of Senegal's UHC scheme

We considered the medical care expenses incurred by the beneficiaries of the UHC scheme and its non-beneficiaries as the costs, and the number of additional years of healthy life as the benefits. The number of years of healthy life was estimated using the QALY (quality-adjusted life-year) method. The health-related quality of life (HRQL) for each individual was determined using the Health Utilities Index Mark 3 (HUI3). The HUI3 is a multidimensional, preference-based measure of HRQL, which assigns a value to different states of health using a multiplicative utility function (Feeny, 1995; Feeny, 2002). According to the HUI3, health status is defined in terms of eight dimensions: **sight, hearing, speech, mobility, dexterity, emotion, cognition,** and **pain**. Each of these dimensions has different levels, and the utility-based preference scores are accumulated multiplicatively (Lim, 2008), giving an overall health status score or index that measures the quality of life associated with each individual's state of health. Global health-index scores range from 0 to 1, where 0 represents death or poor health and 1 represents perfect health. One year of life in perfect health is equivalent to 1 QALY. The incremental cost per QALY gained corresponds to the additional money spent on health insurance divided by the additional gains in quality-adjusted life expectancy, known as the incremental cost-effectiveness ratio (ICER).

To calculate the QALY years, we first calculated the quality-adjusted person-years remaining at birth in a cohort of abridged life tables using methods proposed

by Erickson (1995) and Anderson (1999). This cohort was used as a reference for calculating the marginal QALYs for the beneficiaries and the non-beneficiaries. The values in column 1 of Table 2 were generated using the formula $q_x = D_x/(P_x - 0.5D_x)$ where q_x is the probability of dying during the interval, D_x is the total number of deaths observed at age *x*, and P_x is the mid-year population for people aged *x*. Survivors at age *x* (s_x) were then calculated as $s_{x-1}(1 - q_{x-1})$. Column 2 gives the individuals at the beginning of the cohort. The values in column 3 are simply the product of the values in columns 1 and 2 for the corresponding rows. The number of person-years (column 4) was obtained by the formula $n(S_x - 0.5D_x)$, where n is the length of the age interval, S_x is the number of survivors at age *x* and D_x is the number of deaths in the age interval. Life expectancy (column 6) was obtained by dividing column 6 by

column 2. Column 7 gives the health-related quality of life (HRQL). Column 10 was obtained by dividing column 9 by column 2.

Table 2: Computations of QALYs (quality-adjusted life-years) and QALE (quality-adjusted life-expectancy)

	1	2	3	4	5	6	7	8	9	10
Age group	Probability of death	Number of people at the beginning	Number of deaths	Person-years	Cumulative person-years	Life expectancy	HRQL	QALYs	Cumulative QALYs	QALE (in QALYs)
<5										
5-9										
10-14										
15-60										
60+										

*This table illustrates how the results in this section will be presented. *

6. Results

Descriptive statistics

The characteristics of the beneficiaries and non-beneficiaries of the UHC scheme in Senegal are presented in Table 3. A test of the difference in means between the two groups was carried out to check whether there was any observable bias. The results show that the two populations had the same gender structure. In fact, the proportions of males and females in the two groups of beneficiaries and non-beneficiaries were almost equal. The population was approximately 53% female and 47% male. However, the beneficiaries were significantly older than the non-beneficiaries. Four out of ten beneficiaries had never attended school, against six out of ten non-beneficiaries. For each education level, the number of beneficiaries was greater than the number of non-beneficiaries. In addition, almost half of the heads of beneficiary households were educated, against only 25% of heads of the non-beneficiary ones. The beneficiaries had a better standard of living than the non-beneficiaries. Nearly 45% of the beneficiaries were among the wealthiest 40% of households in the country, compared with only 25% of the non-beneficiaries. There were more poor people among the non-beneficiaries than among the beneficiaries. Most beneficiaries lived in urban areas (65.5%). The proportion of beneficiaries who said they had a health problem was higher among the beneficiaries (34.6%) than among the non-beneficiaries (22.3%). This difference explains the gap between the two groups in terms of use of medical care. 36.2% of the beneficiaries and 19% of the non-beneficiaries said they had made use of the scheme's medical care. The proportion of the beneficiaries in employment was 36%, against 31% for the non-beneficiaries. Finally, on average, an individual lost more than half a day's work due to illness. This loss was higher among the beneficiaries (0.87 days) than among the non-beneficiaries (0.53 days).

Table 3: Socio-economic characteristics of the beneficiaries and non-beneficiaries of Senegal's UHC

	Beneficiaries	Non-beneficiaries	Difference
Gender			
Male	47.0%	46.4%	0.01
Female	53.0%	53.6%	-0.01
Age	25.94	22.52	3.43***
Education level			
No formal education	40.9%	58.9%	-0.18***
Primary education	30.9%	25.8%	0.05***
Secondary education	21.3%	13.6%	0.08***
Higher education	6.9%	1.6%	0.05***
Education level of the head of the household			
No formal education	51.0%	74.1%	-0.23***
Primary education	12.7%	13.6%	-0.01
Secondary education	19.5%	9.4%	0.1***
Higher education	16.9%	2.8%	0.14***
Quintile of the household's standard of living			
Quintile 1	18.4%	29.3%	-0.11***
Quintile 2	16.9%	24.5%	-0.08***
Quintile 3	19.8%	20.6%	-0.01
Quintile 4	24.8%	16.6%	0.08***
Quintile 5	20.1%	9.0%	0.11***
Area of residence			
Urban	65.5%	49.2%	0.16***
Rural	34.5%	50.8%	-0.16***
Household size	10.78	13.25	-2.47***
Health problems	34.6%	22.3%	0.12***
Employed	36.1%	31.0%	0.1***
Use of medical care	36.2%	19.0%	0.17***
Number of days lost to illness during the last 12 months	0.87	0.53	0.33***
Among the sick	2.23	2.22	0.88

