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Child Health Status in Cameroon: Mitigating Role of Information Asymmetry

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Abstract

Prominent among others in agenda 2030 for Cameroon, is to guarantee that every child should have good health and live longer. Information asymmetry can be disadvantageous to child health status and strategies intended to address this worry can improve the child health status and consequently bring growth. This work analyses the mitigating effect of information asymmetry on child health status in Cameroon using data from the Cameroon Demographic Health Survey (CDHS) of 2018. The instrumental variable probit (ivprobit) approach is used to investigate this relation. The findings reveal that information asymmetry measured as an index has an adverse effect on child health status in Cameroon. Specifically, information asymmetry reduces the probability of child health status by 0.949 units. Other covariates that affect child health status in Cameroon include age, age squared, gender, level of education and place of residence. For Cameroon to improve on child health status through information flow, policies guided to increase the flow of health information are highly recommended by this study so that child health status can be improved upon. The use of radios and child health programs that can be in pidgin language and mother tongues should be put on air both for local and national radio stations in Cameroon.

Keywords: child health status, information asymmetry, ivprobit, Cameroon

1. Introduction

Prominent among others in agenda 2030 for Cameroon, is to guarantee that every child should have good health and live longer. Information asymmetry can be disadvantageous to child health status and strategies intended to address this worry can improve the child health status and consequently bring growth. Good health is globally recognized as a fundamental human right for all (World Health Organisation, 2007). The fight to have good health is the priority of any person who is sick. Bad health is one of the serious problems that bring discomfort, which everybody does not like. Differences in health care consumption at the various health services is as a result of inadequate information which have long-term effects on the health status of individuals especially children whose health decisions and outcomes depend on actions of their parents (Thompson, 2003). Flow of Information and Health care are usually perceived as significant determinants of people's welfare around the world (Tinyami *et al.,* 2013). Undoubtedly, a healthy and well-informed population serves as assurance to the country's growth and development, reason why world health organization (WHO) has set the universal health coverage as its first goal with the tagline of "Health for all — everyone, everywhere" (World health day, 2019).

The concept of information asymmetry explains a situation where some people have vital information that others do not have. Information asymmetry is seen as a gap in knowledge between consumers and professionals

regarding price and quality (D'Cruz & Kini, 2007). The main device used to study information asymmetry is the instrument of information flow which is communication. Indicators information (communication) may be radios, televisions, telephones, internet sources to name just a few. These principal indicators of information have been used to construct an index for information asymmetry. Notwithstanding, this information asymmetry index is built using dummies which indicate that the household is not in possession of the various information means. This is for this study to appropriately use as a proxy for information asymmetry. To be informed as to, where to go when one is sick is very important (Zeng *et al.*, 2020). Good communication is necessary for the delivery and receipt of appropriate health care services (Balogun, *et al.*, 2012). Informing people about the progress of diseases and useful prevention methods is of great importance. Investigating the patients' information seeking behaviour and identifying their information seeking patterns can provide health care providers with useful strategies to handle patients' difficulties (Lalazaryan & Zare-Farashbandi, 2014). Nevertheless, information asymmetry especially in the health sector seriously affects health status.

Mortality rate to an extent can be measured Health status. The under-five mortality rate (U5MR) and Infant Mortality Rate (IMR) are the most used outcome indicators of health achievements in developing countries (Ortega & Casquero, 2017). The Cameroon demographic health survey (CDHS) data set or questionnaire has captured health status of children through the anthropometric measure weight for age Z scores (WAZ) which is used in this study. Child health status corresponds to nutritional outcome in that when a child has underweight and / or is stunted he / or she is not well. Nutrition seriously accounts for a higher underweight and stunted level among children in Uttar Pradesh, India (Rani & Singh, 2021). The weight and height of a well-nourished child is comparable with the standard normal distribution of heights and weights of healthy children of the same age and sex (Mahgoub *et al*., 2006). When there is perfect flow of health information (maybe through the radio, television, internet, telephone and through health outreach) and a positive behaviour of health seekers towards attending health facilities, health status will likely improve (Sama *et al*, 1995). The health of a child greatly depends on his / her parents and parents have to take action to prevent or cure illnesses that are probable threats to child survival. Parents are therefore faced with choosing between investing in child health and other activities (Uggla & Mace, 2016).

