



## Is Oil Rent a Curse for Health in Africa?

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### Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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## ABSTRACT

**Aims/ Objectives:** To determine whether oil rent is a curse for the health of populations in Africa.

**Study Design:** Cross-sectional study.

**Place and Duration of Study:** Oil-producing African countries over the period 2000-2015.

**Methodology:** Using the Random effects (RE) and the Two Stages Least Square (2SLS) estimators on a sample of 18 Oil-producing African countries.

**Results:** The results show that oil rent has a negative effect on life expectancy.

**Conclusion:** The fact that oil-producing African countries have a source of revenue that does not depend on taxation, means that the governments of these countries do not make health an important part of public policy.

*Keywords:* Oil rent; human development; health; two stages least squares.

**Classification JEL:** N57; O15; I18.

## 1 INTRODUCTION

According to the Organization of the Petroleum Exporting Countries (OPEC) in 2016, the price

of a barrel of oil increased from 22 dollars to more than 100 dollars in the international market between 2000 and 2014. This has allowed oil-producing countries to have substantial financial

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resources to finance development. Especially for the African oil producing countries that are highly dependent on oil revenue.

However, a major fact surrounds the use of oil rent in Africa: it could in fact be a brake on the development opportunities of these countries. While there has been a significant improvement in the level of human development over the last two decades as a result of the increase in GDP per capita, oil-producing African countries are still among the countries with low levels of human development. Worse still, this significant improvement in the Human Development Index (HDI) has not been accompanied by an improvement in non-monetary aspects, particularly those related to education and health (Avom and Carmignani [1]).

In fact, in 2015, the performance of these countries in this area is far from enviable. Indeed, the majority of African oil countries are among the countries with the lowest Human Development Indices (HDI) over the last twenty years. Apart from Algeria, Tunisia and Libya, which respectively had indices of 0.745, 0.725 and 0.716 ranked in the high human development bracket in the 2015 world ranking, and Gabon, Egypt and South Africa ranked among the medium human development countries, the rest of the countries are ranked among the low development countries. This includes Nigeria, the first producer, and Angola, the second largest producer on the continent.

With regard to the health-related aspects of human development, particularly life expectancy, while there has been an increase in the life expectancy of the population, progress has been slowest and weakest. Life expectancy has increased from 37.5 years for those born between 1950 and 1955 to 60.2 years for those born between 2010 and 2015, an increase of 22.7 years. The above data are obviously below those obtained by Asia, which saw a gain of almost 30 years, and even Latin America with a gain of 23.4 years. It must be said that these countries have substantially reduced their dependence on raw materials, particularly oil. At the same time, the incidence of poverty in these countries and other development indicators have improved considerably (Avom and Carmignani [1]).

The fact that among the countries with the lowest levels of life expectancy are countries such as Chad, Cote d'Ivoire, Cameroon, Angola and Nigeria is in itself a paradox because longevity rhymes with average income (Aghion and al. [2]). Furthermore, it is important to note that Nigeria is a typical example of this situation, it is the largest oil producer on the continent, the leading economic power on the continent, but it is the country most severely affected by poverty according to the World Outlook Poverty in 2018, with more than half of the population living on less than 1.5 dollars day. Worse still, Nigeria has one of the highest infant mortality rates (-5 years) on the continent and in the world, 814 per 100,000 births in 2015, behind Chad with 856 per 100,000 (UNECA, 2018). This high infant mortality rate is thought to be the consequence of oil pollution, whose human and environmental effects are dramatic and irreversible.

However, since the seminal work of Sachs [3] on the impact of natural resources dependency on the development performance of countries that are richly endowed with natural resources, the majority of the economic literature on natural resources has been concerned only with monetary indicators of development, namely per capita income and per capita income growth rates, neglecting non-monetary indicators of development, particularly those related to health. And yet, according to the endogenous growth theory, health is an essential factor in economic growth and development (Grossman [4], Van and Muysken [5]).

The problem of the relationship between dependence on natural resources and public health was first studied by Bulte and al. [6]. The authors looked at the impact of dependence on income from the exploitation of natural resources on the well-being of populations, including water access, food deficit and life expectancy.

Subsequently, Wigley [7], explained that governments in resource-rich countries, particularly oil-rich countries, are failing to make effective use of the exceptional resources at their disposal to improve health. Others have looked at the impact of natural resources on public health spending, Cockx [8] who find that dependence on natural resources hinders public investment in health.