*** p<0.01, ** p<0.05, * p<0.1

Source: Compiled by the authors based on data from the EHCVM 2019 survey

Impact of the UHC scheme in Senegal

The maximum likelihood estimations of the probit selection model are presented in column 2 of Table 4. The results show that the variables influencing the decision to join the UHC scheme were mainly age, education level, the household's standard of living, household size, and having health problems. The older people were, the more likely they were to join the scheme. Educated heads of household were more likely to join it than uneducated ones. The wealthiest people were more likely to join the scheme than the poorest. Also. the larger the household was, the lower the probability of it joining the scheme.

The regression results for the use of medical care by the UHC scheme's beneficiaries are presented in column 3 of Table 4, and those for the non-beneficiaries in column 4. The correlation coefficients ρ_1and ρ_2 are both positive, but only the correlation ρ_1 between being covered by the UHC and the use of medical care is significant. Since rho1 is positive and significantly different from zero, the model reveals that individuals who chose the UHC were more likely to use its medical care. If the non-beneficiaries were covered by the UHC, they would be more likely to use its medical care than the current beneficiaries. However, the non-significance of rho 2 means that the non-beneficiaries would be neither more nor less likely to use the UHC scheme's medical care if they joined it. These results indicate that the hypothesis of sample selection bias cannot be rejected in this study. The results also indicate that among the UHC scheme's beneficiaries, women had greater access to medical care than men, and that age was significantly correlated with the use of medical care. Education level had a positive and significant effect on access to medical care.

Table 4: Results of the endogenous switching regression model on the use of medical care

Use of medical care	Selection equation	Beneficiaries	Non-beneficiaries
Female	-0.003	0.029*	0.020***
	(0.021)	(0.016)	(0.003)
Age	0.003***	0.001***	0.001***
	(0.001)	(0.000)	(0.000)
Education level			
Primary	0.165***	-0.034*	-0.007**
	(0.025)	(0.020)	(0.003)
Secondary	0.142***	-0.023	-0.010***
	(0.030)	(0.022)	(0.004)
Higher	0.240***	-0.022	-0.013
	(0.057)	(0.037)	(0.010)

continued next page

Table 4 Continued

Use of medical care	Selection equation	Beneficiaries	Non-beneficiaries
Quintile 2	-0.039	0.035	0.025***
	(0.031)	(0.026)	(0.003)
Quintile 3	-0.013	0.050**	0.036***
	(0.032)	(0.026)	(0.004)
Quintile 4	0.082**	0.070***	0.054***
	(0.033)	(0.025)	(0.004)
Quintile 5	0.077*	0.102***	0.081***
	(0.040)	(0.027)	(0.005)
Employment	0.031	0.003	-0.013***
	(0.024)	(0.020)	(0.003)
Chronic health problem	0.212***	0.633***	0.565***
	(0.022)	(0.017)	(0.003)
Household size	-0.010***		
	(0.002)		
Education level of head of household			
Primary	-0.019		
	(0.031)		
Secondary	0.336***		
	(0.030)		
Higher	0.835***		
	(0.040)		
Urban	0.094***		
	(0.022)		
Rate of the UHC at the level of the commune	0.086***		
	(0.003)		
Constant	-2.437***	-0.016	0.007**
	(0.042)	(0.059)	(0.003)
σ		0 .370***	0.307***
		(0.006)	(0.001)
ρ		0.104*	0.026
		(0.061)	(0.024)
	LR test of indep. eqns.: $chi^2(1)$ = 4.05 Prob > chi^2 = 0.0441		
	Standard errors in parentheses		
	*** p<0.01, ** p<0.05, * p<0.1		

Source: ANSD, EHCVM 2019, authors' compilation

The results of the conditional expectations of the effects of heterogeneity and the UHC are summarized in Table 5. They show that the UHC scheme had a significant effect on the use of its medical care. The average treatment effect of the scheme on its beneficiaries (ATT) was a 17% increase in the likelihood of them using the medical care offered as part of it. If the non-beneficiaries had been covered by the UHC scheme, the average treatment effect on them (ATU) would be a 9.4% increase in the likelihood of them using its medical care. But the results also reveal heterogeneity; if we refer to the counterfactual, the analysis of baseline heterogeneity shows that if the non-beneficiaries were covered by the UHC scheme, they would be 7.6% (BH1=0.076**) less likely to use its medical care than the beneficiaries. Conversely, if the beneficiaries were not members of the scheme, they would be 0.3% less likely than the non-beneficiaries to use its medical care. These two counterfactual situations point to results going in opposite directions depending on whether the interviewees were members of the UHC scheme or not. These differences reveal a source of systematic bias not taken account of by the observable characteristics. Transient heterogeneity was measured by the difference between the average effect of the scheme on its beneficiaries and the average effect on its non-beneficiaries (TH=ATT-ATU). This difference was found to be positive, which implies that the magnitude of the effect was greater for the beneficiaries.