The transfer of health information by educating the patients and encouraging them to search for related information helps to preventing diseases. Health status can be improved through patients' knowledge of information seeking behaviour (Lalazaryan & Zare-Farashbandi, 2014). Health awareness campaign is of great importance. Information asymmetry may cause people to think that getting drugs from street drug dealers is very cheap and convenient. Lack of information may cause a health seeker to make a wrong choice. Nonetheless, it is very common for people to loss their lives or suffer some serious health complications as a result of lack of knowledge about a particular health complication and how it can be prevented. With the availability of sound health information, it is possible to control such health complications. Child mortality rate is commonly used as a demographic measure and an important indicator of the level of health status because children are the most defenceless age group in any society (Webair & Bin-Gouth, 2013).

Childhood mortality in sub-Saharan Africa remained the highest in the world between 1990 and 2015 (Koffi *et al*., 2017). Although childhood illnesses and mortality rates have declined over the past years in sub-Saharan Africa, under-five mortality rate is still high in the region (Yaya *et al.*, 2021). In sub-Saharan Africa virtually half of the estimated 5.3 million deaths of under-five children in 2018 occurred as a result of morbidity therefore seeking medical care for children is an important measure of reducing mortality occasioned by morbidity (Adedokun & Yaya, 2020). In Sub Saharan African Countries, one reason why some countries, including Cameroon, did not make sufficient progress toward achieving the Millennium Development Goal- 4 (MDG-4) for child mortality reduction is the unavailability of reliable data to inform the measurement of progress and initiation of action (Koffi *et al*., 2017).

Health status equally constitutes a serious challenge in Africa. It is evident that infant mortality rate dropped from 2.7 per thousand to 1.4 between 1990 and 1995 (Nwabu, 1998). Also, World Bank report (1993), indicates that despite the renowned progresses in longevity, the quality of life in Africa is greatly challenged by extreme disease burdens, morbidity rates and risks to life are higher in Africa than in other regions of the developing countries. Adult mortality rate (the rate of dying between 15 and 60 years per 1000 population) in Africa reduced considerably from 361 to 306 between 1990 and 2013. These occurred as a result of MDG4 target (to reduce by two thirds between 1990 and 2015 the under-five mortality rate).

In Cameroon, the health system encompasses both the state sector and the private sector (Sama *et al.*, 1995). Nevertheless, the idea of incorporating traditional and modern medical practices in Cameroon is discussed by both traditional and medical practitioners. In this case, both the public and the private are concerned like; the government, lay private, missions, pharmaceutical, traditional and even street drug dealers who intervene in health care delivery. Therefore, when a person is sick, he/she may go to either of these providers (MINSANTE,

2002). Health care is important in a country because it determines the ability of a country's labour force to produce effectively and efficiently. The government of Cameroon like many other African countries put in place the health cost recovery system as of early 1990, reason why the government of Cameroon prioritizes health for all. This is intended to contribute to the development of a healthy, productive population capable of generating strong, inclusive and sustainable growth (NDS30, 2020).

The government's efforts, in the area of health, precisely in immunization of children aged 12 to 23 months and free malaria care for all children under 5 years of age, have led to great improvements in some important health indicators. This explains why life expectancy at birth increased from 51.4 years to 56 years between 2009 and 2017; infant mortality rate between 0 to 1 year reduced from 62 per 1,000 to 48 per 1,000 between 2011 and 2018. The infant and child mortality rate between 0 to5 years improved from 122 per 1,000 to 79 per 1,000 between 2011 in 2018. The proportion of assisted deliveries increased from 63.6% in 2011 to 69% in 2018 (NDS 30, 2020). In connection with SDG 30 on health, the NDS is concerned with: reducing the maternal mortality ratio to below 70 per 100,000 live births; reducing neonatal mortality to not more than 12 per 1,000 live births and under-five mortality to not more than 25 per 1,000 live births; reducing the prevalence and mortality of major communicable and non-communicable diseases by at least 30%; reducing malnutrition in children under five by two-thirds and making 80% of intermediate and peripheral health facilities viable. To achieve these objectives, interventions will be articulated around four avenues, namely: promotion of health and nutrition; disease prevention; case management and strengthen the health system. (NDS 30, 2020)

Recent literature reveals that there is a serious problem with health status in Cameroon. Looking closely, it can be seen that these problems stem from information asymmetry and health status. Studies have shown that life expectancy for Cameroonians has decreased by about 2 years since 1990 and has increased approximately by an average of 5 years in the rest of sub-Sahara Africa. However, worldwide, Cameroon is noted to be among the countries where the mortality rate of children under 5 years of age has decreased the least, yet Cameroon spends more money on health than other Sub-Saharan African countries except South Africa (Dzudie *et al.*, 2012).