The health dimension is particularly important because it is in line with the Sustainable Development Goals (SDOs), in particular the 3<sup>e</sup> SDO which is "health and well-being for all". Hence the importance for countries to invest in the public good that is health, and for economists to look at the impact of natural rents on health, in a context where the economies of oil-producing African countries are almost exclusively dependent on the exploitation of natural resources.

However, it differs from the other studies in that it provides an institutionalist explanation for the poor public health performance of these countries. Indeed, the previous studies did not take into account the fact that the colonial legacy played an important role in the establishment of an efficient health system serving the population. Therefore, this study distinguishes itself from other studies by proposing the role of the colonial legacy as an explanation for the poor health performance of these countries.

We will present in section 2, a review of the literature on the relationship between natural resources and health. Section 3 will be devoted to the methodology used. Sections 4 and 5 will be devoted to the main results and the conclusion.

## **2 WHAT DO WE KNOW ABOUT THE RELATIONSHIP BETWEEN NATURAL RESOURCES AND HEALTH?**

Dependence on the extractive industry has a paradoxical relationship with improving the well-being of populations. One of the social consequences of such dependence is that oil-exporting countries have high poverty rates, poor educational performance, poor health care, and high infant and maternal mortality rates, which is paradoxical given the huge revenues derived from the exploitation of natural resources.

Health plays a new and important role in the debate on the curse of natural resources. Bulte and al. [6] provided a conceptual

framework for analyzing the effect of natural resource dependence on health. However, the mechanisms that theoretically underlie the influence of natural resource dependency on health are far from elucidated despite the fact that the findings of previous studies are unanimous.

By showing that dependence on natural resources negatively impacted the well-being of the population, Bulte and al. [6] have pointed to a welfare loss effect that it creates in these countries. They examined the relationship between dependence on natural resources and several indicators of well-being, including life expectancy. The authors show that in resource-rich countries with non-productive institutions, the population tends to have low life expectancy. This implies that the resource curse is a phenomenon that occurs on a larger scale than simple economic growth. Economies that rely on resources tend to underperform on the spectrum of social criteria. This reinforces the conclusion of some researchers that institutional reform is a necessary condition for the development of some countries. Finally, if the effects of governance are taken into account, the abundance of one-off and diffuse resources generally has no significant impact on welfare, if only a small one. After this pioneering study, very few studies have looked at health outcomes in resource-dependent countries, as Gylfason [9] has shown that, on average, resource-rich countries provide their citizens with less health care than other countries with similar incomes and fewer natural resources.

Avom and Carmignani [1] study the impact of commodity dependence on social development (education and health), they establish that commodity dependence negatively affects social development through two channels other than income and growth: inequality in income distribution which causes great disparities in the possibility for everyone to have access to health, and macroeconomic volatility because commodity dependence makes countries vulnerable to external shocks which cause huge economic fluctuations.

Subsequently, Kim and Lane [10] made an assessment of natural resource dependence on human capital. Using a time-series approach

based on panels and a large cross-national dataset, it was found that dependence on natural resources has an adverse effect on health. They also find that agricultural exports reduce health. Finally, large differences in relationships are detected across countries, depending on a country's economic and socio-political institutions.

Nkurunziza [11] have also found a negative correlation between commodity dependence and human development, particularly in developing countries and countries with low human development. This relationship is based on several identified mechanisms. These mechanisms also have direct and/or indirect effects at the macroeconomic level, the most important of which are related to terms of trade and fiscal and monetary policy challenges. At the microeconomic level, they make acute price fluctuations responsible for this situation, as such fluctuations complicate the financial decisions and planning of individuals, especially among poor households that do not have sufficient savings to absorb sudden movements in the economy.

Wigley [7] seeks to analyze the adverse effects of oil wealth on social welfare. In his study, he examines whether the so-called resource curse extends to children's health, as measured by under-five mortality. Under the assumption that oil revenues reduce the incentives for governments in oil-rich countries to improve child health. His study of a panel of 167 countries (all countries with populations over 250,000) for the years 1961 to 2011 concludes that oil-poor countries outperform oil-rich countries in reducing under-five mortality. This suggests that governments in oil-rich countries often fail to use their exceptional resources effectively to improve child health.