Table 5: Impact and heterogeneity of the membership of the UHC on the use of its medical care

	Selected	Non-selected	Impact
Beneficiaries	0.362	0.190	ATT = 0.172***
Non-beneficiaries	0.287	0.193	ATU = 0.094***
Heterogeneity	BH1=0.076**	BH2=-0.003*	TH=0.078**

*** p<0.01, ** p<0.05, * p<0.1
Source: ANSD, EHCVM 2019, authors' compilation

The results of the regression on the fall in employee productivity due to a certain number of working days lost to illness for the beneficiaries of the UHC scheme are presented in column 3 of Table 6, and those for the non-beneficiaries in column 4. The correlation coefficients ρ_1 and ρ_2 are both positive and significantly different from zero. This indicates a correlation between the fall in employee productivity and membership of the UHC scheme. It transpires from the model that members of the scheme were more productive at work and that its beneficiaries would have been less productive than its non-beneficiaries if the latter were covered by the scheme. The non-beneficiaries' productivity would have been significantly higher if they had been members of the scheme. All this means that the hypothesis of the existence of a selection bias cannot be rejected.

Table 6: Results of the endogenous switching regression model on employee productivity

	Beneficiaries	Non-beneficiaries	Selection equation
Female	-0.122	-0.175***	-0.061
	(0.192)	(0.044)	(0.038)
Age	-0.023	0.014***	-0.005
	(0.014)	(0.003)	(0.003)
Use of medical care	1.648***	1.559***	0.352***
	(0.234)	(0.045)	(0.043)
Education level			
Primary	0.327	-0.085	0.115**
	(0.238)	(0.053)	(0.048)
Secondary	0.451	-0.237***	0.119**
	(0.279)	(0.068)	(0.059)
Higher	0.154	-0.447***	0.170
	(0.459)	(0.169)	(0.111)
Education level of head of household			
Primary			-0.095*
			(0.057)
Secondary			0.278***
			(0.058)
Higher			0.869***
			(0.074)
Household size			-0.004
			(0.003)
Quintile 2			-0.059
			(0.059)
Quintile 3			-0.149**
			(0.062)
Quintile 4			0.046
			(0.060)
Quintile 5			0.007
			(0.073)
Urban			0.156***
			(0.040)
UHC coverage rate at the level of the commune			0.090***
			(0.005)

continued next page

Table 6 Continued

	Beneficiaries	Non-beneficiaries	Selection equation
Constant	-0.593	0.962***	-2.394***
	(0.650)	(0.059)	(0.086)
σ_i	2.68***	2.50***	
	(0.032)	(0.006)	
ρ_i	0.283***	0.105***	
	(0.106)	(0.038)	
LR test of independent equations:	$chi^2(1) = 14.00$	Prob > $chi^2 = 0.0002$	
Standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Source: ANSD, EHCVM 2019, authors' compilation

The heterogeneity effects of the endogenous switching regression model on productivity, conditional expectations, and coverage are summarized in Table 7. They show that the UHC scheme had a significant effect on the fall in employee productivity. For the beneficiaries, the effect of the scheme on productivity was 0.87 days, equivalent to a reduction of approximately one day's work lost to illness. If the non-beneficiaries had been covered by the UHC scheme, the effect on productivity would have been 1.89 days (ATU), equivalent to a reduction of almost 2 days' work lost to illness. Furthermore, the results for the baseline heterogeneity show that if the non-beneficiaries had been members of the scheme, they would have avoided half a day's work loss and 1.81 (BH1) days less than the beneficiaries. Equally, if the beneficiaries were not members of the scheme, they would have avoided less than one day's work (BH2=0.79) more than the non-beneficiaries. Under both counterfactual conditions, the group that joined the UHC scheme would be more productive at work. These differences reflect systematic sources of variation between the two groups that could not be fully accounted for simply by the model's observable characteristics. The membership of the UHC scheme alone does not explain why its non-beneficiaries are less productive at work. The transient heterogeneity between the beneficiaries and the non-beneficiaries was found to be positive, which implies a greater effect for the non-beneficiaries.

In a nutshell, being a member of the UHC scheme increases employee productivity by reducing the number of working days an employee loses to illness. This finding is consistent with that made about the use of medical care, namely that membership of the scheme increases the chances of the members using the medical care it offers. In addition, the easier it is to access this medical care, the easier it is to seek treatment quickly. As a result, beneficiaries of the scheme receive treatment quickly

and lose few days of work. But although the scheme was found to have positive effects in terms of access to medical care and of increased employee productivity, it is important to compare its costs with its benefits to assess its effectiveness. The following section is indeed devoted to the cost-effectiveness analysis of Senegal's UHC scheme.

Table 7: Impact and heterogeneity of the UHC membership on employee productivity

	Selected	Non-selected	Impact
Beneficiaries	2.314	3.182	ATT=-0.87*
Non-beneficiaries	0.504	2.394	ATU=-1.89**
Heterogeneity	BH1=1.81***	BH2=0.788***	TH=1.022**

*** p<0.01, ** p<0.05, * p<0.1
Source: ANSD, EHCVM 2019, authors' compilation

Cost-effectiveness of Senegal's UHC scheme

This section presents the results of the cost-effectiveness analysis of Senegal's UHC scheme. Tables 8 and 9 give the health-related quality of life (HRQL) and the number of healthy life years (QALYs). The figures about the probability of death were taken from the World Bank data.[4] These statistics were calculated for five age-groups: people aged under 5, those aged 5 to 9, those aged 10 to 14, those aged 15 to 60, and those over 60 years of age. Among those aged under 15 years, the probability of dying is highest among those under five, followed by children aged between five and nine, and adolescents aged between 10 and 14. The mortality rate is around 17% among adults.