Information asymmetry is seemingly a problem, on how the health seekers are connected to the means of communication. Communication therefore constitutes a huge challenge as radio signals, telephones, internet, television and newspapers do not reach all the health areas in Cameroon. Important health information does not reach everyone at the same time. The manner in which health information reaches the health seekers presents a serious threat to health seeking behaviour and thus health status. This information gap may go a long way to affect the health seeking behaviour and consequently child health status. It is equally observed that, in the health sector in Cameroon like in other countries, there is information asymmetry. Health personnel have information about the health seekers that the concerned do not have, which may create a serious information gap. In the healthcare industry in Cameroon, the patients who are the final consumers of healthcare facilities rather have relatively little influence on their own health service decisions (D'Cruz & Kini, 2007). Looking at the doctor – patient relationship, in the medical industry in Cameroon, patients are often comparatively less informed about their condition (Bickerdyke *et al.*, 2002). This is an indicator of poor information available to the health service consumers. Therefore, information has a lot to do about the child's health status. This study therefore seeks to investigate the nexus between information asymmetry index and health status of children as a means of reducing the under-five mortality from the present 55.436 deaths per 1000 live births in 2022 to not more than 25 per 1,000 live births in 2030.

This paper therefore seeks to evaluate the effects of information asymmetry on child health status in Cameroon.

Organisation of the Study: This study will be written in five sections. The introduction being the first section which contains background of the study, problem statement, objectives of the study, the hypothesis, the significance of the study and organization of the study. The second section is the literature review, which is made up of conceptual literature, theoretical and empirical literature. This is followed by the third section, titled methodology comprising of scope and background of the study area, research design, model specification, definition and measurability of variables, sources and method of data collection, estimation and validation techniques. This will be followed by section four which is made up of presentation and discussion of results leading us to the last section made up of the summary of findings, conclusion and recommendations.

2. Literature Review／Theoretical Framework

Although previous studies have been carried out in the world, Africa and Cameroon on information asymmetry and child health status, up till then it is not very clear how information asymmetry affects child health status. Furthermore, despite the intensive studies on these aspects, most of the studies carried out used primary data and a lot of attention has not been paid on the above relationship. This is an indication of poor information to the health service consumers, which is detrimental to the health status of children. This study will test the hypotheses that information asymmetry has no significant effect on child health status in Cameroon.

This section presents both theoretical literature and empirical literature on information asymmetry and health status.

2.1 Theoretical Literature

This study will use the theory of Markets with Asymmetric Information was developed by Akerlof et al. in 1970 and the Trans-Theoretical Model of Health Behaviour Change (1995) developed by C. Nadine Wathen and Roma M. Harris.

The theory of Markets with Asymmetric Information was developed by Akerlof et al. in 1970. The theory explains the direct relationship that exists between information asymmetry and health status. Theory posits that the seller of a product usually knows more about the quality of his product than any potential buyer. The theory further explains that the job applicant typically knows more about what he is able to do than his possible employer. Also the buyer of an insurance policy generally knows more about her situation than the insurance company. Such asymmetries of information can produce adverse selection in the markets. When lenders or car buyers have imperfect information, borrowers with weak repayment prospects or sellers of low- quality cars may thus crowd out everyone else from their side of the market, stifling mutually advantageous transactions. This asymmetry of information explains the fact that health care providers have some information about the health care seeker that the concerned does not have which obviously affects health status. Trans-Theoretical Model of Health Behaviour Change (1995) developed by C. Nadine Wathen and Roma M. Harris. It explains the fact that the main goal of all health experts and enthusiasts is to inform people in having a healthier life. This can be done by advising people who are involved in addictive activities like smoking and unhealthy eating to quite every health threatening practices, take up healthy habits. This explains the fact that some people indulge in some vices that negatively affect their health because of asymmetry of information. Breaking the barrier of asymmetry by informing people can affect health status positively.

2.2 Conceptual Literature

Literature has established that child health status can be affected by information asymmetry. Information asymmetry between the health care producer and the health care consumer can affect the health status of an individual. In a country like Cameroon, it is often realised that people fail to get certain health facilities simply because of lack of information. A woman whose child is sick may eventually die because of her ignorance of the availability of a health facility or service in her environ. Sibiya & Ramlucken (2021) observed that recent trends in medical practice have shown growing concern in the use of mobile technology, which has proven to improve health status.

