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SOCIO-ECONOMIC ISSUES IN CAMEROON

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Socio-Economic Issues in Cameroon

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Socio-Economic Issues in Cameroon, Vol.3

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Preface

Ch.1) Child mortality is an important demographic, health, and development. It is for this reason therefore that the reduction in child mortality is a worldwide target, and was one of the most important key indicators in the Sustainable Development Goals and has been reconsidered as vital in the recent Millennium Development Goals. Following this, this paper attempt to assess the drivers of child mortality in Cameroon using the 2011 Cameroon Demographic Health Survey data collected by the National Institute of Statistics (NIS).To assess the effect of safe drinking water on child mortality in Cameroon. Specifically, the study scrutinises: (a) the effect of safe drinking water on child mortality (b) the effects of the number of bed nets in a household, (c) the effects of the number of births in the past years on child mortality. To attain these objectives, we employ a probit model as the dependent variable, child mortality, is dichotomous in nature. Among the several results, the data revealed that, (a) access to safe drinking water reduces the chances of a child dying, (b) the number of bed nets in the household is important in reducing child

mortality and (c) the fewer the number of births in the past year, the lesser the number of children a woman will loss during pregnancy and child birth. This has policy implication if child mortality must be reduced.

(Ch.2) Commercial agriculture is one of the fundamental catalysts for socio economic development and spatial transformations of space. Oil palm production is amongst the activities carried out in Mamfe Sub-division and today it is perceived as the panacea to rural development even though unsatisfactory. The paper examines the production of oil palm and its contribution to rural development in Mamfe Sub-division. In order to attain this objective a systematic random sampling of 350 oil palm producing households from 8 villages in the Sub-division constituted the sample frame. Data collected from the field were treated and analyzed statistically with the use of cartographic soft-wares: CorelDraw12, MapInfo, Microsoft Excel and results were presented on tables, figures and photos. The main results are: Findings revealed that favorable ecological conditions in terms of sandy soils and temperatures that range between 26°C to 29°C, and rainfall that also oscillate from 1500 to 2000mm are pre-conditions for oil palm production. This is complemented with dynamics of energetic youthful population that ensure the survival of the activity in Mamfe. The second result demonstrates that there are two types of oil palm cultivated concentrated in zones according to species: improved specie (Tenera) and un-improved specie (Dura) these zones of segregation are easily noticed among the farmers of peasant populations of Mamfe Sub-division. Generally, the un-improve specie out-weighs the improved species of palms cultivated in the area. The third findings shows that the peasants derived much income from palms activity and this permit them to construct private residents, about 70% of the 350 oil palm farmers sampled own their own houses in which they live in and close to 60% of the peasants own block houses, send their children to school and their standard of living is improved owing to the provision of protein food. Local development in Mamfe Sub-division is reflected in the evolution of the activity based on villages' development. The fourth and last results depicts that the contribution of oil palm production to socio economic

development is unsatisfactory because it is plague by several problems amongst which include, neglect by elites, inadequate capital etc. The temporal closure of the lone oil palm cooperative; MOPCOOP due to succession crisis is partly responsible for the unsatisfactory oil palm production and socio economic development in Mamfe Sub-division. This article proposes the reinstatement of MOPCOOP amongst other measures; this structure is considered as a corner-stone to the development of the sub-sector.

(Ch.3) The emergence of millennium development goal was to reshape Cameroon economic development in all its scales. The Socio-economic development defined by the goal was considered categorical imperative to the nation building. To attain this socio-economic development, Cameroon arm itself to absorb the economic challenges of balancing its inputs and outputs, good governance, the control of its demography which can have serious consequences, health, insalubrity in the big cities of Douala and Yaoundé, industrial pollution and many others problems causing many diseases.

(Ch.4) This chapter is aimed at investigating the contributions of socio-economic factors in accounting for urban-rural health inequalities in Cameroon. Specifically, it sought to construct and compare a composite index of health endowments in urban and rural Cameroon, to assess the urban-rural disparities in the effects of modern healthcare access on health endowments in Cameroon, and to evaluate the extent of the discrimination component in accounting for urban-rural health inequalities in Cameroon. The chapter used the most recent Cameroon household data survey (ECAM 4 individual) and employed the Oaxaca-Ransom (1994) decomposition technique to explain differences in healthcare between urban and rural areas in terms of urban advantage and rural disadvantage to socio-economic endowments. Our t-test results revealed that health endowments are better in urban areas compared to rural areas in Cameroon. Our findings also showed that the explained component accounts for 83.18% of the overall urban-rural health status inequality in Cameroon. Importantly, the unexplained component that constitutes the discrimination effect made up 16.18% of the total urban-rural health status differential

out of which the rural disadvantage was greater (10.07%). Access to modern healthcare, secondary education, tertiary education, being female, age, age square, and being married contributed overwhelmingly in accounting for the explained component of the urban-rural health status inequality. Primary education was found to have a mitigating effect on this inequality. In terms of modern healthcare use, it was found that this component improved health endowments more in urban than rural areas in Cameroon. The research therefore recommends that policy emphasis should not only be on access to socio-economic endowments but focus more on promoting the use of socio-economic facilities and enhancing equity in returns to these endowments especially in favour of the rural areas.

(Ch.5) The unprecedented demographic growth coupled with the high rate of unemployment and underemployment has greatly influenced the consumption habit of the population in the North West section of Douala. Cassava consumption has become a highly consumed foodstuff by more than 98% of the population. This study examines the cassava economy and its valorization as a social livelihood by the population. It equally proposes valorization options of the cassava economy. Research methodology was based on pluridisciplinary and systemic approach; primary and secondary data were collected on the field and later treated. The results show the "*how*" and "*why*" the cassava economy has become a livelihood. The cultivable surface area, quantity imported and frequency of consumption and the socio-cultural reasons are all revealed. Very rich in carbohydrate, the cassava economy ensures the social welfare of the locals and contributes to the country's GDP. A comprehensive adequate organization system would inevitably contribute to local development.

(Ch.6) Developing countries face a much more crippling burden of diseases especially regarding infectious diseases such as malaria and HIV/AIDS. Every year thousands of children die due to malaria and poverty in Cameroon. This study assess the causality that exists between malaria and poverty and the selectivity bias arising from health-productivity relationships. The research methodology entailed the use of the Three Stage Least Squares

technique to show the link between malaria and poverty. A Mincerian wage equation (which consider malaria attack as an independent variable) was also estimated using the OLS method and the Heckman Maximum likelihood method with area of residence as the most valid instrument. The study makes use of data drawn from the third Cameroon Household Survey data of 2007 (ECAM3). The study found a bi-causality relationship between malaria and poverty. The findings show that malaria renders households poorer and rising household poverty level resulting from an increase in household expenditure raise the incidence of malaria attack on the household. On the relationship between malaria and labour productivity, the results reveal that, malaria leads to a substantial loss in labour productivity of household members. Thus, malaria leads to a drop in labour productivity and engenders poverty. The study concluded that poverty reduction strategies should incorporate those elements that touch the households directly. Implementing strategies that target households directly will reduce the prevalence of malaria and minimise its growing adverse effects on the economy.