For a cohort of 100,000 people, life expectancy at age 0 to 5 was around 68 years. It was 66 for those aged between 5 and 9, and 61 for those aged between 10 and 14. Due to non-availability of data on the mortality rate in the sub-group of the beneficiaries, we assumed that the death probability was identical in the two populations, which implied that life expectancies in the two groups were identical. The results show that the health-related quality of life (HRQL) decreased with age both among the scheme's beneficiaries and its non-beneficiaries. The quality-adjusted life expectancy at birth, that is the number of years of life in good health, was estimated at 64.93 QALYs for the beneficiaries and 65.4 QALYs for the non-beneficiaries for the 0-5 years age group. These values decreased with age.

Table 8: QALYs and QALE in the sub-group of the beneficiaries

Age	Death probability	No. of people at the beginning	No. of deaths	Person-years	Cumulative person-years	Life expectancy	HRQL	QALYs	Cumulative QALYs	QALE (in QALYs)
<5	0.0407	100,000	4,070	489,825	6,806,647	68.07	1.000	489,819	6,492,668	64.93
5-9	0.0053	95,930	504	478,391	6,316,822	65.85	0.994	475,371	6,002,849	62.58
10-14	0.0044	95,426	415	476,094	5,838,431	61.18	0.992	472,087	5,527,478	57.92
15-60	0.1743	95,011	16,565	3,989,525	5,362,337	56.44	0.968	3,862,571	5,055,392	53.21
60+	1.0000	78,446	78,446	1,372,811	1,372,811	17.50	0.869	1,192,820	1,192,820	15.21

Source: ANSD, EHCVM 2019, authors' compilation

Table 9: QALYs and QALE in the sub-group of the non-beneficiaries

Age	Death probability	No. of people at the beginning	No. of deaths	Person-years	Cumulative person-years	Life expectancy	HRQL	QALYs	Cumulative QALYs	QALE (in QALYs)
<5	0.0407	100,000	4,070	489,825	6,806,647	68.07	0.959	469,711	6,539,686	65.40
5-9	0.0053	95,930	504	478,391	6,316,822	65.85	0.990	473,504	6,069,975	63.28
10-14	0.0044	95,426	415	476,094	5,838,431	61.18	0.990	471,464	5,596,471	58.65
15-60	0.1743	95,011	16,565	3,989,525	5,362,337	56.44	0.977	3,899,748	5,125,006	53.94
60+	1.0000	78,446	784,46	1,372,811	1,372,811	17.50	0.893	1,225,258	1,225,258	15.62

Source: ANSD, EHCVM 2019, authors' compilation

Healthcare costs were calculated for the different age groups of beneficiaries and non-beneficiaries. The average cost of medical care for children aged under 10 was around CFAF 31,000 for the beneficiaries and CFAF 23,000 for the non-beneficiaries; that is a difference of 7,000 to 8,000 FCFA more than for people not covered by the UHC scheme. Those aged between 15 and 60 who were UHC beneficiaries spent an average of CFAF 62,000, against CFAF 50,000 for their peers who were not covered by the UHC. Except for the case of the adolescents aged 10 to 14, costs were higher for the non-beneficiaries of the scheme.

It is worth pointing out that a cost-effectiveness analysis takes into account the time horizon while estimating costs. It is therefore necessary to discount the costs of medical care (Muenniget al., 2005; McIntosh et al., 2010). Discounting the future costs that people may incur requires a discount rate that enables the present value of these costs to be assessed. According to McIntosh et al (2010), the most appropriate discount rate is the GDP deflator. This index was used to discount the costs over the time horizon corresponding to the length of each age-group interval. Over a four year horizon, the discounted costs of health expenditure could reach an average of CFAF 116,000 for beneficiary children aged under 5 and CFAF 119,000 and those aged under 10, while their agemates not covered by the scheme would spend less. This trend remained the same in the case of the 15-60 age group. However, in the group aged 10-14 and in that aged over 60, the discounted future expenditure among the beneficiaries was lower than that among the non-beneficiaries.

Table 10: Discounted future medical care expenditure

	Beneficiaries		Non-beneficiaries	
Age	Average costs	Average discounted costs	Average costs	Average discounted costs
<5	30,512	116,577	22,204	84,834
5-9	31,330	119,703	23,474	89,688
10-14	14,273	54,535	25,703	98,205
15-60	62,052	1,880,408	50,453	1,528,923
60+	64,628	1,617,739	95,954	2,401,896

Source: ANSD, EHCVM 2019, authors' compilation

Table 11 presents the incremental costs, incremental effectiveness, and the incremental cost-effectiveness ratio. The table shows that the incremental costs were positive for those aged 0 to 5, those aged 5 to 9, and those aged 15 to 60, but they were negative for those aged 10 to 14 and those aged over 60. The incremental effectiveness was negative for all age-groups. This points to an unequivocal ineffectiveness for people aged under 9 and those aged 15 to 60. Indeed, if the incremental cost is positive and the incremental effectiveness is negative, this can only mean that the UHC scheme has achieved poor results yet at a high cost, and is therefore ineffective (Sanders et al., 2019). One possible explanation for this situation is that the UHC package covers generic medical care and excludes the most expensive. However, for the adolescents

aged 10 to 14, the cost-effectiveness ratio was CFAF 60,402 per QALY gained. This means that one year of healthy life gained would cost CFAF 60,402. Furthermore, for a person aged over 60, the cost of a year of healthy life would be approximately 1,896,380 FCFA. To judge the effectiveness of the UHC scheme, the cost-effectiveness ratio was compared with a threshold known as the social cost or willingness-to-pay. If the cost-effectiveness ratio was lower than the social cost, then the scheme was effective, otherwise the scheme would be said to be ineffective (Muennig and Bounthavong, 2016). For the choice of this threshold, the WHO suggests the GDP per capita.

