

Determinants of Social Health Inequalities in Ivory Coast

Déterminants des inégalités sociales en matière de santé en Côte d'Ivoire

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Abstract

This study aimed to identify the determinants explaining social health inequalities in Côte d'Ivoire, focusing on socio-economic and sociodemographic variables. Using data from EDS-CI (2021), the results from the Logit model show that socio-economic and sociodemographic factors are significantly associated with health inequalities in Côte d'Ivoire. The age of the household head influences health inequalities, with poorer health increasing with age. In contrast, individuals aged 30-49 show better health. Additionally, larger households benefit from improved health due to increased resources and support. Moreover, marriage is associated with better health, likely due to social and economic support. Furthermore, having a secondary or higher education level enhances health, as does household wealth and access to clean water, which in turn reduces health inequalities. Health policies must consider these research findings to guide targeted interventions and promote equity in healthcare access in Côte d'Ivoire. In terms of policy implications, we recommend that governments invest heavily in education, particularly in regions with low literacy and educational access rates. It is essential to implement programs aimed at removing financial and cultural barriers to education, especially for women. By simultaneously addressing social and economic determinants, governments can significantly improve population health and reduce observed disparities.

Keywords: Logit model, social inequalities, health

JEL Codes: C35, I14, I10

Paper type: Empirical Research.

1. Introduction

Access to quality healthcare, social protection for all, the reduction of mortality, and resilience to climate change are major challenges facing all countries, whether developed or developing while considering the necessity of reducing inequalities. Focusing on disparities raises the question of what type of inequality is being addressed. Most studies on inequalities often focus on socioeconomic disparities, including income, education, health, employment, and more. Some authors, such as Nobel laureates in economics Tobin (1970), and Sen (2002), believe that health inequalities are more concerning than other forms of inequalities for human development. Therefore, we will focus on social health inequalities, while recognizing the importance of other types of inequalities.

Social health inequality can be seen as a form of inequality in access to healthcare, making it a matter of inequality of opportunity. Moreover, the theory of equality of opportunity according to Fleurbaey (2008) emphasizes the concept of responsibility, where inequalities resulting from individual choices and actions are accepted without correction, while residual circumstances are considered external factors for which the individual is not responsible. Conversely, Roemer (1993, 1998) insists on neutralizing the impact of circumstances through the principle of compensation, where inequalities due to circumstances are corrected to ensure equality of opportunity. These perspectives can be linked to inequalities in access to healthcare, where explanatory factors such as socio-economic status, education, and place of residence can be considered as circumstances or individual choices, thus influencing opportunities for access to healthcare.

Several recent works in the field of health economics have focused on the distinction between legitimate and illegitimate causes of health inequalities (Bricard & Jusot, 2012; Dias, 2009; Fleurbaey & Schokkaert, 2009; Jusot, Tubeuf, & Trannoy, 2013; Rosa Dias, 2010; Rosa Dias and Jones, 2007; Sen, 2002). This discussion highlights the fact that differences in observed health states are attributable to factors for which the individual can be held responsible, such as their efforts, as well as factors for which they should not be, such as life circumstances. The distinction between effort and circumstances is at the heart of implementing policies aimed at promoting equality of opportunity and rests on the concept of individual responsibility. Thus, to make real progress toward a fair and healthy future, it is essential to actively understand and address the deep roots of social health inequalities that still hinder our collective pursuit of well-being.

Inequalities in access to healthcare, influenced by these two types of factors (individual choices and external circumstances), comprise socio-economic characteristics, sociodemographic factors, and environmental conditions. The socio-economic level is a powerful theoretical framework for understanding social health inequalities. It takes into account income, education, standard of living, etc. Similarly, the sociodemographic level highlights how variables such as age, gender, and marital status can influence the unequal distribution of population health. Regarding environmental conditions, economic theorists have emphasized the importance of the environment as a key determinant of health (Samuelson, 1954).

According to Arrow (1963), a healthy population is an essential asset for long-term economic growth. The health of individuals influences their productivity, their ability to work, and their contribution to the economy. He emphasizes the idea that investing in health can have positive spillovers on a country's economic development. Grossman (1999) posits that individuals invest in their health through lifestyle choices, preventive activities, and medical care. The accumulated capital improves productivity and quality of life, just as other forms of capital (such as education) can do. In his model, several factors influence the demand for health, including income, the price of medical care, education, personal preferences, and available health information.

Starting from Arrow (1963) and Grossman (1999), we can note that one of the main objectives of a country is to invest in the health of its population to create a solid foundation for economic growth, improved quality of life, and sustainable development. This requires policies and actions aimed at promoting healthy lifestyles, facilitating access to medical care, and raising awareness of health issues. Considering all these dimensions of health inequalities, it would be interesting to examine the data from ENV (2018) and RASS (2020) in the case of Côte d'Ivoire. In recent years, in Côte d'Ivoire, researchers have increasingly focused on inequalities, multiplying studies on this subject. A major conclusion of these works is that the situation of poverty in Côte d'Ivoire is associated with significant disparities, whether between urban and rural areas or within different professional categories. These inequalities are also found within professional groups, influenced by factors such as education level, health status (N'da, 2016), and gender, especially regarding access to land ownership (Aka, 2007). In response to these findings, public policies aim to reduce wealth gaps between households, whether between different social classes or within them.