(Ch.7) Floods are one of the most common urbanization problems of Cameroonian cities. The phenomenon has been treated for a long time through structural and technical measures. Each year this phenomenon causes disastrous material and human damages in the city of Douala. The magnitude of the impacts caused by the floods of June-July-August-September 2018 in the neighbourhoods of Douala such as Bobongo and Cité Berge, to name but a few, were beyond scientific explanations. This paper demonstrates spatial representations through the use of "mental maps" and inhabitants to appreciate and analyze vulnerable territories. Systematic fieldwork survey was adopted follow by administering of questionnaires, semi-structured interviews with a sample of 186 households. This was completed through statistical data collection techniques; GPS surveys and the use of GIS (ArcGis). The following results were obtained: Fundamental results is based on mental maps that shows the areas commonly known as the Lebanese bridge, the public school cemetery, the Jean Singulier crossroads, block 4, Ngoua bridge, the white house and the Bandre fam crossroads are considered to be densely populated

are seriously affected. The spaces in question correspond to the transition zone between swampy lowlands and highland whose average altitudes are between 5 and 9m. Considering it geographical configuration makes it subjective to constant flooding that destroys properties and human lives are subjected to flood risk. This therefore, imposes on geographers to define complete paradigm shift, new methods, tools, perspective to tackle the problem of flooding. This paper uses mental maps as one of the new approach to flood risk assessment.

Editors
D.T. Ndamsa & B. Yamb
May 30, 2020

Notes on Contributors

Gladys Njang **Che:** Dr. Njang is a Cameroonian originating from Menchum Division in the North West Region of Cameroon. She is married and a mother of four. DrNjang, obtained her FSLC in 1994 in Catholic School Azire Small Mankon, "O' 'Levels in 1999 in G.B.H.S Bamenda and "A" Levels in 2001 in the same institution. She went to E.N.S Bambili where she obtained a Diploma in Economics in 2003. Upon graduation in 2005 she obtained a Bachelors Degree in Economics from the University of Dschang. She further obtained a Maitrise, Master and Ph.D. in the same University in 2008, 2011, and 2018 respectively. Recruited in the University of Yaounde II Soa 2011, she served as an assistant lecturer in the Faculty of Economics and Management and was transferred to the University of Bamenda, precisely in the Department of Economics of the Higher Teacher Training College where she currently occupies

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Aloysius Mom **Njong:** Professor Njong Aloysius is a Fulbright scholar, an exceptional professor, with several public addresses made to students at Bluefield State College, Concord University, and National College. Njong has been a lecturer in several Universities in Cameroon. He holds a PhD in Economics from the University of Dschang. In 2015, he was appointed DEAN of the Faculty of Economics and Management Sciences at the University of Bamenda by Presidential Decree. He has supervised more than 50 MSc/MBA theses and more than 7 PhD thesis in several universities in Cameroon. Professor Njong has more than 40 publications to his credit. His efforts have made tremendous contributions to professional Higher education I Cameroon.

Johnson **Modika:** Johnson Modika, born on the 14/10/1977 at Manyemen, Kupe Manenguba Division in the South West Region of Cameroon, holds a Bachelor Degree in Geography, option: Planning, Management andMarketing from University of Dschang, Cameroon. He also holds aMaster Degree in Geography at the University of Doualain the Dynamics of Industrial Spaces in Douala, as well as a Ph.D. in Geography at the same University in Territory, Risk, Planning and Development. He's a senior lecturer at the same institution. His research and publication focuses on industrial dynamics and agrarian system: panacea to development. He pertains to a research laboratory: Geography, Territory and Environment. He is also a contributor to many collective publication and journals of Social Sciences of Cameroon and Africans Issues. His contribution to development, Governance and culture has served him a rich academic and social experience. He served as a coordinator of First Degree Professional Studies in Environmental Engineering from 2013 to 2019. Presently, in the same capacity he coordinates First Degree Professional Studies in Urban Planning Engineering. He has also served for ten years in the post of deputy class Master of Second Year classical Degree Studies at the Department of Geography of the Faculty of Letters and Social Sciences of the Douala University. He

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Egbe Sylvester **Tabot:** Egbe Sylvester Tabot hails from Besongabang village in Mamfe Sub division, Manyu Division in the South West Region of Cameroon.He attended Presbyterian school Besongabang and Bilingual Grammar School Buea and obtained the First School Leaving certificate and GCE Advanced Level certificate respectively.Upon completion he enrolled in to University of Yaounde 1 in the Department of Geography in the year 2000 and graduated in 2003 with a Bachelor's degree in Geography. After his undergraduate studies he enrolled for a post graduate diploma (Maitrise) in which he defended a Maitrise in 2006. His insatiable quest for further geographic knowledge took him to the University of Douala in which he defended a Master's degree in 2018. He is presently pursuing a PhD program in Geography in the University of Douala under the speciality; Society, planning and development. His point of focus is the Dynamics of Economic activities and sustainable development. Egbe Sylvester has taught in several schools in Douala and its environs, he equally handled tutorials and map work and Economic Geography for first year students in the University of Douala. He is a prolific writer, haven written extensively some books used at Ordinary and advanced levels as well as a hand full of articles that are in manuscript near publication. Besides being an Evangelist he belongs to several societal and tribal groups.

Paul MPake **Nyeke:** Dr. Nyeke is a Cameroonian historian from the coastal region. He was born on August 13, 1970 in Yaoundé. Son of the late Nyeke Frederic and Ngo Maloo Maximilienne. He began his studies at Saint Dominique Savio School in Edea where he obtained a certificate of primary and elementary

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Fuein Vera **Kum:** Fuein Vera Kum is a focused, enthusiastic and thorough economic researcher who is keen on exploring key socio-economic challenges to seek feasible solutions and contribute to improve human living conditions. She is proficient in the English and French languages and has a good background delivering academic lessons to adult learners in tertiary education institutions. She equally has a good knowledge working with policy makers and being part of a high-level team of professionals working to proffer solutions to economic challenges plaguing Africa. She also has a good and sound understanding working with partners and meeting donor requirements. She strives to share knowledge with learners and encourage more students and junior economists to be interested in the study of economic theory, health economics, research and analysis. She holds a Ph.D in Economics from the University of Benin, Nigeria. Dr. Vera Kum is currently an assistant Lecturer at the University of Bamenda, Cameroon.

Fabien **Sundjo:** Holds a Ph.D. in Health and Development economics, obtained under the auspices of the African Economic Research Consortium, Nairobi (AERC) collaborative PhD scholarship Program, with a double B.Sc. and a double M.Sc. in Economics and in Political sciences. Fabien Sundjo has been invited on several occasions as Key speaker at prominent international Conferences. In September 2018, Sundjo was invited as speaker at the international conference on the 'uncertainty and Complexity of Migration' at the British Academy, London under the University of Southampton, London, UK and in April 2019, he was one of the speakers at the Tax research conference at the University of Exeter in London. Sundjo, has occupied the post of Chair and Dean of studies at the School of Business and Public policy of the St. Monica University and serves as a Policy Fellow in Economics Affair at the Denis and Lenora Foretia Foundation. He is one of

the Founders of D.A.W.E, a philanthropic organization that takes care of the less privileged women in Cameroon. Currently, Dr Fabien Sundjo, is lecturing at the State Owned University of Bamenda, Buea and Yaounde II Soa, as well as in the Institute of Governance, Humanities and Social Sciences of the Pan African University of the African Union who's Headquarters is in ADDIS ABABA where he lectures both at Masters and Ph.D levels.

Betto Djeutcha **Stanislas:** Is a doctoral student at the University of Doctoral Training (UFD) Human Science, Literature, Communication, Geographer, Faculty of Letters and Human Sciences, University of Douala. He is interested in research themes relating of spatial representations of risk via the mind map tool, the development of *bottom-up* approaches in the process of analysis and management of territories to environmental risks.