Table 11: Cost-effectiveness of the UHC scheme

Age		Cost (in CFAF)	Incremental cost (in CFAF)	Effectiveness (in QALYs)	Incremental effectiveness (in QALYs)	Incremental cost-effectiveness ratio
< 5	Beneficiaries	116,577	-	64.93	-	
	Non-beneficiaries	84,834	31,742	65.40	-0.47	-67,511
5-9	Beneficiaries	119,703	-	62.58	-	
	Non-beneficiaries	89,688	30,015	63.28	-0.70	-42,894
10-14	Beneficiaries	54,535	-	57.92	-	
	Non-beneficiaries	98,205	-43 670	58.65	-0.72	60,402
15-60	Beneficiaries	1,880,408	-	53.21	-	
	Non-beneficiaries	1,528,923	351,485	53.94	-0.73	-479,714
60+	Beneficiaries	1,617,739	-	15.21	-	
	Non-beneficiaries	2,401,896	-784,157	15.62	-0.41	1,896,380

Source: ANSD, EHCVM 2019, authors' compilation

7. Conclusion

The aim of this study was two-fold: a) to assess the impact of the Universal Health Coverage (UHC) scheme in Senegal on the use of medical care and employee productivity, and b) to assess the cost-effectiveness of the scheme. Data from the Harmonized Survey of Household Living Conditions (*Enquête Harmonisée sur les Conditions de Vie des Ménages, EHCVM*) in Senegal were analyzed using the endogenous switching regression (ESR) model.

Comparisons of the rates of use of medical care and of the average numbers of working days lost due to illness between the UHC beneficiaries and its non-beneficiaries revealed significant differences. However, knowing these average differences was not enough to understand people's decisions to join the scheme. We therefore modelled enrolment for the scheme as a selection process, where the expected benefits of the scheme determined enrolment decisions. More specifically, we used an endogenous switching regression approach to account for the selection bias and to capture the differential impact of coverage on the scheme's beneficiaries and its non-beneficiaries.

We found that the UHC scheme's beneficiaries had greater access to medical care than its non-beneficiaries. Indeed, for the beneficiaries, the average effect of the scheme (ATT) on the use of medical care was a 17% increase in the likelihood of its members using its medical care. The findings are in line with those of Giedion and Diaz (2010), Jütting (2004), Wagstaff (2007), Spaan et al. (2012), and Gruber, et al. (2014). We also found that if the non-beneficiaries had been covered by the UHC scheme, the average effect on them (ATU) would have increased their likelihood of using medical care by 9.4%. Another interesting finding was that the beneficiaries lost fewer days of work due to illness. In other words, they were more productive than the non-beneficiaries. In this regard, the average effect of the scheme on the beneficiaries (ATT) was found to be a reduction of about one working day lost due to illness. If the non-beneficiaries had been covered by the UHC scheme, the effect would have been a reduction of almost two days' work lost to illness. These results are consistent, since better access to medical care enables its beneficiaries to receive treatment quickly when they are ill. This in turn leads to an improvement in their state of health, as shown by Mensah et al. (2010) and Bagnoli (2019). As a result, they lose a few working days. These results corroborate those of Lee and Torm (2017) and Dizioli and Pinheiro (2016). The latter authors found that the number of working

days lost due to illness was reduced by 76.54% among workers who had a health insurance, compared to those who did not. They also found that a corporate health cover increased a company's productivity.

Although Senegal's UHC scheme improved access to medical care through an increase in the probability of its beneficiaries using its medical care, and improved employee productivity, this twin-improvement happened at a cost. In fact, a cost-effectiveness analysis of the scheme showed that it was unequivocally ineffective in the case of certain age groups, notably those aged under 10 and those aged 15-60. This means that the beneficiaries of the scheme incurred more costs for less benefits than the non-beneficiaries. However, among the adolescents, the cost-effectiveness ratio was CFAF 60,402 FCFA per QALY gained. The ratio was much higher for people aged over 60. For the latter, the cost of a healthy life gained was approximately CFAF 1,896,380.

In a nutshell, while Senegal's UHC scheme was found to improve access to medical care and employee productivity, it is also beset by issues of cost-effectiveness: in the 15-60 age group, an age group that is essentially made up of the working population, the incremental cost-effectiveness ratio showed that the beneficiaries of the scheme incurred more healthcare costs for fewer benefits than its non-beneficiaries.

Based on the study's findings, we can make the following recommendations:

- The country's UHC scheme's coverage needs to be expanded. To this end, emphasizing its positive effects on people's health and their productivity at work would help to enhance the mobilization of the government, in particular of the Ministry of Finance, of local authorities and of potential beneficiaries.

- Despite the UHC scheme's average coverage rate of 76%, its healthcare expenditure remains high. Therefore, care must be taken to ensure that its beneficiaries are effectively covered by service providers.

- A better knowledge of the care package offered would enable the UHC scheme's beneficiaries to make better use of the benefits it offers. To this end, communication strategies need to be developed to increase people's awareness of the content of the care package offered.

- Until now, there has been no rigorous system of continuous data collection to enable regular monitoring of the resources mobilized, the processes applied, the care provided, the beneficiaries, etc. A system for regular assessment of the UHC scheme's effects should be put in place. The production and transmission of data by all stakeholders should be one of the obligations of the affiliated health mutuals, and the UDMSs (County Health Mutuals) and the health service providers.

Notes

1. The main effect is a better state of health, which has a positive impact on employee productivity through saving time at work. People in better health tend to be more productive, because they have more energy and are in a better intellectual shape. They also lose fewer working days through illness. Therefore, gains in employee productivity and working time can be a source of increased income for members of the scheme. Subsidizing their contributions directly reduces their health costs, which amounts to an increase in their income.