The concept of information asymmetry is rooted in Information and Communication Technologies which are a group of tools that allow people store and share knowledge (Rivero, 2022). Information asymmetry is a situation in which a few stakeholders have more information than others. Information asymmetry is a gap in knowledge between consumers and professionals considering price and quality (D'Cruz & Kini, 2007). Nevertheless, Carpenter & Petersen (2002) asserts that asymmetric information exists if in any transaction, one party to that transaction has information that the other does not have. This will certainly lead to market failure. Restrepo & Rojas, (2016) contends that Informational asymmetry occurs when one party to a transaction has more information relevant to a transaction than the other party, making the more-informed party to exploit the less-informed party and influence the cost-effectiveness of medical intervention. It arises in other markets, but more pronounced in medical markets. Furthermore, Fishman & Parker (2015), observe that information asymmetry lead to market failure which may be adverse selection (when one party in an agreement has more related information than the other party) and moral hazard, (a situation in which one party engages in risky behaviour or fails to act in good faith because it knows that the other party will bear the economic consequences of their behaviour (Wang & Pallis, 2014).

The measurement of information asymmetry is presented in many approaches in literature. Obasola & Mabawonku (2018) realised that information is measured using Mobile phones, radio, the Internet and other acceptable ICT. Wang et al. (2011), observed that information asymmetry can be reduced by carrying out the medical information publicity system, strengthening hospitals' information construction, developing e-medical record information system, developing self-diagnosis system for patients; and developing healthcare system for household.

2.3 Empirical Literature

Many studies investigated the information asymmetry and child health status with different techniques and obtain different results. Mocan (2007) carried out a study in U.S to test adverse selection in the market for child care. The study employed the primary method and unique data set containing quality measures of various characteristics of child care provided by 746 rooms in 400 centers, as well as the evaluation of the same attributes by 3,490 affiliated consumers (parents) in the U.S. The results show that information asymmetry in the

market has the tendency to reduce the quality of child health in U.S. Also, Dahl *et al.* (2022) conducted a study in USA on reducing information asymmetry and increasing health value co-creation in a rural healthcare context. They used the primary data sources and the Structural equation modelling. The results showed that the use of digital information can improve consumers' health seeking behaviour and health outcomes. This can be done by helping consumers utilize digital information that can facilitate their activation in value co-creation. Nevertheless, the study recommended that health care providers and seekers need to share knowledge of the digital information in order to improve awareness. Furthermore, Nemati *et al*. (2020) investigated the effect of mitigating information asymmetry in liver allocation in USA using the clinical data model. This was in accordance with the national organ transplant act with the aim of ensuring efficient and equitable allocation of donated organs. This was done using the United Network for Organ Sharing (UNOS) priority was given to patients on the liver transplant waiting list within given geographic areas based mainly on their most recently reported health status. The results show that information asymmetries exist between the UNOS and the patients on the waiting list. The study recommends that information asymmetry can be alleviated through more frequent updating requirements.

Also, Barile *et al.* (2014) addresses a gap between service research on co-creation in health care and the problem of information asymmetry in the service provider–user relationship in the Italian health system using a three-step interpretative framework adopting the viable systems approach. This was done by going beyond the traditional information asymmetry view towards a framework capable of examining the human side of service interaction. The findings showed that information asymmetry reduces health seeking behaviour and consequently health status. The study further recommended a shift in focus from information sharing to interpretation schemes sharing. Aoki (2005) carried out a study in UK and sought to know how to measure asymmetric information in the health insurance market by identifying the ways of measuring information asymmetry. The study used a simple modified bivariate Probit model incorporating non-parametric kernel density estimation to test asymmetric information in a health insurance market. Results show that there exists asymmetry of information (be it moral hazard or adverse selection) between the contract of insurance coverage, and some non-emergency visits services. Also, Clement (2009) in his study was out to investigate and to provide solutions to the many problems encountered by the government as a result of special properties of moral hazard and adverse selection in health insurance contract in its effort to efficiently provide health care services to their citizens in Ghana. This study used the primary and secondary sources of data (administered questionnaires and empirical research using the National Health Insurance Scheme (NHIS)), using both quantitative and qualitative methods to analyse data. The results of this study reveal evidences of adverse selection in that they acquired the insurance as a result of their expected future utilization of healthcare services and moral hazard implication evident by looking at the high rate of health care utilisation by insured respondents before and after insurance policy. The study recommended that in the short term, there should be the introduction of a risk rating to minimise the effect of adverse selection and to introduce a policy of cost-sharing to curb the situation of moral hazard.