Using a global index of dependence on natural resources, Madreimov [12] revisits the link between dependence on natural resources and quality of life, measured by life expectancy over the period 1990-2011. Using fixed-effect regression and panel-corrected standard error regression estimators, they show that there is an inverted U-shaped relationship between natural resource dependence and life expectancy.

This implies that, in the long run, resource dependence is a constraint. This effect remains robust after a set of robustness checks.

Other authors have looked at the impact of natural resource dependency on health expenditures. Cockx and Francken [8] were the first to truly highlight the low level of investment by resource-rich countries in the health sector. They used a wide range of countries and their results suggest a negative relationship between natural resource wealth and public spending on health. Before that, Bhattacharyya and Collier [13] find results in juxtaposition with those of Cockx and Francken [8]. Their results suggest that in resource-rich developing countries, governments in resource-rich developing countries give little capital investment in priority sectors such as health, the same results were obtained by Karimu and al. [14] and, Turan and Yankkaya [15].

A new class of researchers have turned their attention to the impact of natural resource wealth on a determinant of well-being, including the resurgence of infectious diseases. With the study by De Soyza and Gizelis [16] which shows that oil-dependent countries suffer from governance failures and, consequently, public health problems. Since the cost of fighting disease redistributes income to the rulers, resource wealth is likely to lead to neglect of public action to contain a deadly disease.

The author tests a sample of 137 countries from 1990 to 2008, using resource wealth as a proxy for endogenous policy choices on HIV/AIDS prevalence, a proxy for policy ineffectiveness and policy non-compliance. His conclusion is that the "resource curse" appears to be affecting the spread of HIV/AIDS, even though oil-rich countries, other things being equal, should have more financial resources for effective public action.

Chang and Wei [17] attempt to explore the link between natural resources and health, focusing on malaria, a major infectious disease. They argue that in resource-rich countries, government reluctance to invest in human capital, endemic corruption, and poor hygiene conditions in mining and drilling areas are leading to an increase in malaria cases. They apply different measures

of natural resources and examine their impact on the number of malaria infections and deaths for the period 2000-2014. The statistical results confirm that the abundance of natural resources is positively associated with a higher number of malaria incidences and deaths.

While the majority of studies find a negative association, others find a positive relationship. Cotet and Tsui [18] have studied the relationship between oil and growth, as well as oil wealth and health outcomes, using global data on oil discovery and production. The study found that the natural resource curse hypothesis is not valid. The results show that there is a positive relationship between oil abundance and long-term growth. In addition, there is a positive trend in life expectancy and infant mortality rates in oil-rich countries.

El anshasy and Katsaiti [19] have studied the impact of economic dependence on different natural resources on health expenditure and health outcomes using data from 118 countries for the period 1990 to 2008. Countries were divided into four groups according to resource type and resource density. The empirical results are as follows: the level of health expenditure is increasing in countries with high resource density. However, there is no significant relationship between natural resource density and health outcomes. Diabetes and obesity rates remain low if energy-dependent economies (based on oil, natural gas and coal revenues) generate more revenues from hydrocarbon resources.

According to Nikzadian [20], low economic growth and the lack of good quality institutions have led to a decline in the level of health in resource-rich developing countries. The authors explored the effects of natural resource rents on public spending on health in OPEC countries over the period 2002 to 2015. The results of this study indicate that resource rents positively influence public health resources when the interactions between the explanatory variables are ignored. However, the sign and magnitude of the coefficients are modified when the interaction terms are included in the regression models. According to the results obtained in this study, resource abundance is not a bad thing in itself.

### 3 METHODOLOGY

This section presents the methodology used in this study to answer the question : what is the impact of oil rent on the life expectancy of populations in oil-producing African countries? We will present the econometric model, the estimation procedure and the data.

#### 3.1 Empirical Model and Estimation Procedure

The model to be estimated is inspired by the work of Wigley [7], with the difference that here the dependent variable is life expectancy instead of the infant mortality rate. The model has also been modified to meet the specificities of African economies, as far as the control variables are concerned.

$$Life_{it} = \alpha_0 + \alpha_1 Oil_{it} + \alpha_2 lnPIB + \alpha_3 X + \epsilon_{it} \quad (3.1)$$

Where X represents a vector of control variables, including Water acces (Water), percentage of population with HIV/AIDS (HIV), Internal Conflicts (Conflicts), logarithm of GDP per capita (lnGDP), and Official Development Assistance (Aid).