In the field of health, improving the protection of vulnerable populations against diseases is a governmental priority. However, the health insurance system in Côte d'Ivoire remains selective and limited to workers in certain sectors, leaving a large part of the population without social coverage. At the same time, despite efforts to improve access to quality healthcare, social health inequalities persist, manifesting in various forms.

The analysis of data from the ENV (2018) and RASS (2020) surveys reveals the existence of inequality in the health status of individuals concerning their living environments and social statuses. The unequal distribution of doctors between regions and health districts in Côte d'Ivoire shows marked disparities, raising concerns about the equity of access to healthcare. Doctor-population ratios vary significantly, with the health regions of Abidjan 2, Grands-Ponts, and Sud Comoé having the highest ratios (2.15 doctors per 10,000 inhabitants), while Guémon, Nawa, and Marahoué have the lowest ratios (0.5 doctors per 10,000 inhabitants). This disparity is also reflected in the density of health professionals, including nurses and other caregivers, with higher concentrations in the Grands-Ponts, Sud-Comoé, and Béliér regions (13.11 doctors per 10,000 inhabitants) and lower densities in Guémon, Nawa, and Tchologo (4.34 doctors per 10,000 inhabitants).

The unequal distribution of first-contact health facilities (ESPC), with higher ratios in the Kabadougou, Grands-Ponts, and Folon regions (2.30 doctors per 10,000 inhabitants), contrasts with lower ratios in the San-Pedro, Haut-Sassandra, and Tchologo regions (0.74 doctors per 10,000 inhabitants). Some health districts, such as Korhogo 2, Kouassi-kouassikro, Bouake sud, Bouake nord-est, Transua, Doropo, Tehini, and Botro, lack operating rooms, radiology services, or biomedical analysis laboratories in their public health facilities. Geographic accessibility to health centers also varies, with high proportions of populations living within 5 km in the regions of Abidjan 2 (93.55%), Abidjan 1 (87.14%), and Moronou (84.12%), but lower proportions in Folon (26%), Bokani (40.69%), and Tchologo (42.30%). These geographic disparities highlight potential challenges for healthcare delivery, with direct implications for the population's health (RASS, 2020).

According to the data from the household living standards survey in Côte d'Ivoire (ENV2018), when examining morbidity rates by place of residence, another layer of inequalities emerges. Morbidity percentages differ significantly: 38.52% in urban areas and 61.48% in rural areas. This geographic variability highlights that access to care and the prevalence of diseases are not uniformly distributed across the territory. Information regarding the duration of illnesses and access to care adds an important dimension to this perspective. It is also clear that the availability of health infrastructures varies greatly between the poor and the non-poor. Indeed, the majority of poor households (98%) report the absence of first-contact infrastructures in their place of residence, compared to 21% of non-poor households. This reality highlights the

challenges faced by the most vulnerable populations in accessing essential health services. Access to health facilities is also influenced by distance and available transportation means. While the majority of households (55%) take less than 15 minutes to reach a first-contact health center, a significant proportion of poor (28.2%) and non-poor (23%) households take more than half an hour to reach such a facility.

Given this complex context, our study will focus on social health inequalities in Côte d'Ivoire. Thus, our research question naturally arises:

What are the explanatory factors of social health inequalities in Côte d'Ivoire?

This question will guide us through an in-depth exploration of the complex determinants underlying these inequalities.

This research work has undeniable scientific and social significance. On the scientific level, it contributes to enriching the existing literature on social health inequalities, particularly in the Ivorian context where studies are still limited. By adopting a multidimensional approach and using recent data, this research offers an in-depth analysis of the determinants of health inequalities, thereby providing a better understanding of the underlying mechanisms.

On the social level, this research aims to provide concrete and tangible elements to inform policymakers in the formulation and implementation of effective public policies. By identifying the main explanatory factors of health inequalities, this study aims to guide interventions to reduce these disparities, particularly by improving access to healthcare for the most vulnerable populations. Ultimately, this research aspires to achieve a more equitable society and inclusive development in Côte d'Ivoire.

In the first section, we present a literature review structured into two distinct sections, review of the theoretical foundations and empirical literature. We then present the theoretical model adopted for this study, along with all the variables used and introduced into the model. The last section presents and discusses the theoretical foundations. In the final section, we present and discuss our findings.

2. Literature review and formulating hypotheses

2.1. Theoretical Foundations of Health Inequalities

This section of our review explores the theoretical foundations of health inequalities through the perspectives of several economic theorists.

2.1.1. Health Inequality According to Grossman's Approach (1972)

The theory of human capital, initially developed by Becker (1964) and expanded upon by Grossman (1972), can be viewed through the lens of health inequalities. This theory emphasizes the significance of investing in education and health to enhance individuals' well-being and productivity. However, concerning health inequalities, it is evident that not all individuals have equal access to these investments. Firstly, regarding education, access to quality education varies significantly based on socio-economic factors. Individuals from disadvantaged backgrounds often have fewer opportunities to invest in their education, potentially resulting in lower human capital. Consequently, they may be less capable of making informed health decisions and seeking care.

Secondly, regarding health, Grossman's model (1972) views health as a durable investment. Yet, disparities in access to healthcare services are prevalent in many societies. Individuals with higher incomes generally have better access to healthcare services, medications, and quality medical care. This means that those who are already healthier have an additional advantage in maintaining and improving their health capital, while disadvantaged individuals may face financial barriers to accessing care, thus perpetuating health inequalities.