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Contents

Chapter II

Oil palm prodıuction: A panacea for rural development in Mamfe sub division south west region, Cameroon

J. Modika & E.S. Tabot

Chapter III

Chapter V

Valorization of the cassava economy as a social livelihood between Bonaberi to Souza in the north-west of Douala, Cameroon

N.M. Essone, & E.E. Wonomu

Chapter VI

Malaria, labour productivity and poverty in Cameroon

F.V. Kum & F. Sundjo

(132-156)

Chapter **VII**

Cartographic representation risk zones in the flooded drainage basin of Bobonga and socio-economic problems in Douala, Cameroon

B.D. Stanislas, M. Johnson, & T.G. Mavie

(157-177)

1 Determinants of child morality in Cameroon

Gladys Njang **Che** [a] [†]
Aloysius Mom **Njong** [b]

Introduction

Improving the health of children is an important public health goal for Cameroon. Their well-being determines the health of the next generation, and can also help predict future public health challenges for families, communities, and the health care system. Apparently child mortality is a factor that can be associated with the well-being of the population, and taken as one of the development indicators of health and socio economic status. Child mortality is an important demographic, health, and development issue for a number of reasons. It is useful for the calculation of the overall mortality, as the highest risk and proportion of deaths occur during childhood. Interestingly, child

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mortality is one of the three measures (with fertility and migration) that determine the population size and growth rate, the age-sex distribution and the spatial spread of the population. Hence informed knowledge on its measurement and determinants is very important for evaluation and public health strategy. A reduction in child mortality is an implication that females can reach their desirable family sizes with fewer pregnancies (Shultz, 1999).

Most importantly of course all human beings have a right to life, and the extent to which that right is enjoyed is summarized by tracking trends and disparities in childhood mortality, and decreasing child mortality is thus a focus of communities since child mortality affects a countries labour force quality and productivity (Okechukwu, 2009). The United Nations (1985) enshrined the right to life in the declaration of human rights which is re-affirmed for children in the convention of the rights of the child. It also indicates the quality of life of a given population, as measured by life expectancy. It is for this reason therefore that the reduction in child mortality is a worldwide target, and one of the most important key indicators among the Millennium Development Goals (MDG's). This Goal number 4 is targeted to reduce under five mortality rate at the global level by two thirds over the years 1990 to 2015.This fight against child mortality in the world is now a target in the Sustainable Development Goals (SDG) for goal number 3, which is to ensure healthy lives and promote well-being for all at all ages. For these objectives to be met, knowledge of the determinants of child mortality at country-specific level is crucial.

Even though, with all the efforts by public health measures and a scientific approach in medicine to reduce child mortality in the developed and less developed countries, the rate of child mortality in these areas still remains high. This is observed with wide disparities that persist between demographic groups.

In order to understand the determinants of child mortality, this paper specifically investigate the following objectives:

- ✓ To assess the effect of safe drinking water on child mortality in Cameroon.
- ✓ To investigate the effects of the number of bed nets in a household on child mortality in Cameroon.

✓ To find out whether the effects of the number of births in the past year on child mortality is resident-sensitive.

The following sections of this write-up is designed as follows: section 2, focus on the literature reviews, section 3 presents the methodology and the data description is done in section 4 while section 5 present the findings and section 6 concludes the paper.

Literature review

Many studies have shown that child mortality is influenced by a number of demographic and socio-economic factors such as; sex of child, age of mother at first birth, proceeding birth interval among others (Abimbola *et al.*, 2012; Bello, 2002). However, Adeyemi *et al.*, (2008) holds that the environment in which man lives is the main cause of child mortality, which is attributed to diseases like malaria, diarrhoea and respiratory infections. Kruger (2013) realised that apart from infectious diseases that affect a child's health, prematurity and low birth weight are very vital risk factors that determine child mortality for both African Americans and whites. This situation affects more the African Americans than whites because they are more likely to live in highly deteriorating neighbourhoods. Also, these prematurity and low birth weights are accounted for by the scarcity of adult men, as observed especially in households with children that are headed by single mothers.

In Developing countries, the reduction in child survival probability in any society is as a result of the operation of social, economic, biological and environmental factors (Mosely & Chen, 1984). Theses authors highlighted that the biological indicators are viewed in terms of specific diseases and nutrient deficiencies observed in a surviving population, while growth flattering and ultimate mortality in children is observed as the cumulative consequences of multiple disease processes because only infrequently is a child's death the result of a single isolated disease episode. Among the ten identified major mortality risks in high mortality countries in developed countries, factors such as unsafe water, sanitation and hygiene, smoke from solid fuels were ranked first, second, third and fourth respectively (Mutanga, 2007).

According to Borjas (2005), the increase in female labour force participation rate was more pronounced in Developed countries than in Less Developed Countries. The reason for this increase was as a result of higher wages and technological developments within the domestic sphere. He attributed the cause in differences in female labour force participation between countries to different cultural values and institutional frameworks which had great impacts on women's decisions and ability to work. He went further to analyze and explain in his study that the decline of time spent on domestic work by women is due to the fact that most of these women seek jobs outside their home, especially jobs in the informal sector.

A study by Basu (1987), investigating the recent mortality trends in developed and developing countries showed that falls in childhood mortality within these two areas is mostly determined by social changes especially at the individual or behavioural level as measured by female education. Family factors, based on maternal attitudes, knowledge and abilities are important determinants of childhood mortality levels. The more educated the women are, the more knowledge they acquire which gives them a better chance of raising children the right way, both health wise and nutrition wise.

Child mortality in developing countries is mostly determined by the role of mother's education. The study highlights the fact that when an educated woman ensures her health especially during pregnancy, she indirectly ensures the health of the baby too. The mother's education is also necessary for the health and wellbeing of the child, as well as nutrition and how to take care of infectious diseases (Godelieve, 2001). In third world countries, infant and child mortality is still a major health problem. In a study on political economy of health by Ande & Eugene (1992), they seek to explain the discrepancies between economic progress and progress against infant mortality. In countries with high economic development, registers more progress against infant mortality, while countries with low economic progress show less progress. Furthermore countries with high infant mortality indicate more progress against infant mortality, while those with low infant mortality try to maintain such levels from increasing.

A study by Wang (2003) on the determinants of child mortality in less developed countries showed that as child mortality falls, the between the poor and the rich widens, and the results also indicate that the reduction in child mortality is still much slower in the rural areas, where the poor are concentrated than in urban areas. Antoine & Diouf (1988) in a study carried out in Africa realized that child mortality ratio between urban and rural areas is high in some countries (Benin and Cameroon), and low in others like (Kenya and Senegal), due to some socio-economic factors like illiteracy, education etc.

In Nepal ethnic differentials in early child hood mortality is explained more by other socio-economic and demographic covariates such as illiteracy, and also breastfeeding which reduces age-specific mortality risks during the first 2 years of life by 76%. Rising food prices in India especially those foods of high-protein meat and dairy products are associated with the worse child mortality outcomes, this associations were concentrated in the most deprived states. Most of the people in the most deprived states are the poor who cannot afford these prices, and as a result their children are malnourished and eventually fall sick (Jasmine *et al.,* 2016). Childhood under nutrition is the main factor of child mortality in South Asia. Children under five years are malnourished, implying insufficient calories in their body systems which can lead to deficiency diseases (like rickets, beri-beri, kwashiorkor etc). More resources at the household level improve the ability to acquire more calories, and for parents to invest more in the nutrition of their children for a better health. This high child mortality rate in South Africa is associated to income poverty, under nutrition and under nourishment (Klasen, 2006).