In a related study, Wirsiy *et al.* (2019) reviewed the effect of mobile health intervention (mhealth) on women's health outcomes in Cameroon using secondary data sources specifically the data extraction template resolved through consensus or by tie breaker. Data was analysed in excel and because of heterogeneity and differences in methodology, papers were assessed on a judgement of their validity and reliability and how well they related with the study. Hence, they collected, summarised and categorised the extracted data. Their findings showed that generally mobile health information (mobile phone technology using SMS) improves adolescent girls' health status.

3. Methodology

The Scope and Study Area, Methods of Data Collection and Techniques of Data Analysis and Specification of the Empirical Model are discussed in this section.

3.1 Scope and Study Area

The focus of this paper is on the extent to which information asymmetry affect child health status in Cameroon. The paper used the cross sectional data from secondary data source collected specifically from the most recent Cameroon Demographic Health Survey data that was collected in 2018 (CDHS, 2018). The 2018 Cameroon Demographic and Health Survey combined with the Multiple Indicators Clustered Survey (CDHS-MICS, 2018) and was implemented by the National Institute of Statistics (NIS) in 2018 in collaboration with the 'Centre Pasteur du Cameroun' (CPC). This fifth survey was actually a follow-up to the 1991, 1998 and 2004 DHS surveys and 2000 and 2006 MICS, 2011 DHS surveys which provides updated estimates of basic demographic and health indicators in Cameroon. This study was conducted in Cameroon. It has a land area of about 475,650 km², shares borders with Atlantic sea, Nigeria in the West, Chad in the North East Central African Republic in the east and Congo, Gabon and Equatorial Guinea in the south. Cameroon has 10 regions, 360 districts, 360 municipalities and 14 major city councils (BUCREP, 2010).

3.2 Methods of Data Collection and Techniques of Data Analysis

3.2.1 Methods of Data Collection

Data used in this study is from secondary source collected specifically from the most recent Cameroon Demographic Health Survey data that was collected in 2018 (CDHS, 2018), which is cross sectional in nature.

3.2.2 Techniques of Data Analysis

The instrumental variable probit (IVPROBIT) technique was used to analyse the data collected.

3.3 Specification of the Empirical Model

Information asymmetry as revealed by literature is judged to be an important determinant of child health status in Cameroon. Child health status is contingent to parental care, such that information asymmetry can be detrimental to the child health status everything being equal. Information asymmetry is measured as an index using four primary indicators which include do not own a telephone, do not use internet, do not own a radio and do not own a television. The multiple correspondence analysis (MCA) is specifically used since these categories are all binary. In the construction of this index, the ordering consistency principle (FOAC) is respected ensuring that only the yes or 1 value of the indicators are selected and used. However, the negative values with gross indicator may render interpretations difficult. We therefore normalize the index to lie between 1 and 0 using-(Var-r(min))/(r(max)-r(min)). This is the main endogenous regressor of the model and denotes lack of information about health facilities and services by households or parents.

The dependent variable is Child health status (CHS), measured as weight for age Z scores (WAZ). WAZ with Z scores below -2 indicates underweight, between greater than or equal -2 and less than or equals 0.99 indicates normal weight while that with Z-scores above 1 is overweight. To binaries WAZ, underweight and overweight are considered to be bad child health status illustrated as CHSbad and normal weight considered to be good child health status illustrated CHSgood. WAZ is thus dichotomised and takes the value 1 if child health status is good and 0 if otherwise. The hypothetical linkage between information asymmetry and child health status is specified in a simple functional form equation as in equation 1.

$$CHS_i = f(IAI_i, x_i) \tag{1}$$

Where CHS_i is child health status, IAI_i is information asymmetry, x is a vector of exogeneous variables (individual characteristics) such as, age of the household head, age squared of household head, health insurance, educational level of household head and zone of residence, and i illustrates the cross-sectional structure of the study. This functional relationship is further transformed into an econometric model which is specified as follows:

$$CHS_i = \pi_0 + \pi_1 IAI_i + \rho_1 x_i + \mu_i \tag{2}$$

Equation 2 above becomes our main structural equation and CHS_i, IAI_i, i and x_i are as earlier defined. π, ρ are the parameters to be estimated in the model and μ_i is the error term of the model. Noting that our dependent variable CHS_i is binary appeals to the use of the limited dependent variable model (LDVM) in estimating results. Using an Ordinary Least Square (OLS) method of data analysis will be inappropriate for values will not be well fitted to lie between 0 and 1. There is a choice to be made between the logistic or probit models. Most researchers choose the probit because of the normal distribution assumption attributed to it (Yunita, 2006). Due to the close similarity of the two distributions functions in the univariate dichotomous model, it does not matter much whether one uses a probit or a logit model (Amemiya, 1981). The present study however resorts to use the probit method for the same reason. Following the specification in the structural equation in 2, it is observed that the CHS function suffers from the econometrical issue of endogeneity. IAI_i is potentially endogenous to CHS_i which can be as a result of reverse causality between these two variables. It can be observed that child health status can affect information asymmetry as well information asymmetry can affect child health status. Other sources of endogeneity could be measurement errors in variables and omission of some important variables from the model.

To control for the identified endogeneity issue in the model, the conventional method of using instruments is employed. A suitable instrument is that factor that affects information asymmetry directly and not child health status. It should affect child health status only through information asymmetry. Given the Cameroon health demographic survey, the suitable instrument is non-self-cluster-proportion of newspaper. To capture this variable at the non-self-cluster mean renders it to be exogenous to child health status (Baye *et al.*, 2020). This is because its occurrence is now influenced by neighbourhood influences which make it free from the individual heterogeneity that cuts across the sample population. This now becomes excludible to CHS. This instrument will however be statistically tested for exogeneity and validity. Assuming that non-self-cluster proportion of newspaper is a valid instrument; we proceed to use the ivprobit model to estimate results which respects the binary nature of CHS represented by the following functions:

$$IAI_i = \beta_0 + \beta_1 Z + \gamma_1 x + \varepsilon_1 \quad (3)$$

$$CHS_i = \pi_0 + \pi_1 IAI_i + \rho_i x_i + \mu_i \quad (4)$$

Equation 3 is the reduced form equation (first stage) that harbours non-self-cluster of no newspaper (Z) that solves the endogeneity problem. Equation 4 is the second stage equation which is our final structural equation estimated with the corrected IAI_i. Note that CHS_i =1 if $CHS_i^* > 0$ and CHS_i =0 if $CHS_i^* < 0$. It is further assumed that ε_1 and μ_i which are the error terms of the reduced form and structural equations respectively follows a normal bivariate distribution as prescribed by the probit assumption.

However, the marginal effect is where meaningful interpretations can be made. Hence the first derivative of the structural equation gives the marginal effect on which interpretation and conclusions will be made as in equation 5.

$$ME(CHS) = \frac{\delta CHS_i}{\delta \widehat{IAI}_i} \quad (5)$$

4. Presentation and Discussion of Results

4.1 Descriptive Statistics

Table 1. Summary Descriptive Statistics

Variables	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**
Outcome Variable				
Child Health Status (WAZ)	-0.611	0.512	-5.03	5.6
Main Endogenous Variable				
Information Asymmetry Index (IAI)	0.401	0.323	0	1
Endogenous Instrument				
Newspaper-nscp	80.899	39.441	0.944	181
Exogenous Variables				
Health Insurance-mcp	0.019	0.052	0	0.548387
Age	46.433	12.785	13	95
Age Squared	2319.480	1307.596	169	9025
Male (1= yes and 0 = otherwise)	0.776	0.417	0	1
Female (1= yes and 0 = otherwise)	0.224	0.417	0	1
No Education (1= yes and 0 = otherwise)	0.289	0.453	0	1
Primary Education (1= yes and 0 = otherwise)	0.366	0.482	0	1
Secondary Education (1= yes and 0 = otherwise)	0.315	0.464	0	1
Higher Education (1= yes and 0 = otherwise)	0.030	0.171	0	1
Urban Residency (1= yes and 0 = otherwise)	0.434	0.496	0	1
Rural Residency (1= yes and 0 = otherwise)	0.566	0.496	0	1
Number of Observations	31,591			
Variables	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**
Outcome Variable				
Child Health Status (WAZ)	-0.610642	0.5117527	-5.03	5.6
Main Endogenous Variable				
Information Asymmetry Index (IAI)	0.400641	0.322579	0	1
Endogenous Instrument				