Lastly, information inequality is a key factor. Educated and informed individuals are better equipped to make health decisions and seek quality care. Inequalities in education and access to health information can create disparities in individuals' ability to invest in their health capital. It is noteworthy that one of Arrow's (1963) major contributions is his theory that healthcare can be considered a public good. A public good is characterized by two main features: non-exclusion (no one can be excluded from its consumption) and non-rivalry (consumption by one individual does not diminish its availability to others). This theory suggests that healthcare has public good properties because it is difficult to exclude individuals from its use, and the consumption of healthcare by one person can benefit society as a whole. Indeed, Arrow highlighted that disparities in access to healthcare can impact overall economic productivity. When certain populations do not have equal access to healthcare, it can lead to health inequalities and limit these populations' ability to fully participate in the workforce. Thus, health inequalities can hinder economic growth by limiting available human capital.

In conclusion, studying social health inequalities and their impact on economic health is essential for understanding the economic repercussions of health disparities. Key contributions from economists like Grossman and Arrow highlight the importance of considering health as human capital, noting that disparities in healthcare access can hinder this accumulation.

2.1.2. Health Inequalities According to Sen's Well-being Approach (1999)

Sen (1999) argues that an individual's well-being should not be measured solely by their resources or access to goods and services, but rather by their capability to lead the life they desire. Health is one of the primary determinants of capabilities, as it influences a person's ability to function fully in society. Social health inequalities, such as unequal access to healthcare, limit these capabilities by hindering full participation in social, economic, and political life. Indeed, health inequalities, particularly when certain populations have limited access to healthcare, can restrict these choices and diminish economic and social opportunities. For example, a person with chronic health problems may struggle to pursue a career, access education, or engage in community activities due to physical limitations.

2.1.3. Health Inequalities According to Bentham's Utilitarian Approach (1789)

Bentham's utilitarian approach, developed in the 18th century, emphasizes maximizing societal well-being by seeking to minimize suffering and maximize pleasure (Bentham, 1789). This approach is based on the principle of utility, which evaluates actions based on their ability to produce outcomes that benefit the greatest number of people.

Health Inequalities in Terms of Utility: In the context of health inequalities, the utilitarian approach considers that the unequal distribution of health directly affects societal utility. Individuals in poor health experience suffering, which reduces their utility. This can also negatively impact overall societal utility if these health inequalities lead to increased healthcare costs or decreased productivity.

Maximizing Utility: The goal of the utilitarian approach is to maximize utility, meaning it is in society's interest to reduce health inequalities (Gert et al., 2006). This can be achieved by ensuring all individuals have equitable access to healthcare, regardless of their socio-economic status, ethnic background, age, etc. Thus, reducing health inequalities is seen as a measure conducive to maximizing overall utility.

Utilitarian Ethics and Dilemmas: However, the utilitarian approach can pose ethical dilemmas. For instance, resource allocation decisions for health that aim to maximize overall utility may sometimes be perceived as unfair by certain groups or individuals. This raises questions regarding equity, justice, and individual rights, particularly concerning access to healthcare.

2.1.4. Health Inequalities According to Rawls' Approach (1971)

Rawls approach focuses on justice and fairness in the distribution of social advantages (Rawls, 1971). He developed a theory of justice that emphasizes the veil of ignorance, where individuals devise principles of justice without knowing their specific position in society.

Justice in Health According to Rawls: Applied to health inequalities, Rawls' approach examines how society treats sick or unhealthy individuals. Health inequalities are considered unjust if they do not benefit the least advantaged members of society (Daniels, 2008). To this end, Rawls proposes the difference principle, which states that economic and social inequalities are acceptable only if they improve the health of the most vulnerable individuals.

Distribution of Health Resources: For Rawls, the distribution of health resources should be designed to ensure that society's least advantaged have equitable access to healthcare (Daniels, 2001). This involves health policies specifically aimed at reducing health inequalities, with a focus on the most vulnerable populations.

Rawlsian Justice Ethics: Rawls' approach emphasizes fairness, justice, and prioritizing the needs of the most disadvantaged. This means that health inequalities should be evaluated based on their impact on these vulnerable groups to determine whether they are just or unjust.

2.1.5. Health Inequalities According to Modigliani's Lifecycle Approach (1957)

Modigliani's lifecycle approach addresses health inequalities from a specific economic lifecycle perspective. The approach focuses on variations in income and expenditures throughout an individual's life cycle. According to this theory, individuals optimize their well-being by distributing their economic resources over their lifetime.

Impact on Health Inequalities: In this perspective, health inequalities are closely linked to variations in economic resources over time. Individuals typically experience income fluctuations throughout their lives, which can influence their access to healthcare.

- **Youth:** During youth, individuals tend to have lower income, limiting their access to quality healthcare. Health inequalities manifest here through differences in accessing preventive and curative care.
- **Adulthood:** As individuals enter adulthood and increase their income, they are better positioned to access healthcare services and higher-quality health insurance. Health inequalities generally decrease at this stage.
- **Retirement:** During retirement, when incomes decrease again, health inequalities may reappear. Individuals with higher incomes have more resources to maintain their well-being, whereas those with lower incomes may face difficulties.
- This approach highlights how health inequalities are influenced by income variations throughout an individual's life, underscoring the need for equitable health policies to mitigate these disparities.

2.2. Empirical review

In this section of our literature review, we delve into empirical evidence supporting the theories and concepts discussed earlier. We explore studies and findings that shed light on social health inequalities, their causes, and their impacts on population health.