With respect to the control variables, the GDP Logarithmus (lnGDP) represents the country's standard of living and is a key determinant of quality of life. It is necessary to control its effect since nations, just like the richest people, are willing to pay to improve their health status because they value their lives more highly Hall and Jones [21]. Other studies such as Filmer and Pritchett [22] estimate that the higher the GDP per capita of a territory, the lower the infant and child mortality rate, and therefore the better the life expectancy.

We have checked for Official Development Assistance (Aid), since health for all is an SDO, one of the means proposed to achieve this goal is Development Assistance, since studies like those of Mishra and Newhouse [23] have shown that Development Assistance reduces the infant mortality rate in poor countries. To capture the effect of poverty on longevity, we have included the percentage of the population without access to improved water sources (Water

aces). Safe drinking water is essential for health. Water-borne diseases and diarrhoea caused by contaminated water sources are one of the leading causes of mortality and morbidity in Africa.

We also controlled the effect of HIV/AIDS prevalence (HIV) measured by the percentage of the population with HIV/AIDS. Previous studies have linked the HIV prevalence rate to life expectancy Kim and Lane [24]. We have also controlled the quality of governance through the resurgence of internal conflicts (Internal conflicts). Indeed, Fearon [25], Collier and Hoeffler [26] have shown that the presence of natural resources in a territory is a determinant of the presence of conflicts for the monopolization of the wealth resulting from the exploitation of these resources. This undoubtedly has a significant impact on life expectancy in these territories.

Our sample consists of countries with geographical, economic and political differences. Thus, the Hausman test tells us that the most appropriate estimator is the random effects estimator (RE). The use of this model is also

justified by the fact that the time dimension is relatively small compared to the cross-sectional dimension, the fixed effects estimator gives less good results under such conditions. The Breusch-Pagan heteroscedasticity test was also carried out to test the overall significance of the random effects. After these preliminary estimates, we proceeded to tests for the presence of endogeneity, notably the Nakamura Nakamura test. The presence of endogeneity biases caused by the variables lnPIB, Access to water and HIV were observed. We used the random effects estimator with instrumental variables, including internal instruments in the absence of robust theoretical instruments. This model allows us to correct for the observed endogeneity bias, and to verify the robustness of our preliminary results.

### 3.2 Data

Our sample consists of 18 countries over the period 2000-2015. The data used are secondary quantitative data. They were collected in the ICRG (2017) database for the variable of presence of internal conflicts, the WDI (2016) for the other macroeconomic variables.

**Table 1. Descriptive statistics**

Variable		Mean	Std-dev	Min	Max	Obs
Life	overall	4.064817	.1400312	3.811203	4.318055	N = 288
	between		.1384805	3.891461	4.308646	n = 18
	within		.0378704	3.958274	4.175555	T = 16
Oil	overall	15.44518	17.8977	0	83.50863	N = 288
	between		15.29249	.0386998	44.46525	n = 18
	within		9.9343	-21.80419	68.78202	T = 16
Aid	overall	19.715	1.483374	13.16158	23.15968	N = 287
	between		1.31246	16.66219	21.30524	n = 18
	within		.7584971	16.21439	22.61063	T = 15.9444
lnGDP	overall	8.410694	1.09518	5.991115	10.79365	N = 283
	between		1.090962	6.285786	10.39735	n = 18
	within		.2922035	6.711056	9.418911	T = 15.7222
Water acces	overall	69.10607	17.97421	42	99.4	N = 280
	between		17.93879	46.81875	97.7	n = 18
	within		3.150441	59.68732	77.88732	T = 15.5556
HIV	overall	3.322266	4.623208	.1	21	N = 256
	between		4.737535	.1	19.6625	n = 16
	within		.5000662	.6847656	4.684766	T = 16
Conflicts	overall	2.078572	.2098298	1.386294	2.442347	N = 240
	between		.1595086	1.785756	2.272237	n = 15
	within		.1420647	1.622848	2.340509	T = 16

Source: Author, from STATA

The choice of the study period is justified by the fact that it is punctuated by a sharp rise in the price per barrel until 2008, a sharp fall in 2009 with the subprime crisis that shook the world from 2008 and a recovery in 2010 before falling back from 2014 with the entry of shale oil from the United States on the market. Moreover, the choice of this period will make it possible to verify whether the negative relationship between the level of development and oil rent remains despite a rise in prices (even if it was still limited in 2003 compared to the evolution of prices between 2003 and 2008). Indeed, Stevens [27] points out that in the empirical literature on the curse of natural resources, there is a strong tendency to consider data over periods that may bias the result, due to the fall in crude oil prices after the shocks of the 1970s.