Newspaper-nscp	80.89855	39.44058	0.944444	181
Exogenous Variables				
Health Insurance-mcp	0.019468	0.051826	0	0.548387
Age	46.43307	12.78496	13	95
Age Squared	2319.48	1307.596	169	9025
Gender (1= female and 0 = otherwise)	0.223576	0.416648	0	1
No Education (1= yes and 0 = otherwise)	0.289323	0.453455	0	1
Primary Education (1= yes and 0 = otherwise)	0.365705	0.481635	0	1
Secondary Education (1= yes and 0 = otherwise)	0.314742	0.46442	0	1
Higher Education (1= yes and 0 = otherwise)	0.03023	0.171223	0	1
Urban Residency (1= yes and 0 = otherwise)	0.433636	0.495584	0	1
Rural Residency (1= yes and 0 = otherwise)	0.566364	0.495584	0	1
Number of Observations	31,591			

Note: Nscp=non-self-cluster proportion, mcp=mean-cluster proportion.

Source: Computed by Author(s) Using Stata 14 from DHS 2018.

In this study, the findings on table 1 are focused on the quality of the variables using the means and standard deviations of each variable under study. Based on the sampled population, the mean value of the anthropometric measure of weight for age Z scores (WAZ) (which is an assessment of the health outcomes of children) is averagely 61% which represents child health status. This means on average, majority of children below the ages 5 years were measuring between 5.6 and -5.03 during the year 2018. Concerning information asymmetry, findings show that out of the 31,591 households under observation, 40% of them were reported to have asymmetry of information. This implies that less than half of the population under survey did not have access to information either through radio, telephone, internet and televisions. The endogenous instrument used in the study given the CDHS 2018 is the non-self-cluster proportion of newspaper. The result shows that averagely, 80.1% of the household heads were reading newspapers while 19.9% were not reading newspapers. This generally shows there were little chances of high information asymmetry among household heads. Health insurance is one of the control variables used in the model that can affect child health status. When a greater proportion of the population go in for health insurance health status can improve. The descriptive results indicate that out of the total observations, only approximately 2% on average household heads went in for health insurance. Health insurance coverage is however captured at the community level in order to reduce the problem of heterogeneity in measurement. The descriptive statistics has revealed average age to be 46years. This means the population of Cameroon by 2018 as measured by DHS was fairly an active population. The variable gender shows that, averagely about 78% of the household heads were males while 22%were females. The descriptive result therefore implies that they were more male headed-households than the females. The result on Table 1 above further indicates that on the average, 29% of the total population had no education. On average 37% had primary education, 32% had secondary education, and just about 03% attended higher education. This indicates that a minority of the population obtained higher education while a majority of the population had primary and secondary education. Concerning place of residence, 43% of the observed population on average, live in urban areas while 57% resided in the rural areas.

4.2 The Effect of Information Asymmetry on Child Health Status in Cameroon

Results are presented in three columns. Column 1 shows the regression estimates of information asymmetry on child health status using the simple probit method, Column 2 shows the regression estimates of information asymmetry on child health status using the ivprobit method while column 3 will hoists the reduced form estimates of information asymmetry that carries the instruments.

Table 2. The Effects of Information Asymmetry on Child Health Status in Cameroon

	Estimates of child health status (probit)	**Estimates of child health status (ivprobit)**	**Reduced form estimates of information asymmetry**
Variables	**(Col.1)**	**(Col.2)**	**(Col.3)**
Information Asymmetry Index	-0.020***	-0.949***	
	(0.00679)	(0.245)	
Age	-0.010***	-0.0529***	0.00522***
	(0.00069)	(0.00465)	(0.000598)
Age Squared	0.0001***	0.000428***	-3.99e-05***
	(0.0001)	(4.45e-05)	(5.84e-06)
Gender (1=female, and 0=otherwise)	-0.040***	-0.284***	-0.0222***
	(0.00338)	(0.0253)	(0.00318)
Level of education (1=primary, and 0= otherwise)	0.028***	0.300***	0.141***
	(0.00464)	(0.0461)	(0.00339)
Level of education (1=secondary, and 0= otherwise)	0.053***	0.577***	0.296***
	(0.00578)	(0.0840)	(0.00384)
Level of education (1=higher, and 0= otherwise)	0.090***	0.876***	0.481***
	(0.01577)	(0.142)	(0.00849)
Residency (1=rural, and 0= otherwise)	-0.006	-0.245***	-0.220***
	(0.00393)	(0.0654)	(0.00303)
Use of Newspaper and Magazine-nscp			-0.294***
			(0.0102)
Constant		0.416***	0.479***
		(0.115)	(0.0178)
Prob > chi2	0.0000	0.0009	
Wald chi2(8)	599.21	642.03	
Pseudo R2	0.0299		
Rho		0.1972465 (0.0578915)	
Sigma		0.2319924 (0.0009229)	
Wald test of Exogeneity (Athrho = 0): chi2(1)		11.01	
Observations	31,591	31,591	31,591

Note: Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Source: Computed by Author(s) Using Stata 14 from DHS 2018.