2.2.1. Sociodemographic Approach to Health Inequalities

In this section, we analyze social health inequalities with a focus on the sociodemographic approach. We examine researchers' work investigating how sociodemographic factors such as age, sex, ethnicity, marital status, and household composition influence health disparities in this context. Each study provides insights into methodologies and specific results, enhancing our understanding of how these sociodemographic factors relate to health disparities.

- ***Influence of Age***

Several studies have highlighted age as a significant factor in health inequalities. Older individuals may be vulnerable to specific health conditions, while younger individuals face distinct health challenges. Disparities related to age can be assessed using various health indicators, including chronic disease prevalence and mortality rates.

Chisumpa & al. (2018) found through the Arraiga decomposition method that mortality is higher among men than women in Zambia, particularly in the 20-49 age group. The decomposition analysis indicated that adult mortality, by age group and cause, positively contributed to the gap in life expectancy between men and women. Infectious and parasitic diseases (26.3% of life expectancy gap), accidents and injuries (12.2%), and suicide and violence (6.8%) were major contributors to this gap. Conversely, HIV-related mortality in women offset male mortality, while deaths from tumors in women negatively impacted the life expectancy gap. This study highlights mortality differences between men and women in Zambia, focusing on causes of death among adults. Similarly, Thomas & al. (2022), analyzing panel data from 2016 to 2019 in the United States, demonstrate that sex and age significantly influence health inequalities compared to other health inequality determinants. Tossou (2024) reveals that a woman's age is a key determinant of maternal healthcare utilization. Specifically, the age groups of 15–20 years and 31–49 years contribute minimally to inequalities in healthcare needs, with contributions of -0.024 and -0.022 , respectively, among women.

- ***Influence of Residential Environment***

Disparities between rural and urban residents in accessing healthcare are stark. According to Rémi Barroux's article "More than half of rural residents excluded from healthcare, according to the ILO," published in *Le Monde* on April 27, 2015, 56% of rural inhabitants lack access to essential healthcare, compared to 22% in urban areas. This disparity is more pronounced in developing countries, where the lack of healthcare coverage in rural areas reaches 83%, especially in Africa. The primary explanation lies in the shortage of healthcare professionals in rural areas. Despite over half of the global population living in rural areas, with rates reaching 68% in South Asia and 63% in sub-Saharan Africa, less than a quarter of healthcare professionals are allocated to these regions. For instance, in Nigeria, over 82% of the rural population lacks access to healthcare services due to insufficient healthcare professionals, while this figure is 37% in urban areas.

Aka (2010) examines the accessibility of rural populations to healthcare in the Abengourou department of Côte d'Ivoire through comparative analysis. The author explores the challenges and barriers faced by rural populations in accessing healthcare services. According to the study, factors such as dense but failing road networks, impoverishment of populations, and weak local economies influence healthcare accessibility in rural areas.

In a study by Tiehi (2012) on healthcare demand for children in Côte d'Ivoire, using multinomial probit models, it is demonstrated that urban households have a strong inclination towards private hospitals compared to rural areas. This increased preference for private hospitals in urban areas is associated with a reduced probability of using public healthcare services. This study draws attention to how healthcare utilization in a given environment depends on the quality, availability, and cost of services that households perceive in terms of consumed utility.

- ***Influence of Marital Status and Household Composition***

We now explore how marital status and household composition can lead to health inequalities. Regarding health disparities related to women's marital status, several studies have highlighted that married women tend to have higher utilization of prenatal care, significantly impacting their maternal well-being. For example, findings from Abdourhamane's (2008) survey on maternal mortality in Mali convincingly highlight that unmarried women, whether single or in

cohabitation, are more likely to die compared to their married counterparts. This disparity can be attributed to financial obstacles faced by young unmarried women in accessing maternal healthcare and lacking the family support often enjoyed by married women. In a study on social disparities in access to healthcare, Youness & al. (2018), through a theoretical and empirical review, highlighted that individuals from larger families were less likely to use healthcare services. According to them, in case of illness, larger households, often characterized by lower incomes, face a dilemma: choosing between healthcare expenses or meeting other essential needs of their households. Often, this trade-off does not favor seeking medical care and creates health inequalities between families. This situation differs in smaller households. Larger families tend to see their income per person reduced due to their composition, impacting various health aspects such as food quality and the decision to consult a healthcare professional in case of health problems. Furthermore, Comoé (2018) observed that in Côte d'Ivoire, women from larger families have a less favorable socioeconomic status and tend to undergo fewer prenatal consultations.

- ***Influence of Religion or Culture***

Research by different authors provides interesting insights into how factors such as ethnicity, ethnic origin, religion, and culture impact health inequalities. Phelan and Link's (2015) study aimed to examine how ethnicity can influence health inequalities. Using public health data, they identified patterns of ethnic disparities in health in the United States. Their results showed that minority ethnic groups tended to have less favorable health outcomes compared to majority ethnic groups, highlighting the significant impact of ethnicity on health inequalities. Analyzing longitudinal data, Benjamins (2019) aimed to explore the impact of religion and culture on health inequalities among immigrants in the United States. However, the study's results revealed that religious practices and cultural ties play a crucial role in immigrants' health, emphasizing the importance of considering these factors to understand health inequalities. Nazroo et al. (2019) also undertook a study to examine health inequalities related to ethnic origin in the UK. Using health data and national surveys along with in-depth conceptual analysis, the authors assessed differences based on ethnic origin. The study's findings highlighted significant health disparities among ethnic groups, suggesting that factors related to ethnic origin contribute to health inequalities in the UK. Studies by Williams and Mohammed (2009), examining racial disparities and health discrimination with a census review approach, likely yielded results similar to those of Nazroo et al. (2019). Hence, the author proposes the following hypotheses:

H1: Sociodemographic factors such as marital status, age, and access to clean water contribute to social health inequalities.