The results of the descriptive statistics show that the standard deviation of the variable Life is not high, which means that there is a small disparity between countries in the life expectancy of the population. The same is true for the variables Aid, Life, HIV and Conflicts, which means that there is convergence between these countries with respect to these variables. However, for the variable Oil, the standard deviation of this

variable is rather high. This tells us that oil rent dependency is very heterogeneous across the continent. Similarly, for the variable Water acces, the standard deviation shows that some countries are making more efforts than others with regard to access to improved water sources.

## 4 RESULTS AND COMMENTS

The results presented in Table 2 show that there is a significantly negative correlation between oil rent and life expectancy. Thus, the result of column (1) of table 2 shows, as we hoped, that the oil rent is negatively and significantly correlated with life expectancy at 1% degree of significance.

The addition of lnPIB in this preliminary regression is justified by the fact that economic development is strongly correlated with quality of life and vice versa as shown in Aghion and al. [2]. They show in their study that GDP is positively correlated with health, especially life expectancy, and that, conversely, improving life expectancy is beneficial for GDP. Our study shows a positive and significant impact of lnPIB on life expectancy.

**Table 2. Random effects estimations**

VARIABLES	(1)	(2)	(3)	(4)	(5)
		Life exptancy at birth			
Oil	-0.000573*** (0.000214)	-0.000678*** (0.000206)	-0.000494*** (0.000186)	-0.000371** (0.000172)	-0.000747*** (0.000285)
lnGDP	0.0777*** (0.00618)	0.0714*** (0.00606)	0.0520*** (0.00603)	0.0528*** (0.00524)	0.0510*** (0.00666)
Aid		0.0122*** (0.00245)	0.00640*** (0.00241)	0.00432* (0.00225)	0.00661*** (0.00249)
Water acces			0.00479*** (0.000560)	0.00356*** (0.000493)	0.00310*** (0.000597)
HIV				-0.0158*** (0.00258)	-0.0235*** (0.00341)
Conflicts					0.00685 (0.0114)
Constant	3.419*** (0.0601)	3.233*** (0.0695)	3.177*** (0.0630)	3.335*** (0.0567)	3.350*** (0.0765)
<i>Prob &gt; F</i>	0,000	0,000	0,000	0,000	0,000
<i>R</i> <sup>2</sup>	0,218	0,237	0,368	0,68	0,615
Observations	283	282	279	254	206

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: Author, from STATA

**Table 3. 2SLS estimations**

VARIABLES	(6)	(7)	(8)	(9)	(10)
	NA	NA	SSA	SSA	All sample
Oil	-0.00183*** (0.000429)	-0.00166*** (0.000501)	-0.000795** (0.000328)	-0.000620** (0.000309)	-0.000582* (0.000304)
lnGDP	0.109*** (0.00830)	0.108*** (0.0115)	0.0293*** (0.00872)	0.0473*** (0.0152)	0.0751*** (0.0129)
Aid	-0.0140*** (0.00312)	-0.0149*** (0.00483)	0.00486 (0.00314)	0.00465 (0.00361)	0.00280 (0.00341)
Water acces	0.000622 (0.000460)	0.000914 (0.000787)	0.00529*** (0.000767)	0.00464*** (0.000996)	0.00293*** (0.000805)
HIV	0.0813 (0.110)	0.198 (0.215)	-0.0192*** (0.00374)	-0.0183*** (0.00352)	-0.0244*** (0.00401)
Conflicts	0.0547*** (0.00937)	0.0543*** (0.0111)	-0.0288 (0.0189)	-0.0624*** (0.0228)	-0.00862 (0.0157)
Constant	3.403*** (0.0854)	3.387*** (0.117)	3.442*** (0.0975)	3.412*** (0.138)	3.274*** (0.146)
<i>Prob &gt; F</i>	0,000	0,000	0,000	0,000	0,000
<i>R</i> <sup>2</sup>	0,988	0,987	0,212	0,193	0,619
Observations	63	59	143	116	167

Standard errors in parentheses

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

Source: Author, from STATA

With respect to these control variables, the results show that development aid is positively and significantly associated with life expectancy, as well as access to water. While the HIV/AIDS variable is negatively associated with life expectancy, it must be said that Africa is the continent most affected by the AIDS virus. The Internal Conflicts variable, for its part, has no significant impact.