In Africa, through maternal education the woman acquires knowledge and modern standards in the areas of child care, hygiene and other domains that affect the level of child mortality. It was discovered that the risk of death increased with bottle feeding. Children who did not take natural breast milk had more chances of dying than those who breast feed exclusively for six months (Dackam & van Der, 1988). Another study carried out in 11 countries in Saharan Africa to show the survival chances of children, indicated that child mortality is closely associated with

socio economic inequality in many countries coupled with the different use of child health services in countries of the Sahel region (Brockerhoff & Hewett, 2000).

Okechukwu (2009) analyzed the differences between urban and rural areas across countries in sub- Saharan Africa with respect to child mortality using the logit model. Since child mortality affects a country's labour force quality and productivity, the study revealed that the rate of child mortality is higher in countries that are less urbanized than in countries that have a higher proportion of the population residing in the cities.

A study carried out in the Rajshahi district in Bangladesh by Nazrul *et al.,* (2009) showed that children in this country continue to lack basic amenities and opportunities of life. It is noticed that one in every 7 children born in Bangladesh die before their fifth birthday, probably due to low weight at birth and malnourishment. Household environmental factors are very influential on a Childs health in Chattisgarh in India. Better cooking facilities, availability of water at house, and better sanitation facilities may lead to better health. Where these conditions are good, a child has lesser chances of dying (Prakasam & Prasad, 2005). A study by Majumder & Islam (1993) still in Bangladesh on child survival uncovered that the survival of a child depends on socio-economic and environmental factors, which if not favourable will expose the child to health risk, especially from poor sanitation, and lack of safe drinking water. They investigated the differentials in child survival in Bangladesh, using data from the Bangladesh fertility survey and employing the multivariate analysis, their study revealed that both wife's and husband's education and household electricity show a significant positive relationship with child survival than that of husband. According to Amin *et al.,* (1986), exploring the trends and differentials in infant and child mortality in Bangladesh, where a major improvement in achieving the basic needs of human survival has been observed, the study found that levels of infant and child mortality continued to be high in Bangladesh. Infants whose father's belong to higher socio-economic strata, whose families live in urban areas and whose parents have better resources were more likely to experience lower child mortalities.

Chowdhury *et al.,* (2010) in a study carried out in Bangladesh on the socio-economic that determine infant and child mortality realized that among factors such as education, electricity and sanitation that affect infant and child mortality, illiteracy and sanitation factors had more impact. The result showed that the infant and child mortality rates were higher for illiterate reproductive mothers, and those whose houses had hygienic latrine. The study concluded that in order to reduce infant and child mortality in Bangladesh, the priority factors should be targeted.

Even though infant mortality declined in India by 30% between 1981 and 1990, mortality rates remain very high among age groups of 0 to 5 years. Sex differentials in infant and child mortality reflect strong son preference in many states. Furthermore among socio-economic background characteristics mother's literacy, access to a flush or pit toilet, membership in a scheduled caste of tribe, and household economic level have substantial effects on infant and child mortality. The mother's tetanus immunization during pregnancy is strongly associated with reduced neonatal mortality. These results suggest that minimizing the number of births to every young mother, encouraging mother's to space births by at least 24 months, and avoiding high- order births will substantially enhance the survival chances of children in India (Pandey *et al.,* 1998).

In Tanzania, there is a high infant mortality rate, and for this reason the government encourages women to space their births at least two years apart and also delay child bearing beyond the teenage years using the hazard model (Mturi & Curtis, 2016). A study by Kembo & Ginneken (2009) in Zimbabwe on the maternal, socio-economic and sanitation factors on child mortality using the cox regression model found that short birth intervals are associated to high child mortality risk. Also the expected u-shape relationship between birth order and child mortality is not conformed in their analysis. A similar study on socio-economic determinants of child mortality carried out in Kenya discovered that most of these socio economic factors are not associated with the risk of infant and child mortality. The results from this study show that children

born in richest households have lower probability of a child dying than those born in the poorest households.

A Study carried out in Ethiopia showed that among the bio demographic factors that determine child mortality, breastfeeding has a significant impact on infant and child mortality, while among the socio economic determinants, education, household size and sex of household are the most important determinants for both infant and child mortality. This study goes further to explain that other socio economic variables diminish their impact on child mortality as a result of environmental factors (Mekonnen, 2011; Kumar & File, 2010). Also they indicated that children whose mother's educational levels are high significantly correlate to the low risk of child mortality relative to children born of illiterate parents.

Still in Ethiopia, Ezra & Gurum (2002) employs a logistic regression model to investigate the impact of birth interval on infant and child mortality in the context of communities characterized by high reproductive, prolonged breastfeeding practice and poor living conditions. They found that short birth intervals (<18 months) was significantly associated with child mortality, as compared to long birth intervals (< 24 months). They also observed that children born to young mothers ages (15-19) and oldest mothers (35-49) have a significant effect on infant and child mortality as compared to with children born to mothers in the age category (25-34) (Mekonnen, 2011). Kumar & File (2010) used data from the Ethiopia Demographic and Health Survey conducted in 2010 to examine the predictors 'of child mortality. Using the cross tabulation technique the results showed that the major factors influencing child mortality were birth interval and previous child and mother's standard of living index. Mother's education was also an important factor in determining child mortality. The study ended up by concluding that increase4s in mother's education and improved health care services are significant in reducing child mortality in Ethiopia.

Assefa *et al.,* (2013) in another study till in Ethiopia using the Ethiopia Demographic Health Survey data of the year 2000, 2005, and 2011 carried out their analysis using the cox regression. The results from the levels and trend analysis indicate that all five

childhood mortality indicators (neonatal, postnatal, infant, child and under five mortality) have been steadily declining over the last decade in Ethiopia. Despite this decrease, the contribution of neonatal mortality to infant mortality, both by region and at the national level has increased over time. The multivariate analysis from this study indicate that the significant determinants of under-five mortality are; sex of child, birth size, birth interval, mothers education, mothers marital status, and access to toilet facility. The region Addis-Ababa was more prominent for child mortality than other regions.

Maternal education in Nigeria appears to be the single most powerful determinant of the level of child mortality. In addition to maternal education access to the use of medical services is also another factor affecting child mortality. Children of educated mothers stand higher chances of dying before the age of 5 years. Women's education in societies like that of Yoruba in Nigeria can produce profound changes in family structure and relationships, which in turn may influence child mortality (Caldwell, 1979). In Oyo state in Nigeria, among the many determinants of child mortality, the major determinants are; poverty, malaria, post- natal care and breastfeeding. It was noticed that even though HIV is a catalyst to child mortality, it was not a major determinant of infant and child mortality (Bello & Joseph, 2014).

Mesike & Mojekwu (2010) investigated the environmental determinants of child mortality in Nigeria using principal component analysis and simultaneous multiple regression to analyze the determinants of child mortality. The results reveal that household environmental characteristics had a significant impact on mortality, as portrayed by lower mortality rates in households that had access to immunization, good and proper refuse and solid waste disposal facilities, sanitation facilities, good roofing and flooring materials as well as those using low polluting fuels as their main source of cooking. Adeleye (2013) reveals that child mortality in Nigeria is associated to a number of factors among which place of delivery played an important role, since better places of deliveries significantly reduced infant and child mortality. Also there exist a negative relationship between educational attainment and child mortality, explained by the fact

that the more educated a woman is. The more she can ensure her health and that of her child too, hence experiencing a reduction in child mortality.

In Ghana, Garo (2007) used the Demographic Household Survey data for the years 1993, 1998, and 2003 to examine the determinants of infant and child mortality in three Northern regions. Using multivariate logistic regression models, it was noticed that education of mothers, marital status, and birth order of children were the major significant factors determining infant mortality, but then only the education of the mother was outstanding and had a significant effect on child mortality.