2.2.2. Socioeconomic Approach

In this section, we delve into the analysis of health inequalities from a socioeconomic perspective. By examining a series of studies, we highlight the economic factors that influence individuals' health and contribute to observed disparities. Authors, through various methodologies, explore the impact of income, education, employment, and other economic variables on health.

- ***Influence of Income and/or Household Living Standards***

The relationship between income and/or household living standards and health is a complex subject, with researchers presenting divergent views. On one hand, some argue that income has no significant impact on health, while others contend that income substantially influences health.

According to our review, some authors believe that income has no significant impact on health. Mullahy & al. (2001) used various income samples and measures to demonstrate a close link between income, morbidity, and mortality. However, their main conclusion is that there is no direct link between income inequality and poor health. Blau (1999) concluded that income had a limited impact on health, suggesting that the importance of income for health was low. On the contrary, Jusot (2003), Shang & al. (2023), Lindberg & al. (2022), Larcher (2007), and Judge & Elstad (2006) argue otherwise. Jusot (2003) found a strong correlation between income and mortality, highlighting a clear link between income and the likelihood of death, especially before the age of 65. Shang & al. (2023) showed that income inequalities limit households' ability to perform instrumental activities of daily living. Lindberg & al. (2022) developed a composite score based on education and income and examined how this score predicts inequalities in health-related quality of life. It was found that income had a significant influence in predicting inequalities in quality of life. Larcher (2007) suggested that mortality inequalities were linked to economic factors. Mackenbach (2020) reveals that one of the most important socioeconomic factors influencing health disparities is income. Indeed, under certain conditions, lower relative income is associated with higher mortality (Elstad & al. 2006). In this case, individuals with higher incomes are the ones who mostly use health centers for care and care more about the quality of food to consume (Kouadio, 2019).

- ***Influence of Education Level***

Education can contribute to health inequalities when disparities exist in access to education, the quality of education, and opportunities after education.

Montez et al. (2011) analyzed trends in mortality based on education in the United States between 1986 and 2006 using a logistic regression model, noting an increase in mortality inequalities related to education. Disparities between individuals with higher education levels and those with limited schooling are significant. For example, in 1999, the mortality rate of adults aged 25-64 who had not completed high school was more than twice that of college graduates in the United States. These health disparities have garnered considerable attention (Cutler & al. 2006). The study analyzing the evolution of the relationship between maternal education level and mortality of children under five in sub-Saharan Africa by Bado & al. (2016), through logistic regression and the Buis decomposition method, shows significant results. The improvement in levels of insurance (5.4 percentage points) maternal education and attributable found diseases in 17 to 2, results. Tossou (2024) utilized the decomposition of the concentration index, the concentration curve, and data from the 2013 Demographic and Health Survey (DHS III) in Togo, revealing that education level and women's occupation are key determinants of maternal healthcare utilization. Similarly, Kumar, & Sharma (2023) found that women's education level and household wealth were positively associated with cesarean deliveries. Socioeconomic inequalities are prevalent in cesarean deliveries in Bangladesh, with place of delivery, household wealth, prenatal care, body mass index, women's education, and mass media being the main contributing factors to these inequalities. Hence, the author proposes the following hypotheses:

H2: Socioeconomic factors such as household living standards and education have a significant impact on social health inequalities.

3. Approach Methodology

3.1. Data Source

The data for our study are derived from the Demographic and Health Survey (DHS) in Côte d'Ivoire, conducted in 2021. The 2021 Demographic and Health Survey in Côte d'Ivoire (DHS-CI 2021) was implemented by the National Institute of Statistics (INS). DHS-CI 2021 received

funding from the Ivorian government, the United States government through USAID, the World Bank through its Health Projects Coordination Unit, the Global Fund, UNICEF, and UNFPA.

3.2. Study Variables

The variable under investigation in this study is the health status of an individual. It provides information on the self-reported health status of households during the survey, categorized into five modalities (very poor, poor, fair, good, very good), which we aggregated into two modalities (good and poor). This measure of health status is commonly used in empirical studies (Rochaix & Tubeuf, 2009). It is a dichotomous variable that takes on the values 0 and 1: 0 if the individual is in poor health and 1 if they are in good health. This variable allows us to quantify the probability that an individual is affected or not by health inequalities when they are in good or poor health. This assessment is based on socio-demographic and socio-economic factors. The independent variables include sex of the household head, age of the household head, age grouped into five-year intervals, household size, place of residence, marital status of the household, religion, household wealth status, occupation, household education level, and access to clean water.

3.2.1. Socio-economic Differentiation Factors in Health Status

In our research framework, we examined health status through the following socio-economic factors: household wealth status, occupation, and household education level.

Household wealth status is a variable of social differentiation and plays a significant role in explaining inequalities in access to healthcare. In Côte d'Ivoire, health inequalities are higher among poor households, at 49.20%. In comparison, households with medium and high wealth status have health statuses of 20.33% and 30.47%, respectively.