2. World Bank: https://databank.worldbank.org/source/health-equity-and-financial-protection-indicators-(hefpi)#

3. The medical care package offered by Senegal's UHC scheme excludes antiretrovirals, eyeglasses, contact lenses, prostheses (including dental), orthoses, and treatment outside Senegal.

4. World Bank: https://databank.worldbank.org/source/health-equity-and-financial-protection-indicators-(hefpi)#

References

Achadi, E.L., Achadi, A., Pambudi, E. and Marzoeki, P. 2014. A study on the implementation of Jampersal policy in Indonesia. World Bank Group, 1–78. https://openknowledge.worldbank.org/bitstream/handle/10986/20740/913250WP0UHC0C00Box385331B00PUBLIC0.pdf?sequence=1&isAllowed=y%5Cnhttp://documents.worldbank.org/curated/en/2014/09/20286598/study-implementation-jampersal-policy-indonesia.

Acharya, A., Vellakkal, S., Taylor, F., Masset, E., Satija, A., Burke, M., and Ebrahim, S. (2012). Impact of national health insurance for the poor and the informal sector in low-and middle-income countries. London: The EPPI-Centre.

Acton, R., Imberman, S. and Lovenheim, M. 2021. "Do health insurance mandates spillover to education? Evidence from Michigan's Autism Insurance Mandate". *Journal of Health Economics,* 80: 102489.

Alcaraz, C., Chiquiar, D., Orraca, M.J. and Salcedo, A. 2017. "The effect of publicly provided health insurance on education outcomes in Mexico". *The World Bank Economic Review,* 30 (Supplement 1): S145–S156.

Alene, D.A. and Manyong, V.M. 2007. "The effects of education on agricultural productivity under traditional and improved technology in northern Nigeria: An endogenous switching regression analysis". *Empirical Economics*, 32(1): 141–159.

Anderson, R. N. (1999). Method for constructing complete annual US life tables (No. 129). National Center for Health Statistics.

Anindya, K., Lee, J.T., McPake, B., Wilopo, S.A., Millett, C. and Carvalho, N. 2020. "Impact of Indonesia's national health insurance scheme on inequality in access to maternal health services: A propensity score matched analysis". *Journal of Global Health,* 10(1): 1–12. https://doi.org/10.7189/JOGH.10.010429.

ANSD. 2020. Communication des résultats de pauvretéde l'Enquête Harmonisée sur les Conditions de Vie des Ménages au Sénégal (EHCVM 2018/2019).

Asfaw, S., Shiferaw, B., Simtowe, F., and Lipper, L. (2012). Impact of modern agricultural technologies on smallholder welfare: Evidence from Tanzania and Ethiopia. Food policy, 37(3), 283–295.

Bagnoli, L. 2019. "Does health insurance improve health for all? Heterogeneous effects on children in Ghana". *World Development*, 124: 104636.

Bai, B., Zhang, Y. and Liu, Y. 2021. "Influences of public medical insurance system on labor health status and supply". *Iranian Journal of Public Health,* 50(8): 1658.

Barros, R. 2008. Wealthier but not much healthier: Effects of a health insurance program for the poor in Mexico. Discussion Papers, 09–002.

Brodaty, T. 2013. "Évaluation des politiques publiques: Trois illustrations dans le champ culturel". *Culture methodes*, (1): 1–12.

Campbell, A. P., Hoehle, L.P., Phillips, K.M., Caradonna, D.S., Gray, S.T. and Sedaghat, A.R. 2018. Le contrôle des symptômes dans la rhinosinusite chronique est un facteur prédictif indépendant de la baisse de productivité. Annales françaises d'Oto-rhino-laryngologie et de Pathologie Cervico-faciale, 135(4), 230–234.

Carrin, G., Waelkens, M. P., and Criel, B. (2005). Community-based health insurance in developing countries: a study of its contribution to the performance of health financing systems. *Tropical medicine & international health*, 10(8), 799–811.

Carter, D. W., and Milon, J. W. (2005). Price knowledge in household demand for utility services. *Land Economics*, 81(2), 265–283.

Chevreul, K., Thomas, D., Chan, E., Durand Zaleski, I. and Cadier, B. 2013. Evaluation coût-efficacité de la prise en charge à 100% du sevrage tabagique par l'assurance maladie. Bulletin épidémiologique hebdomadaire, (20–21): 230–233.

Chuma, J., Mulupi, S., and McIntyre, D. (2013). Providing financial protection and funding health service benefits for the informal sector: Evidence from sub-Saharan Africa. London, UK: KEMRI—Wellcome Trust Research Programme, University of Cape Town.

Cohodes, S.R., Grossman, D.S., Kleiner, S.A. and Lovenheim, M.F. 2016. "The effect of child health insurance access on schooling: Evidence from public insurance expansions". *Journal of Human Resources,* 51(3): 727–759.

De Janvry, A., and Sadoulet, E. (2015). *Development economics: Theory and practice. Routledge.*

Di Falco, S., Veronesi, M., and Yesuf, M. (2011). Does adaptation to climate change provide food security? A micro-perspective from Ethiopia. *American journal of agricultural economics,* 93(3), 829–846.

Dizioli, A. and Pinheiro, R. 2016. "Health insurance as a productive factor". Labour Economics, 40: 1–24.

Duflo, E., & Kremer, M. (2003). Use of Randomization in the Evaluation of Development Effectiveness[1]. Evaluating development effectiveness, 7, 205.

Erickson, P. (1995). *Years of Healthy Life* (No. 7). US Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Health Statistics.