Child mortality in Cameroon is as a result of the socio economic factors, among which poor socio economic factors like poor housing characteristics, and lack of immunization programs on child were the major causes of infant and child mortality in Cameroon (Kuate, 1994). Child mortality is high in among children of migrant mothers in Cameroon and much higher in children whose mothers spend their entire lives in rural areas. Also ethnic groups in the East and Northern parts of Cameroon had the highest the highest child mortality rates even when maternal education and residence were controlled. The results revealed that Muslims had higher child mortality rates than Christians. Moreover, this mortality rate was also higher in polygamous unions than in monogamous unions (Kwekem & Dgoumessi, 1987).

In a study carried out in East Cameroon between 1987-1988, focused on two major issues which are; the relationship between biomedical assumptions and programs, traditional cultural tenets, and the impact it has on child mortality in the Eastern region of Cameroon. Results from this study contrast the problems of disease and mortality in this area as portrayed in official statistics with the actual health situation arising mainly from resilient beliefs, attitudes, and practices that hinder, rather than facilitate the effectiveness of immunization campaigns undertaken by the government to save a child (Mario *et al.*, 1991).

Methodology

To investigate the determinants of child mortality, we employ a probit model. This model fits our analysis because the dependent variable, child mortality, is dichotomous in nature. The probit model is summarized as follows:

$$P(Y^* = 1 \ /X) = \varphi(x\beta) \quad (1)$$

Where P denotes probability, and Φ is the Cumulative Distribution Function (CDF) of the standard normal distribution. The parameters β are typically estimated by maximum likelihood, Y^* represents the dependent variable and x is the vector of independent variables.

It is possible to motivate the probit model as a latent variable model. Then we can write:

$$y_i = x_i\beta + \varepsilon_i \quad (2)$$

$$\text{Where } y = \begin{cases} 1 & if child dies \\ 0 & otherwise \end{cases}$$

Where y_i is the dependent variable, x_i is the vector of exogenous regressors, β is the vector of structural parameters to be estimatedand ε_i is the error term of the structural equation.

Data

The study employs the Demographic and Health Survey data conducted by the National Institute of Statistics (INS) in 2011. These Demographic and Health Surveys were conducted through representative sampling at the national level. The data provide detailed information on fertility, family planning, maternal and child health, nutritional status of children aged less than three years, infant and child mortality and maternal mortality. The survey was conducted in both urban and rural areas, and covered all the ten regions of Cameroon.

The 2011 Cameroon Demographic health Survey combined with Multiple Indicators Clusters Survey (2011 DHS-MICS) was implemented by the National Institute of Statistics (NIS) from

January 2011 through August 2011. ICF Macro provided technical assistance through the major DHS program, a project funded by the United States Agency for International Development (USAID), which provides support and technical assistance in the implementation of population and health surveys in countries worldwide. The 2011 DHS was funded by the Cameroon Government with the support of UNICEF (United Nations Children's Fund), UNFPA (United Nations Population Fund), World Bank and the USAID.

The 2011 DHS-MICS is a follow-up to the 1991, 1998 and 2004 DHS surveys and 2000 and 2006 MICS surveys which provides updated estimates of basic demographic and health indicators and children situation in Cameroon. However, the primary objective of the 2011 DHS-MICS project is to provide high-quality data on fertility levels and preferences; family planning use; reproductive, child and maternal health; nutritional status of young children and women; childhood mortality levels; ownership and use of mosquito bed nets, prevalence of malaria; prevalence and treatment of childhood illness; fistula, domestic violence, knowledge, behaviour and regarding HIV/AIDS and prevalence of HIV/AIDS; maternal mortality; and woman participation in social life.

The sampling frame employed for the 2011 DHS-MICS is the 2005 Population and Housing Census. The sample excluded nomadic and institutional populations, such as persons staying in hotels, barracks, and prisons. The sample was designed to allow estimates of key indicators for each of Cameroon's 10 regions, the main towns Douala and Yaoundé due to their population were considered as separates regions. To achieve this objective, the sample was selected in two stages. In the first stage, 580 sample points (or clusters) were randomized selected and 578 of them were effectively visited. In the second stage, 24 households in each urban cluster and 28 households in each rural area were selected from each sample point in all regions. A household listing operation was undertaken in all the selected areas in June and September 2009. From these lists, households to be included in the survey were selected. The sample design resulted in a total of 15,060 households selected. In all households, women age 15-49

were eligible for interview. Every second household was selected for the men's survey. In these households, all men age 15-59 were also eligible for interview. Of the 15,060 households selected, 14,354 were found to be occupied. Of the 14,354 occupied households, 14,214 were successfully interviewed, yielding a household response rate of 99 percent. In the interviewed households, a total of 15,852 women were identified to be eligible for the individual interview, and 97 percent of them were successfully interviewed (corresponding to 15,426). For men, 7,525 were identified as eligible for interview, and 96 percent of them were successfully interviewed (corresponding to 7,191).

Worthy of note, due to the approximately equal sample sizes in each region, the sample is not self-weighting at the national level and weighting factors have been added to the data file so that the results are proportional at the national level. The 2011 DHS-MICS used three questionnaires: Household Questionnaire, Woman's Questionnaire and Man's Questionnaire. These questionnaires were based on the standard DHS and MICS surveys questionnaires, adapted to reflect the population and health issues relevant to Cameroon. Inputs were solicited from various stakeholders representing government ministries and agencies, non-governmental organizations, and international donors. Table 1, present the variables from the data as use to run the regression.

Table 1. *Presentation and description of variables*

Variables	Description
Dependent variable	
Mortality	1 if child dies and 0 if child is alive
Independent variables	
Education	Categorical
Primary education	Binary
Secondary education	Binary
University education	Binary
Safe drinking water	1 if access to safe drinking water and 0 if unsafe drinking water
Household size	Continuous
Currently breastfeeding	Continuous
Bed nets in household	1 no bed nets in household, and 0 if bed nets
Age of mother	Continuous
Mother working	1 if mother is employed and 0 if mother is not

	employed
Tetanus injection	1 if child has taken tetanus injection and 0 if child has not taken tetanus injection
Pre-natal not with doctor (specialist)	1 if attended pre- natal care and 0 if did not attend pre-natal care

Source: Computed by authors using DHS 2011.

Findings and discussion

Descriptive statistics

Table 2, reports the descriptive statistics for the overall sample. It shows that child mortality is 8.5% and 42% of the women attended the primary level of education, 31% have secondary level of education, and 2.8% have university education.

Table 2. *Summary descriptive statistics: overall sample*

Variable	Obs	Mean	Std. Dev.	Min.	Max.
Dependent variable					
Mortality	11732	0.085067	0.278993	0	1
Independent variables					
Primary level of education	11732	0.418173	0.49328	0	1
Secondary level of education	11732	0.305148	0.46049	0	1
University level of education	11732	0.028043	0.165103	0	1
Safe drinking water	11732	0.304722	0.460309	0	1
Household size	11732	7.888766	4.333055	1	43
Currently breast feeding	11732	0.518667	0.499673	0	1
Bed net in household	11732	0.654357	0.475599	0	1
Age of mother	11732	27.92942	6.76777	15	49
Mother working	11732	0.73031	0.443818	0	1
No tetanus injection	11732	0.191378	0.393412	0	1
Births in past year	11732	0.420815	0.521095	0	2
Endogenous variable					
Pre-natal not with doctor (specialist)	11732	0.767603	0.422389	0	1
Subgroups					
Rural	11732	0.600153	0.489888	0	1
Urban	11732	0.399847	0.489888	0	1

Source: Computed by authors using DHS 2011.