Table 1: Health Status and Household Wealth Level in Côte d'Ivoire

Health Status	Household Wealth Level			Total
	Poor	Mean	Rich	
Bad	5.225	2.159	3.236	10.620
Good	14.137	5.554	9.668	29.359
TOTAL	19.362	7.713	12.904	39.979

Source: Authors based on EDS-CI 2021

Household education level can influence health status when there are disparities in access to education, educational quality, attainment level, and post-education opportunities.

Health inequalities are higher among households with no education, comprising 7,590 individuals, or approximately 71.47%. In comparison, those with primary education numbered 1,998 individuals or about 18.81%. Households with higher levels of education, such as secondary (909 individuals, or 8.56%) and higher education (123 individuals, or 1.16%), experience lower health inequalities.

Table 2: health status and education level

Health Status / Education	None	Primary	Secondary	Higher	Total
Bad	7 590	1 998	909	123	10 620
Good	21 210	5 189	2 542	418	29 359
TOTAL	28 800	7 187	3 451	541	39 979

Source: Authors based on EDS-CI 2021

The workers in lower professional status positions report poorer health, a higher probability of disability, and a reduced life expectancy compared to their counterparts in higher positions in the professional hierarchy. In particular, the unemployed and farmers are the most affected by health inequalities in Côte d'Ivoire (EDS-CI, 2020).

3.2.2. Socio-demographic factors differentiating health status

At the level of socio-demographic factors, we explored the following key aspects: gender and rural-urban residence. The gender of the household can play an important role in explaining health inequalities due to socio-cultural differences and gender roles, which influence access to healthcare, health-related behaviors, and living conditions. Family responsibilities, gender norms, and lifestyle choices can also contribute to health disparities.

The statistical breakdown of EDS data reveals that among the 39,979 individuals who reported health problems during the survey period, 10,620 likely have deteriorated health, representing 18.25% who are female and approximately 81.75% who are male.

Table 3: Health status and the gender of the household head

	the gender of the household head.		
Health status	Male	Female	Total
Bad	8 682	1 938	10 620
Good	24 704	4 655	29 359
TOTAL	33 386	6 593	39 979

Source: Authors based on EDS-CI 2021

The place of residence influences health inequalities due to disparities in access to healthcare services, specific environmental conditions, and lifestyle factors. In rural areas, limited access to medical services, geographic distance, and precarious living conditions contribute to inequalities. In urban areas, although access to healthcare may be better, other challenges such as air pollution and urban stress can also play a role. Therefore, the place of residence is a crucial factor in understanding health disparities.

Table 4: Health Status and Place of Residence

	Place of Residence		
Health status	Rural	Urban	Total
Bad	6 709	3 911	10 620
Good	18 006	11 353	29 359
TOTAL	24 715	15 264	39 979

Source: Authors based on EDS-CI 2021

The distribution of individuals by their place of residence reveals that among the 10,620 individuals who experienced health problems in the last days of the survey, 36.83% reside in urban areas, while 63.17% reside in rural areas. This health disparity highlights significant health inequalities among residents in Côte d'Ivoire.

Marital status can also influence health inequalities in several ways. Married individuals may benefit from increased social support, emotional stability, and financial security, which can contribute to better health outcomes. Conversely, single or separated individuals may face greater social and economic challenges, potentially impacting their physical and mental well-being. Differences in marital status can also influence access to healthcare and health behaviors, thereby contributing to observed health disparities in the population.

Examining the distribution of individuals based on their marital status reveals that among the 10,620 people who experienced health problems in the last thirty days, 12.72% are single, while 87.28% are married (EDS).

3.3. Specifications and Justification of Basic Models

The basic model is justified by extensive literature. The logit model was developed by Berkson (1944) to address problems of classification and analysis of binary data and was popularized by McFadden (1974, 1978) for his work on modeling individual choices. The model is part of

econometrics for qualitative data or discrete choices. Nobel laureates in 2000 for these models were McFadden and Heckman. More recent compilations have been done by Wooldridge (2012) and Cameron & Trivedi (2005). Unlike the General Linear Model, statistical inference required in such modeling must consider both the lack of continuity and the absence of natural ordering between the different qualitative categories the variable can take. While the dependent variable in the General Linear Model follows the law of perturbation, in models with a qualitative dependent variable, due to the underlying non-linearity of the specification, the law of perturbation guides more in determining the probability of the observed event occurring. For each individual, we observe whether a certain event has occurred and record it as y_i .

$$y_i = \begin{cases} 1, & \text{if individual } i \text{ is in good health} \\ 0, & \text{if not} \end{cases}$$

Unlike the general linear model, the analysis mainly focuses on the probability of an event occurring. Thus, we denote this probability $p(x)$.

$$p(x) \equiv p(y = 1|x) = P(y|x_1, x_2, \dots, x_k)$$

where p is the probability of occurrence of the variable y and x_k are the explanatory variables. The model for p can be formulated as follows :

$$p = \frac{1}{1 + e^{-(\beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k)}}$$

The use of maximum likelihood estimation can be applied considering the Bernoulli distribution. Marginal effects are necessary for interpreting our results. In this study, given discrete choices without ignoring circumstances and responsibilities, the use of logit models would allow for an in-depth analysis of social health inequalities. The logit model could identify factors associated with specific health disparities and provide precise estimates of the effects of socio-economic and demographic determinants on these inequalities.

4. Results and discussions

4.1. Results

The results of the overall significance analysis suggest that the logit model as a whole is statistically significant (Prob > chi2 = 0.0000). This indicates that all independent variables included in the model have a significant effect on predicting health inequalities. The ROC curve is also necessary to justify the model's performance.