Feeny D, Furlong W, Boyle M, Torrance GW. 1995. "Multi-attribute health status classification systems: Health utilities index". *Pharmacoeconomics,* 7: 490–502.

Feeny D, Furlong W, Torrance GW, et al. 2002. "Multi-attribute and single-attribute utility functions for the Heath Utility Index Mark 3 System". *Med Care*, 40(2): 113–128.

Fiestas Navarrete, L. (2018). Impact of universal health coverage on catastrophic health expenditure: Evidence from Ghana. *European Journal of Public Health*, 28(suppl_4). https://doi.org/10.1093/eurpub/cky214.118

Fiestas Navarrete, L. 2018. "Impact of universal health coverage on catastrophic health expenditure: Evidence from Ghana". *European Journal of Public Health*, 28 (Supplement 4). https://doi.org/10.1093/eurpub/cky214.118.

Fink, G., Robyn, P.J., Sié, A. and Sauerborn, R. 2013. "Does health insurance improve health?: Evidence from a randomized community-based insurance rollout in rural Burkina Faso". *Journal of Health Economics*, 32(6): 1043–1056.

Geng, X., Janssens, W., Kramer, B. and van der List, M. 2018. "Health insurance, a friend in need? Impacts of formal insurance and crowding out of informal insurance". *World Development,* 111: 196–210.

Giedion, U. and Díaz, B.Y. 2010. A review of the evidence. The impact of health insurance in low-and middle-income countries, 13–32.

Giuntella, O. and Lonsky, J. 2020. "The effects of DACA on health insurance, access to care, and health outcomes". *Journal of Health Economics*, 72: 102320.

Givord, P. 2014. Méthodes économétriques pour l'évaluation de politiques publiques. *Economie prevision,* (1): 1–28.

Gnawali, D.P., Pokhrel S., Sié A., Sanon M., De Allegri M., Souares A., Dong H., Sauerborn, R. 2009. "The effect of community-based health insurance on the utilization of modern health care services: Evidence from Burkina Faso". *Health Policy*, 90: 214–22.

Gouda, H.N., Hodge, A., Bermejo, R., Zeck, W. and Jimenez-Soto, E. 2016. "The impact of healthcare insurance on the utilisation of facility-based delivery for childbirth in the Philippines". *PLoS ONE*, 11(12): 1-15. https://doi.org/10.1371/journal.pone.0167268.

Grossman, J. B. (1994). Evaluating social policies: principles and US experience. The World Bank Research Observer, 9(2), 159–180.

Gruber, J., Hendren, N. and Townsend, R.M. 2014. "The great equalizer: Health care access and infant mortality in Thailand". *American Economic Journal: Applied Economics*, 6(1): 91–107.

Hsu, Y. T., & Yang, C. H. (2017). Universal Coverage Scheme and out-of-pocket healthcare expenditure: evidence from Thailand. *Journal of the Asia Pacific Economy*, 22(2), 309–329.

Jirawat Panpiemras, Thitima Puttitanun, Krislert Samphantharak, Kannika Thampanishvong. 2011. Impact of universal health care coverage on patient demand for health care services in Thailand". *Health Policy*, Vol. 103, Issues 2-3. https://doi.org/10.1016/j.healthpol.2011.08.008.

Jütting, J. P. (2004). Do community-based health insurance schemes improve poor people's access to health care? Evidence from rural Senegal. *World development*, 32(2), 273–288.

Jütting, J. P. (2004). Do community-based health insurance schemes improve poor people's access to health care? Evidence from rural Senegal. *World development*, 32(2), 273–288.

Jütting, J.P. 2004. "Do community-based health insurance schemes improve poor people's access to health care? Evidence from rural Senegal". *World Development*, 32(2): 273–288.

Lecocq, A., Ammi, M. and Bellarbre, É. 2016. "Le score de propension: Un guide méthodologique pour les recherches expérimentales et quasi expérimentales en education". *Mesure et Évaluation en Éducation*, 37(2): 69-100. https://doi.org/10.7202/1035914ar.

Lee, S. and Torm, N. 2017. « Sécurité sociale et résultats des entreprises: l'exemple des PME au Viet Nam ». *Revue internationale du Travail*, 156(2): 207–237.

Lim, K. L., Jacobs, P., Ohinmaa, A., Schopflocher, D. and Dewa, C.S. 2008. Une nouvelle mesure, fondée sur la population, du fardeau économique de la maladie mentale au Canada. *Maladies chroniques au Canada*, 28(3): 103–110.

Lokshin, M., & Sajaia, Z. (2004). Maximum likelihood estimation of endogenous switching regression models. *The Stata Journal*, 4(3), 282–289.

Lu, C., Chin, B., Lewandowski, J.L., Basinga, P., Hirschhorn, L.R., Hill, K., Murray, M. and Binagwaho, A. 2012. "Towards universal health coverage: An evaluation of Rwanda Mutuelles in its first eight years". *PLoS ONE*, 7(6).

Maddala, G. S. (1983). Limited-dependent and qualitative variables in econometrics (No. 3). Cambridge university press.

Mate, K. S., Sifrim, Z. K., Chalkidou, K., Cluzeau, F., Cutler, D., Kimball, M., ... Barker, P. 2013. "Improving health system quality in low-and middle-income countries that are expanding health coverage: A framework for insurance". *International Journal for Quality in Health Care*, 25(5): 497–504. https://doi.org/10.1093/intqhc/mzt053.

McIntosh, E. (Ed.). (2010). Applied methods of cost-benefit analysis in health care. Oxford University Press.

Mensah, J., Oppong, J.R. and Schmidt, C.M. 2010. "Ghana's national health insurance scheme in the context of the health MDGs: An empirical evaluation using propensity score matching". *Health Economics*, 19(S1): 95–106.