#### 4.1 Robustness Check

In order to explore the robustness of these preliminary results, we proceed to further regressions, first dividing our sample into two sub-samples, respectively Sub-Saharan Africa (SSA) and North Africa (NA) to highlight the specificities of these sub-regions. Second, we will use the 2SLS estimator to confirm the results obtained by the RE estimator.

The results presented in Table 3 show that the preliminary results obtained in Table 2 are robust with respect to the effect of oil rent on

life expectancy, a negative and significant effect with the DMCs in NA and SSA, and in the entire sample. This is despite the fact that the specificities of the two regions are felt in this table, particularly with public aid being negatively associated with life expectancy only in SSA, Water acces which is not associated with life expectancy in AN and positively in SSA, the HIV/AIDS variable being negatively correlated only in SSA.

On the one hand, these results confirm the work of Bulte and al. [6] and Kim and Lane [10], because for these authors, the poor performance of countries dependent on natural resources in terms of well-being is mainly a function of the presence of non-productive institutions. On the other hand, this corroborates the results of Wigley [7] on the poor performance of countries dependent on natural resources in terms of public health, especially oil countries.

Indeed, political leaders in countries rich in natural resources, especially oil, can rely on a



source of income that does not depend on their investments in health to gain the support of their people. As a result, their political survival is less likely to be threatened by a failure of health care services. This type of predatory behaviour can either result from conflicts within societies, or be the product of external forces such as colonial origins. From this perspective, it is essential to take into account the colonial legacy, which imposed a political system of domination and inefficient institutions in colonized countries.

Acemoglu and al. [28] note that the poor performance of these countries in terms of public health may be the result of a colonial legacy that led to the establishment of institutions that did not favour the emergence of an efficient health system in resource-extracting colonies as was the case in Africa. This type of legal system was installed in the colonies where the mortality rates of the colonists were the highest.

Therefore, the association between oil rent and life expectancy in these countries can be explained by institutional factors. These have led to a greater dependence on natural resources over the years, as well as a political system that blocks investment in health, for example the provision of universal health coverage as is the case in developed countries. Conversely, this type of exclusionary system has allowed the establishment of a two-tier health system, on the one hand a high-tech private sector that takes care of the political elites and encourages the medical evacuation of the elites to the developed countries, and on the other hand a second-tier system that takes care of the population. In other words, access to health care in these countries is shaped by political loyalties.

## 5 CONCLUSION

The objective of this paper was to analyse the impact of oil rent on the health of populations in oil-producing African countries. The econometric analysis showed that oil rent has a significant and negative impact on the longevity of populations in these countries. We controlled for the sensitivity of our results by controlling for other determinants of life expectancy in Africa, namely GDP per capita, official development assistance, access to improved water sources, the percentage of the

population with HIV/AIDS, and the presence of internal conflicts in the country; and we tested the robustness of our results with the use of 2SLS.

Without claiming to be exhaustive, two policy recommendations can be considered for sub-Saharan African countries. The first is to make greater efforts to reduce the emergence of internal conflicts, which are generally linked to the inefficient redistribution of revenues from the exploitation of oil resources, which turn into civil war and are one of the major causes of the low level of life expectancy in these countries. The second consists of the creation of a special social fund that would be financed by oil revenues, which would allow the effective establishment of universal health coverage that would be beneficial for all the population, and to strengthen the health system by investing massively in the technical platform, which would reduce medical evacuations reserved for the political elite.

Future studies should focus on the association between natural resource dependence and other health outcomes such as alcoholism, medical evacuations, and associated expenditures. In addition, future studies should consider the quality of governance and institutions in the link between natural resource dependence and health outcomes.

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## COMPETING INTERESTS

Author has declared that no competing interests exist.

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## **APPENDIX**

List of countries: Algeria, Angola, Cameroon, Chad, Democratic Republic of the Congo, Congo, Ivory coast, Egypt, Equatorial Guinea, Gabon, Ghana, Libya, Mauritania, Nigeria, Niger, Sudan, South Africa, Tunisia.

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