ROC Curve The ROC curve is a graph that plots sensitivity (true positive rate) against specificity (true negative rate) for different thresholds of the model classification. It provides a visualization of the model's performance across the entire range of thresholds. The area under the curve (AUC) is a summary measure of the model's performance. It represents the likelihood that the model will assign a higher score to a positive observation compared to a negative one. An AUC close to 1 indicates excellent performance, while an AUC close to 0.5 suggests performance equivalent to random chance. In our case, an AUC of 0.6157 indicates better performance when assuming a 5% threshold as the measure of model performance.

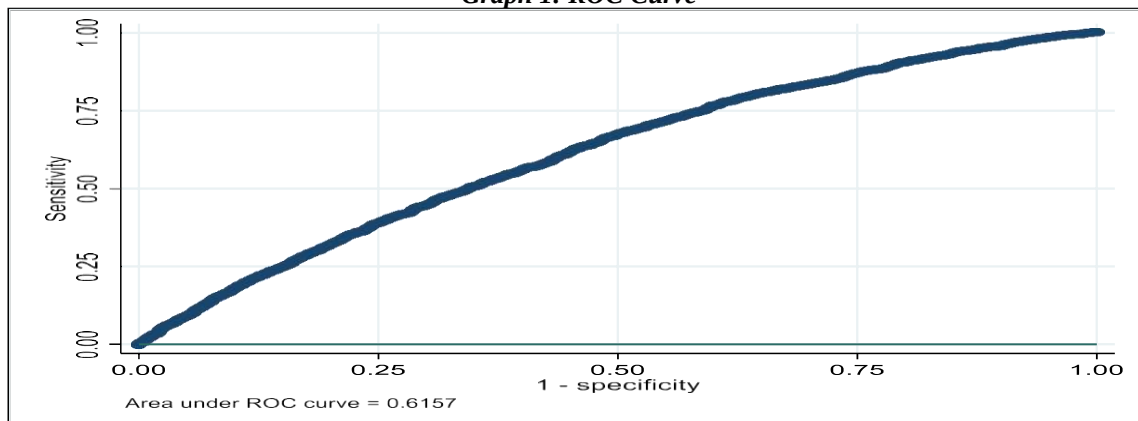
Table 5: Results of the Logit model

VARIABLES / MODALITIES	Coefficient	dy/dx	P> z
Household Head Gender			
Male	Ref	Ref	Ref
Female	-0.059	-0.011	0.100*
Household Head Age	0.003	0.0005	0.029**
Age group			
15-19	Ref	Ref	Ref
20-24	0.018	0.003	0.871
25-29	-0.136	-0.020	0.184
30-34	-0.278	-0.043	0.004**
35-39	-0.593	-0.101	0.000***
40-44	-0.762	-0.135	0.000***
45-49	-1.174	-0.229	0.000***
Household Size	-0.007	-0.001	0.040**
Residence Area			
Rural	Ref	Ref	Ref
Urban	0.006	0.001	0.831
Religion			
Marital Status			
Single	Ref	Ref	Ref
Married	-0.114	-0.022	0.006**
Education Level			
No level education	Ref	Ref	Ref
Primary	0.131	0.025	0.000***
Secondary	-0.250	-0.049	0.000***
Higher	-0.092	-0.018	0.021**
Access to Potable Water			
No potable water	Ref	Ref	Ref
Potable water	-0.141	-0.026	0.000 ***
Household Living Standards			
Poor	Ref	Ref	Ref
Middle	-0.057	-0.011	0.067*
Rich	-0.099	-0.019	0.001***
Sample Size	39 979		
LR chi2(16)	1352.40		
Prob > chi2	0.0000		
Pseudo R2	0.0292		

Note: (***), (**) and (*) indicate significance levels at 1%, 5%, and 10%, respectively.

Source: Authors based on EDS-CI 2021

Graph 1: ROC Curve



Source: Authors translation from EDS-CI 2021.

4.2. Interpretation and Discussion of Results

4.2.1. Sex of household head

Being a female household head is associated with a 0.058 decrease in the probability of having poor health status at the 10% significance level compared to a male household head. Therefore, transitioning from a male to a female household head decreases the probability of health inequalities by approximately 1.1%. This differentiation could be explained by women seeking healthcare more frequently due to prenatal care and benefiting from family support. This result aligns with findings by Chisumpa et al. (2018) when gender is used as a differentiating variable in health inequalities. In parallel, Mbuku et al. (2023) conducted a study showing that the gender of the household head is associated with lower utilization of healthcare services.

4.2.2. Age of household head

The age of the household head has a significant effect in explaining health inequalities at the 5% significance level. The marginal effect of 0.00048 suggests that with each unit increase in the age of the household head, the probability of poor health status slightly increases. When analyzed in five-year age groups, health inequalities are more pronounced in the 30-49 age category. Our results reveal that being in the 30-34 age group decreases the probability of poor health status by approximately 0.278. The marginal effect of -0.043 also indicates that an additional unit within this age group further decreases the probability of health inequalities at the 5% significance level. Similarly, for the age groups 35-39, the probability of poor health status decreases by 0.59 at the 1% significance level. The marginal effect of -0.1 also indicates that an additional unit within this age group further decreases the probability of health inequalities at the 1% significance level. The same applies to the age groups 40-44 and 45-49 with coefficients of (-0.762 and -1.174) and marginal effects of (-0.135 and -0.229) at the 1% significance level. Belonging to these specific age groups is associated with a lower probability of poor health status in Côte d'Ivoire. This can be explained by individuals in these age groups generally having a lower prevalence of serious illnesses or chronic health conditions compared to older age groups. Additionally, these age groups may correspond to life stages where individuals still enjoy overall good health and are less likely to develop serious health problems. We justify these results based on the work of Thomas & al., (2022).