Miller, G., Pinto, D.M. and Vera-Hernández, M. 2009. High-powered incentives in developing country health insurance: Evidence from Colombia's regimen subsidiado. Cambridge, MA: National Bureau of Economic Research.

Muennig, P. and Bounthavong, M. 2016. *Cost-effectiveness analysis in health: A practical approach.* John Wiley and Sons.

Muennig, P., & Bounthavong, M. (2016). Cost-effectiveness analysis in health: a practical approach. John Wiley & Sons.

Muennig, P., Franks, P. and Gold, M. 2005. "The cost effectiveness of health insurance". *American Journal of Preventive Medicine,* 28(1): 59–64.

Muennig, P., Franks, P., & Gold, M. (2005). The cost effectiveness of health insurance. American journal of preventive medicine, 28(1), 59–64.

Newman, J., Rawlings, L., & Gertler, P. (1994). Using randomized control designs in evaluating social sector programs in developing countries. *The World Bank Research Observer*, 9(2), 181–201.

Nguyen, S.V. and Zawacki, A.M. 2009. Health insurance and productivity: Evidence from the manufacturing sector. *US Census Bureau Centre for Economic Studies Paper* No. CES-WP-09-27.

Ravit, M., Ravalihasy, A., Audibert, M., Ridde, V., Bonnet, E., Raffalli, B., Roy, F. A., N'Landu, A. and Dumont, A. 2020. "The impact of the obstetrical risk insurance scheme in Mauritania on maternal healthcare utilization: A propensity score matching analysis". *Health Policy and Planning*, 35(4): 388-398. https://doi.org/10.1093/heapol/czz150.

Ridde, V. and Morestin, F. 2011. "A scoping review of the literature on the abolition of user fees in health care services in Africa". *Health Policy and Planning*, 26(1): 1–11.

Sanders, G.D., Maciejewski, M.L. and Basu, A. 2019. "Overview of cost-effectiveness analysis". *Jama*, 321(14): 1400–1401.

Shen, Z., Parker, M., Brown, D. and Fang, X. 2017. "Effects of public health insurance on labour supply in rural China". *China Agricultural Economic Review*.

Soors, W., Devadasan, N., Durairaj, V., & Criel, B. (2010). Community health insurance and universal coverage: multiple paths, many rivers to cross.

Spaan, E., Mathijssen, J., Tromp, N., McBain, F., Have, A. T. and Baltussen, R. 2012. "The impact of health insurance in Africa and Asia: A systematic review". *Bulletin of the World Health Organization*, 90: 685–692.

Torrance, G.W. 1986. "Measurement of health state utilities for economic appraisal: A review". *Journal of Health Economics*, 5: 1–30.

Torrance, G.W., Furlong, W., Feeny, D. and Boyle, M. 1995. "Multi-attribute preference functions". *Pharmacoeconomics*, 7(6): 503–520.

Tracking universal health coverage: 2017 global monitoring report. World Health Organization and International Bank for Reconstruction and Development / The World Bank; 2017. Licence: CC BY-NC-SA 3.0 IGO.

Vialle-Valentin, C. E., Ross-Degnan, D., Ntaganira, J., & Wagner, A. K. (2008). Medicines coverage and community-based health insurance in low-income countries. Health Research Policy and Systems, 6, 1–11.

Wagstaff, A. 2007. Health insurance for the poor: Initial impacts of Vietnam's health care fund for the poor. *World Bank Policy Research Working Paper*, 4134, 1–33.

Wagstaff, A., Flores, G., Hsu, J., Smitz, M. F., Chepynoga, K., Buisman, L. R., ... and Eozenou, P. 2018. "Progress on catastrophic health spending in 133 countries: A retrospective observational study". *The Lancet Global Health*, 6(2): e169-e179.

Wang, W., Temsah, G. and Mallick, L. 2016. "The impact of health insurance on maternal health care utilization: Evidence from Ghana, Indonesia and Rwanda". *Health Policy and Planning,* 32(3): 366–375. https://doi.org/10.1093/heapol/czw135.

Wooldridge, J.M. 2010. Econometric analysis of cross section and panel data. Cambridge: MIT Press.

Xu, K., Evans, D.B., Kawabata, K., Zeramdini, R., Klavus, J. and Murray, C. J. L. 2003. "Household catastrophic health expenditure: A multicountry analysis". Lancet, 362(9378), 111–117. http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=medc&AN=12867110.

Yang, J., Hong, Y., & Ma, S. (2016). Impact of the new health care reform on hospital expenditure in China: A case study from a pilot city. *China Economic Review,* 39, 1–14.

Mission

To strengthen local capacity for conducting independent,
rigorous inquiry into the problems facing the management of economies in sub-Saharan Africa.

The mission rests on two basic premises: that development is more likely to occur where there is sustained sound management of the economy, and that such management is more likely to happen where there is an active, well-informed group of locally based professional economists to conduct policy-relevant research.

Bringing Rigour and Evidence to Economic Policy Making in Africa

- Improve quality.
- Ensure sustainability.
- Expand influence.

www.aercafrica.org

Learn More

www.facebook.com/aercafrica

www.instagram.com/aercafrica_official/

twitter.com/aercafrica

www.linkedin.com/school/aercafrica/

Contact Us
African Economic Research Consortium
Consortium pour la Recherche Economique en Afrique
Middle East Bank Towers,
3rd Floor, Jakaya Kikwete Road
Nairobi 00200, Kenya
Tel: +254 (0) 20 273 4150
communications@aercafrica.org