This show that the higher the level of education, the fewer the women. It is realized that 30% of the population have access to safe

drinking water, which is an indication that 70% does not have access to safe drinking water.

Considering the variable household size, there are averagely 8 people in each household in the overall sample. 52% of children are currently breastfeeding, and there are 65% of households with no bed nets. The average age of the mother is 28 years and 73% of mothers are currently working.

Given the importance of the tetanus vaccine, the overall sample shows that 19% of the children have not taken it implying that 81% of the children have taken it which is a good sign. The overall sample statistics show that on an average a woman is expected to have at least one birth in the past year.76% of the women in the overall sample attend pre natal consultations without a doctor. The population that make up the rural area is 60%, while that of the urban area is 40%.

Table 3. *Summary of descriptive statistics: Urban subgroup*

Variable	Obs	Mean	Std. Dev.	Min.	Max.
Mortality	4691	0.069495	0.254321	0	1
Primary level of education	4691	0.346621	0.475945	0	1
Secondary level of education	4691	0.473673	0.49936	0	1
University level of education	4691	0.061607	0.240467	0	1
Safe drinking water	4691	0.581966	0.493289	0	1
Household size	4691	7.320827	3.989436	1	30
Currently breast feeding	4691	0.429759	0.495094	0	1
Bed nets in households	4408	0.642015	0.479462	0	1
Age of mother	4691	27.73097	6.409855	15	49
Mother working	4691	0.633127	0.482003	0	1
Tetanus injection	3268	0.140147	0.347193	0	1
Births in past year	4691	0.3933063	0.5123943	0	2
Pre-natal not with doctor (specialist)	3268	0.643513	0.479035	0	1

Source: Computed by authors using DHS 2011

Table 3, reports the descriptive statistics for the urban subsample. The mortality rate stands at 6.7%. The statistics show that 35% of the women in the urban area have primary education, 47% have secondary level of education and 6% have attained the university level. 58% of the population have access to safe drinking water in the urban area. Considering the variable household size, there are averagely 7 people in each household in the urban

subsample. 43% of children are currently breastfeeding and there are 64% of households with no bed nets.

The mother has an average age of 27 years and 63% of mothers are currently working. 14% of the children have taken the tetanus vaccine and on an average a woman is expected to have at least one birth in the past year. 64% of the women attend pre natal consultations without a doctor.

Table 4. *Summary of descriptive statistics: Rural subgroup*

Variable	Obs	Mean	Std. Dev.	Min	Max
Mortality	7041	0.095441	0.293844	0	1
Primary level of education	7041	0.465843	0.498867	0	1
Secondary level of education	7041	0.19287	0.39458	0	1
University level of education	7041	0.005681	0.075163	0	1
Safe drinking water	7041	0.120011	0.324998	0	1
Household size	7041	8.26715	4.508333	1	43
Currently breast feeding	7041	0.577901	0.493929	0	1
Bed nets in households	6803	0.662355	0.472942	0	1
Age of mother	7041	28.06164	6.993394	15	49
Mother working	7041	0.795058	0.403688	0	1
Tetanus injection	4387	0.229542	0.420586	0	1
Births in past year	7041	0.4391422	0.5260504	0	2
Pre-natal not with doctor (specialist)	4387	0.860041	0.346984	0	1

Source: Computed by authors using DHS 2011.

Table 4, presents the descriptive statistics for the rural subsample. The mortality rate of children is 9.5%.The statistics show that 46% of the women have primary level of education, 19% having secondary education, and 0.5% have the university level of education. This statistics in the rural area show that many women have primary level of education, and the number reduces as the level of education increases. Comparatively we find more women at higher levels of education in the urban areas than the rural areas.

In the rural sub sample 12% of the population have access to safe drinking water. Considering the variable household size there are averagely 8 people in each household in the rural area. Specifically we find fewer people in urban households than in rural households. 58% of children are currently breastfeeding in the urban areas. We realise that there are more breastfeeding

children in the rural areas than in the urban areas, which most often is explained by the fact that most women in the urban areas are of the working class and as such do not have the time to stay at home and breast feed their children.

66% of households in the rural areas have no bed nets. Comparing this statistics with the urban area indicates that a majority of households with no bed nets are those in the rural area. The average age of the mother is approximately 28 years. Eventually we find younger women in the urban areas than in the rural areas. 79% of mothers are currently working, as compared to those in the urban area. This is an implication that the number of working women in the rural area surpasses the number in the urban area, irrespective of the kind of jobs. 23% of the children have taken the tetanus vaccine. Therefore we realize that more children have not received the tetanus vaccine in the rural area compared to those in the urban area.

The rural subsample statistics show that on an average a woman is expected to have at least one birth in the past year. Interestingly the number of births in the rural area is higher than the number of births in the urban area implying that rural women on an average deliver many children within a very short interval of time. 86% of the women in the overall sample attend pre natal consultations without a doctor. Eventually, the percentage of the women attending pre natal consultations with no doctor is higher in the rural area than in the urban area. An indication that more women in the rural area do not visit a specialist when they are pregnant as compared to those in the urban areas.

Correlates of child mortality: Overall sample

Table 5 below reports the probit regression for the correlates of child mortality.

Table 5. *Determinants of child mortality*

	Probit	
Independent variables	Coefficients	t-statistics
No education (reference category)	-	-
Primary level of education	-.2323***	-2.75
Secondary level of education	-.4441***	-4.67

University level of education	-.8085***	-2.74
Safe drinking water	-.1139	-1.50
Household size	.0277***	4.01
Currently breastfeeding	-1.6207***	-10.22
Bed nets in household	-.1151*	-1.68
Age of mother	-.0202***	-4.18
Mother working	.0487	0.63
Tetanus injection	.1158	1.36
Prenatal not with doctor	-.1038	-1.27
Births in past year	1.1284***	11.44
Number of observations	11732	
LR chi2(12) [Prob> chi2]	326.13(0.0000)	
Log likelihood	-835.42996	
Pseudo R2	0.1633	

Source: Computed by authors using DHS 2011
Note: *, **, *** represent 10%, 5% and 1% levels of significance respectively

Table 5, submits the correlates of child mortality in Cameroon. The LR Chi2 value of 326.13 with a p-value of 0.000 shows that our model is globally significant at 1%.

Levels of education (primary, secondary, and university) are significant at 1% and correlates negatively with child mortality. This implies that an increase in the level of education of the mother reduces the predicted probability of a child dying. This situation can be explained by the fact that an educated woman knows exactly how to care for her children (in terms of nutrition, hygiene, health) from the knowledge she has acquired in school, unlike an uneducated woman who has little or no knowledge on such issues. Also female education reduces the risk of losing a child because through education, the woman improves on her skills in health care practices related to contraception, preventive care and diseases. The children of women who have little or no education are usually characterized with a poor nutritional level, exposure to diseases, and even take traditional medicine in times poor health due to ignorance about the harmful effects of such acts. These results are in tandem with those of Dackam & Van Der (1988), Caldwell (1979).