4.2.3. Household size

Being in a larger household is associated with a reduced probability of having poor health status in Côte d'Ivoire by 0.007 at the 5% significance level. This can be explained by several factors. Firstly, larger households may benefit from additional family and social resources, such as financial and emotional support, which can contribute to maintaining better health for all household members. Moreover, in larger households, there may be a division of domestic responsibilities and care, enabling better health management for each family member. Furthermore, larger households may foster a more supportive social and family environment, which can have beneficial effects on individuals' mental and emotional health (Comoé, 2018; Bamushina & al., 2024). Similarly, Nanche's (2023) work demonstrated that health determinants are linked to household size, particularly when the household consists of a small family with fewer than six children.

4.2.4. Marital status

Being married or in a union is associated with a higher probability of having better health status in Côte d'Ivoire, with an increase of 0.114 at the 5% significance level. This positive association can be explained by several favorable factors. Individuals in relationships generally benefit from increased social support, which can contribute to better mental and physical health by

reducing stress. Additionally, couples often have access to extra-economic resources through two incomes, improving their access to healthcare, quality food, and adequate housing. They are also more likely to adopt healthy behaviors and mutually encourage preventive practices, such as regular medical check-ups. The emotional stability provided by a stable relationship can reduce the risk of psychological disorders, and extended support networks offer additional resources when needed. These combined factors explain why married or partnered individuals tend to have better health status compared to single individuals, thus helping to reduce health inequalities. The results obtained contradict those of Nanche (2022), who found that single individuals are more likely to visit hospitals when they are ill, while married and divorced individuals tend to stay home and consult traditional healers. Furthermore, some authors have found that marital status does not influence access to modern healthcare (Ouattara & Bini, 2023).

4.2.5. Education level

Having a primary education level is associated with an increased probability of having poor health status by 0.131 at the 1% significance level. In contrast, having a secondary or higher education level is associated with a reduction in the probability of having poor health status by 0.25 and 0.09 at the 1% and 5% significance levels, respectively. Transitioning from having no education to having a secondary or higher education level is also associated with a reduction in the probability of having poor health status by approximately 0.049 and 0.017, respectively. This can be explained by the fact that education is often correlated with a better understanding of health practices, healthier behaviors, and increased access to medical resources and healthcare services. Individuals with a secondary or higher education level may be better equipped to make informed decisions about health, adopt preventive behaviors, and seek appropriate healthcare when needed, thereby contributing to maintaining better overall health. These results are consistent with the findings of Sen (1992). The results align with those of Bamushina & al. (2024), who found that education level is a highly significant factor in explaining inequalities in access to healthcare.

4.2.6. Household wealth.

Belonging to a middle or wealthy class is associated with a reduction in the probability of having poor health status by 0.057 and 0.098, respectively, at the 5% and 10% significance levels. Additionally, transitioning from being poor to belonging to the middle or wealthy class decreases the probability of having poor health status by 0.011 and 0.018. These results underscore the influence of household wealth on the prevalence of health inequalities. This finding is supported by Arrow's (1963) economic theory, which posits that a healthy population is a crucial asset for long-term economic growth, as well as by the WHO's definition of health and its commitment to health and well-being. Conversely, economic growth is accompanied by improved health status. The results are similar to those of Nanche (2023), who found that individuals with a monthly income exceeding 52,000 F CFA are more likely to seek healthcare services. Conversely, those who do not seek any form of treatment typically have an income below 25,000 F CFA and are mostly unemployed or informal sector workers. Overall, health inequalities are generally associated with income levels.

4.2.7. Access to clean water

Access to clean water is associated with a reduced probability of having poor health status in Côte d'Ivoire by 0.141 at the 1% significance level. Transitioning from a household without access to clean water to a household with access to clean water is also associated with a reduced probability of having poor health status by 0.026. This can be explained by the fact that clean water is essential for maintaining human health by preventing waterborne diseases such as diarrhea, parasitic infections, and intestinal diseases. Therefore, individuals with access to clean

water are less likely to contract these diseases and are more likely to maintain better overall health. The results are consistent with those of Aka & al. (2020), who suggest that the factors responsible for inequalities are related to access to clean water.

5. Conclusion

The objective of this paper was to analyze social health inequalities in the Ivory Coast by focusing on socio-economic and sociodemographic factors using data from EDS-CI (2021). The results from the logit model show that household wealth and education level play a significant role in these inequalities, influencing the probability of being in good or poor health. The age of the household head also affects health inequalities, with a trend towards worse health increasing with age. In contrast, individuals aged 30 to 49 show better health. Additionally, larger households benefit from improved health due to increased resources and support. Moreover, being married is associated with better health, likely due to increased social and economic support. Furthermore, a secondary or higher education level enhances health, as do household wealth and access to clean water, which helps reduce health inequalities. To address these disparities, it is recommended to increase investments in education, particularly in rural areas; introduce gender equality policies in the labor market; support household incomes through conditional transfers and vocational training programs; and improve healthcare infrastructure with an emphasis on prevention. These actions require close collaboration between governments, the private sector, civil society, and the international community.

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