The results in Column 2 in Table 2 elicit the findings of the structural equation investigating the effect of information asymmetry on child health status using the binarised WAZ. The ivprobit results in Column 2 show that, asymmetry of information affects child health status in Cameroon significantly and adversely. The simple probit results in Column 1 equally show that, asymmetry of information adversely affects child health status in

Cameroon. That is information asymmetry reduces the probability for a child to be healthy by 0.020. When controlled for endogeneity, the estimate on child health status shifts upward to 0.949 (Column 2). This is approximately 47.45 times the simple probit estimate. The results clearly show that when controlled for endogeneity, the results are more improved. The effect is far greater than when we used the normal probit. Nevertheless, the magnitude of the effect is greater in the ivprobit than in the simple probit. This provides evidence that asymmetry of information index in Cameroon reduces the probability for a child to have good health by 0.949 units following the ivprobit results in Column 2. This result is statistically significant at the 1% level and therefore, we reject the null hypothesis and conclude that asymmetry of information significantly affects child health status in Cameroon.

This result is in line with Akerlof et al. (1970) in their theory of markets with asymmetric information. Their work shows that informational asymmetries can produce adverse selection in the markets. It therefore makes us understand the fact that the seller of a product usually knows more about the quality of his product than any potential buyer. This is exactly what obtains in the health care market. The health service provider who is the seller of the health product knows more about his service than the patient. Akerlof et al. in their model therefore suits the objective of this study as it links the information to individuals' health status. Also, the result is perfectly in line with the study of Mocan (2007) whose empirical findings revealed that information asymmetry in the market has the tendency to reduce the quality of child health in U.S.; it is also in line with Dahl *et al.* (2022) who realised that the use of digital information can improve consumers' health outcomes. The result also agrees with the findings of Barile et al. (2014) that information asymmetry reduces health status. The result is also in line with the empirical findings of Wirsiy et al. (2019), who realised in a study in Cameroon that using SMS text messages and mobile phones improves behavioural actions as well as treatment adherence in women patients / individuals. Within the context of this study, limited flow of information (symmetry of information), will lead to a fall in child health status in Cameroon.

These findings can be attributed to the fact that information asymmetry is very essential in determining health status in Cameroon as many people in the country have reportedly been sick and eventually died because of lack of information about drug availability and certain health facilities like cheap drugs at certain health centres and free consultation facilities. The fact that perfect health information is not available to the health seekers is an issue. Communication actually constitutes a huge challenge as radio signals, telephones, internet, television and newspapers do not reach all the vital health areas in Cameroon. Vital information on health does not reach everybody. This information gap causes the population to rely on the information they have, which may not be reliable. For example, when we look at the challenges faced in Cameroon in the year 2021 concerning the smooth administration of the COVID-19 vaccines, we see fake information taking an upper hand. There was and there is still a lot of resistance to receive the vaccine because people rely on unverifiable social media information that was sabotaging the credibility of the vaccine. In this situation, many people may end up dying of COVID-19 because of asymmetric information.

5. Conclusion and Recommendations

Since the result indicates that information asymmetry significantly negatively affects child health status in Cameroon, the following policy implications are derived: First, Cameroonians should make good use of the radio by listening to health programmes, the government should encourage local radio stations by giving them financial assistance to put on air adverts on the available health services around the rural communities. Targeting perfect information flow on health services in peripheries can boost child health status in Cameroon and above all, any move by policy makers to facilitate information flow on availability health services will be of great importance to health status. The main limitation of this study among others is the fact that the DHS 2018 data set used for this study was not collected specifically for this topic; it was being adapted to match the expectations. Equally, given that this study used basically the secondary data, the difficulty encountered was being unable to separate the rural from the urban population. The result obtained was global, thereby making it impossible to comment about the effect of information on rural and / or urban child health status. Based on the result obtained, it is suggested that similar research should be conducted using primary data separately, this time, a study should be carried out in a rural area and another one in an urban area. This will enable us to identify the differences in effects of information between the rural and urban child health status.

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