The variable access to safe drinking water is negatively related to child mortality, implying that access to safe drinking water reduces the chances of a child dying. This is obvious because safe

drinking water is clean, and has no germs which are the main causes of water borne diseases like diarrhoea, cholera, typhoid and dysentery that endangers a child's life. Therefore, if children drink safe water, their chances of contracting water related diseases is greatly minimized. Eventually, lack of safe drinking water take a greater human toll than war and terrorism combined. According to the United Nations (1985) report, 4000 children die each year as a result of diseases caused by ingestion of filthy water, In Ethiopia and Malaysia many children aged 1- 5 years die as a result of water borne diseases. These results are in tandem to those of Mosley & Chen (1984)

Household size is positive and significant at 1% in explaining child mortality. Specifically, children in households with fewer numbers of people have more chances of surviving than those in households with more people. This may be due to the fact that it is financially expensive to care and provide the needs of a larger household, and as such children in such homes are more likely to be malnourished, and not well cared for. Hence this situation may essentially expose the child to more chances of contracting diseases which may be life threatening. These results are same with those of (Kuate, 1994). Avoiding having large family sizes because they are less affordable, resulting from a fall in income and the fact that extended families refuse to support may be of high risk to the children, health wise and education wise (Eloudou *et al.*, 2000).

Looking at the variable currently breastfeeding, we realize that it is negative and significantly related to child mortality at 1%. Specifically, this is an indication that a reduction in child breastfeeding increases the expected probability of a child dying. This is feasible because breast milk is the first element of food, and constitutes an irreplaceable food in for new born. Indeed breast milk by its properties (rich in antibodies and essential nourishing elements like a perfect combination of protein, fats, vitamins and carbohydrates) prevents malnutrition and infection diseases especially diarrhoea that endangers a child's life. It is therefore obvious that a child who is currently breast feeding has a stronger immune system that can fight diseases than a child who takes artificial milk which does not have leukocytes that help fight against diseases (Dackam & Van Der, 1988).

The variable bed nets in the household are significant at 10% and negatively related to child mortality. This indicates that the number of bed nets in the household is important in reducing child mortality. When children do not sleep under bed nets they are exposed to illnesses such as malaria which is the number one killer disease in children. The absence of bed nets in household also exposes the children to mosquito bites which cause life threatening diseases such as yellow fever, Chikungunya, dog heart worm, the zika and west Nile virus. Therefore bed nets are a necessary tool in fighting child related illnesses, and therefore households are advised to sleep under treated bed nets.

The age of the mother is positively related to child mortality. This means that an elderly woman stand more chances in reducing child mortality than a younger woman. Apparently, an elderly woman must have had the experience of raising a child more than a younger woman. Given the experience an elderly woman has gathered over the years, may be from raising children being they her biological children or those of others, she will always be in a better position to advice the younger women on the type of food to give their children, and what to do immediately they notice any change in the child's feeding habit or when the child has a fever. Since experience is the best teacher and is only acquired by doing the job, an elderly woman with her experienced gathered over the years is in a better position than a younger woman to look after a child. This goes a long way to prevent the child from many health and other factors that would have endangered the child's life.

The variable mother working relates positively with child mortality, implying that the more involved a woman is in the labour market, the more exposed are her children to the risk of dying. This is evident because a working mother spends most of her time away from the home, does not have time to follow up her children's feeding, health situations and even medication in times when they are sick. For this reason the children of a working mother are more exposed to health risk and other injuries they may have in her absence which therefore puts these children in danger. This result is in tandem with those of Basu (1987).

The variable tetanus-injection has a positive relationship with child mortality. This implies that a child who has not taken the

tetanus injection is more exposed to the disease and has a high probability of dying than those who have received this injection. Tetanus is a disease also known as lockjaw that affects the body's muscles and nerves. This injection is therefore given to fight against this disease, and failure to receive it exposes the child to such illnesses which may eventually result to the death of the child.

The variable number of births in the past year is significant at 1% and positively related to child mortality. This implies that the fewer the number of births in the past year, the lesser the number of children a woman will loss during pregnancy and child birth. This is evident because short interval births (less than 18 months is usually associated with premature births, and also the risk of having a child with childhood behavioural problems (Da Vando *et al.*, 2008). Therefore births should be spaced at an interval of 2-3 years. While obstetricians are concerned about the mother's health, paediatricians and child development specialists look forward to the health of offspring (Hanushek, 1992; Kessler, 1991).

Prenatal care is negatively related to child mortality at 5% level of significance. This is evident as antenatal follow-up will easily detect any fault in the growth of the foetus and the mother's health too. Women who do not attend antenatal care are more exposed to the risks of child birth and also delivering children with disabilities. Therefore pre-natal consultations not necessarily done with a doctor will reduce child mortality.

Subsample results

From Tables 6, above the sign for primary, secondary and university levels of education is the same (negative) in the overall sample as in the urban subsample, and rural subsample. This may be explained by the fact the education of the mother is very important in reducing child mortality. This is evident because from the knowledge gained in school, educated mothers know how to better take care of the children; health wise and nutrition wise as compared to mothers with no level of education.

Table 6. *Determinants of child mortality by subgroups (Rural and urban)*

Variable	Rural		Urban	
	Coefficients	t-statistics	Coefficients	t-statistics
No education (reference category)	-	-	-	-
primary education	-0.3016***	-6.13	-0.2166**	-2.35
Secondary education	-0.6535***	-9.2	-0.4252***	-4.63
University education	-0.9446**	-2.53	-0.8333***	-4.79
Safe drinking water	-0.2608***	-3.37	-0.0819	-1.37
House hold size	-0.0085*	-1.69	-0.0089	-1.18
Currently breast feeding	-0.7639***	-13.05	-0.7757***	-8.41
Bed nets in house hold	-0.2968***	-6.61	-0.3391***	-5.74
Age of mother	-0.0001	-0.04	-0.0143**	-2.92
Mother working	0.0108	0.19	0.03882	0.62
Tetanus injection	-0.0158	-0.2	-0.1253	-1.1
Prenatal not doctor	-0.7061***	-13.64	-0.4222***	-6.63
Births in past year	0.3143***	5.9	0.4099***	4.93
_cons	-0.2292	-1.92	-0.2065	-1.17
Number of observations	7041		4691	
	498.40		183.33	
LR chi2(12) [Prob> chi2]	[0.0000]		[0.0000]	
Log likelihood	-1962.3532		-1092.0152	
Pseudo R	-0.1124		0.0774	

Source: Computed by authors using DHS 2011.
Note: *, **, *** represent 10%, 5% and 1% levels of significance respectively

The variable safe drinking water has the same negative sign in the overall sample as in the urban and rural subsamples. This is an indication that safe drinking water reduces child mortality. This is evident because safe drinking water is not contaminated by germs that can cause life threatening diseases to children like; Typhoid and diarrhoea.

The sign for the variable household is positive in the global sample but interestingly it is negative in the rural and urban subsamples. This is an indication that it is an important element in reducing child mortality both in the rural and urban areas. The variable currently breastfeeding is negative in the overall sample and in the rural and urban sub samples subsamples. This is explained by the fact that breastfeeding reduces the chances of a

child dying as children who are breastfed have a stronger immune system that can fight against diseases.

The sign for bed nets in the households is negative in the overall sample as in the rural and urban subsamples, showing that the number of bed nets is essential in reducing child mortality, as children will be protected from mosquito bites than causes certain illnesses like malaria. The variable age of mother appears negative in the overall sample as in the rural and urban subsamples, confirming the fact that the children of elderly women have less risk of dying.

We observe a positive sign for mother working in the overall sample as well as in the urban and rural subsample. This is explained by the fact that the children of working mothers are exposed to so many risks that can endanger their lives, because they are mostly left on their home when the mother is away for work. The sign for tetanus injection is negative in the overall sample as well as in the urban and rural subsamples. This shows the importance of this vaccine in reducing child mortality. Children who are vaccinated are prevented from contracting certain illnesses.

The sign for prenatal without a doctor is positive in the overall sample, but interestingly is negative in the rural and urban subsamples. This is explained by the fact that prenatal follow up by any other trained medical personnel to reduce child mortality. This personnel's will identify if any problems during pregnancy, and may refer severe cases to a gynaecologist if need be. The variable births in the past year have a positive sign in the overall sample, as well as in the urban and rural subsamples. This imply that the more children a woman has within a year, the more exposed they are to the risk of dying.

Conclusion and policy implications

This chapter focused on investigating the determinants of child mortality in Cameroon. It employed the probit model. From the results we observe that in Cameroon mother's educational level, safe drinking water, currently breast feeding, bed nets in households and age of mother relate negatively with child mortality that is they strongly reduce child mortality. Apparently,

household size, mother working, tetanus injection and births in the past year relate positively with child mortality. The results show that there are fewer births in the past year in the urban areas than in the rural areas which explain why child mortality is higher in the rural area than in the urban area.

Given the fact that some variables affect child mortality positively in Cameroon, the government and other stake holders should address the issue with much care. Therefore policies should be revised and implemented, including effective health intervention programs that focus on mothers and children health to achieve the Millennium Development Goals of infant and child mortality in the remaining years. In addition policies should be focused on both fathers and mothers education and prolonged breastfeeding should be encouraged. Some of the policy implications include:

- Sensitization seminars should be organized by the government to educate parents on the need carry out family planning, so as to reduce birth rates and birth interval so as to reduce the risks of child death.
- The expansion of public health system for reducing the risk of infant and child mortality through free vaccination campaigns on diseases that threaten children's life, for example tetanus, measles.
- The government should create more part time jobs for working mothers so that they can be able to take care of their children and at the same time manage their jobs. This part time jobs will enable the mothers to spend ample time with the children as they are not much exposed to accidents at home and are well cared for, thereby reducing their exposure to situations that may be life threatening.

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2 Oil palm production: A panacea for rural development in Mamfe sub-division south-west region, Cameroon

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Introduction

The main objective of agriculture is to meet the growing needs of the ever increasing and diverse food demands. Commercial agriculture has emerged and is one of the fundamental catalysts for socio-economic development. The prospect of such agriculture is to raise revenue to the producers and the state. Amongst the commercial agricultural crops introduced in tropical countries includes; cocoa, coffee, cotton, bananas as well as oil palm cultivation. Among these, palm oil production has become the world's leading vegetable oil in terms of consumption. Over 61 million tons produced worldwide in 2015.The biggest producer in 2015 is Indonesia with a share of 53.3% followed by Malaysia 32%, Thailand 3%, Columbia 2%, Nigeria 1.5%. Global production of palm oil and the plantations of

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oil palm have been increasing tremendously in the last decade with annual average growth rate of 9.7% between 1998 and 2015 with Malaysia and Indonesia contributing 84% of the market share in 2015.

In most countryside of tropical countries, oil palm production constitutes an important sector providing revenue. Several scientific works have shown that 50% of rural population takes it as a major activity for their livelihood. Findings equally reveal that oil palm sector created an employment rate of 1,5% to the economy of Indonesia in 2014.

In this regard many communities have successfully embraced the cultivation of palms which have enabled them to augment the standard of living of their populations, to boost foreign exchange earnings of their countries which have culminated to inevitable local and global development. Certain communities endowed with favourable conditions for commercial agriculture adopted the idea but the contribution of oil palm production to socio economic, local development as well as spatial transformation of such populations' remains unsatisfactory meanwhile the prospects for such success remain favourable.

In Cameroon the first cultivation of commercial oil palm plantations was established in 1907 under the German colonial administration on the slopes of Mount Cameroon and subsequently in Edea. The crop was further developed under the Franco-British regime until 1960 when it had reached an estimated production of 42,500 tons. After Independence, the government of Cameroon took over the production of palm oil with the creation of public sector companies like Société des Palmeraies (which later became SOCAPALM), PAMOL and CDC.

According to the Ministry of Agriculture and Rural Development (MINADER), Cameroon produced 300,000 tons of crude palm oil in 2015, across an estate of approximately 190,000 hectares. Production of palm oil in Cameroon is distributed across three plantation types or scales: Agro-industrial plantations (58,860 ha producing 120,000 tons); Supervised smallholder plantations (35,000 ha producing 30,000 tons), and Independent small holdings (occupying an estimated 100,000 ha) producing approximately 80,000 tons of palm oil. The Government of Cameroon's Rural

Sector Development Plan projects an increase in palm oil production from 300,000 tons in 2015 to 450,000 tons in 2020. This can be achieved primarily through increasing oil production yields, as well as potentially increasing the area under oil palm production and by increasing oil extraction rates. The Government's plan is focused mainly on the area under production targets and not on yields or any environmental or biodiversity impacts.

Currently, agro-industrial palm oil plantations and the industrial transformation of palm oil in Cameroon are carried out by five large companies: The French group Bolloré has three companies including - SOCAPALM (28,027 ha), SAFACAM (4,870 ha) and the Swiss Firm (3,793 ha); the other two companies belong to the State: CDC (12,670 ha) and PAMOL. Industrial palm oil production is an integral element in the government's growth, employment and poverty reduction policies. The 1994 New Agricultural Policy of MINADER states that there is a need for increased investment in agro-industry through privatization of existing public institutions and the creation of new agro-industrial plantations, including oil palm. Therefore, the industrial production of palm oil is a national priority initiative to meet domestic demand and secondly to increase exports.

In 1975 the Cameroon government through the division of studies and projects of the Ministry of Agriculture launched the project of village plantations of oil palm in the whole territory. This project has as objective to promote the creation and exploitation of oil palm in the whole territory, village plantations were therefore created in SOCAPALM zones, in Mungo, Nyong and kelle and Sanaga Maritime Divisions. This scenario was equally extended to other rural localities Mamfe inclusive.

Before the introduction of improved specie of oil palm in Mamfe Sub-division, the unimproved specie was in existence. Oil palm cultivation especially the improved specie was introduced in 1974 when a group of youths in Nchang village decided to create a joint farm. They were led by Rev. Father Von Vogen who was the then principal of Saint John College Nchang. The latter persuaded them to plant oil palm instead of coffee as they intended. They subsequently change from coffee cultivation to oil palm. They were

assisted by the then Rev. Father who demanded material and financial aid from a West German charitable Organization called MISEROR. It is also alleged that retired workers from the Cameroon Development Corporation (CDC) and the Divisional Delegation of Agriculture Mamfe furnished improved seeds so as to boost the palm oil production capacity of the area. The peasants of Mamfe adopted the improved oil palm by virtue of its high yields. These conditions encouraged the cultivation of palms couple with the heterogeneous population that used diverse techniques to alter the agrarian system. As a result of this, production rose from 120 tons in 1974 to more than 3000tons of palm oil today. This has permitted the populations to employ themselves, send their children to school, construct private residences and create solidarity groups

In 1982 the Manyu oil palm cooperative society (MOPCOOP) was created, and its prime objective was to ensure the processing of Fresh fruit bunches (FFB) in to palm oil and other bi products. Field workers were recruited and through this way many peasants were encouraged to intensify oil palm cultivation in the Sub-division because of ready market for the disposal of FFB let alone the processing of other bi products such as palm wine, distilled wine, kernel oil is on the increase.

Geographic, definition of terms, and theoretical framework

Geographic situation

Mamfe

Historically Mamfe was known as Ossidinge Division. It is the headquarters of Manyu Division, Southwest Region of Cameroon. Preoccupation in this study is Mamfe Sub-division also known as Mamfe Central which is one of the four Sub-divisions that constitute Manyu Division (Figure 1). Throughout this study Mamfe Sub-division and Mamfe will be used interchangeably.

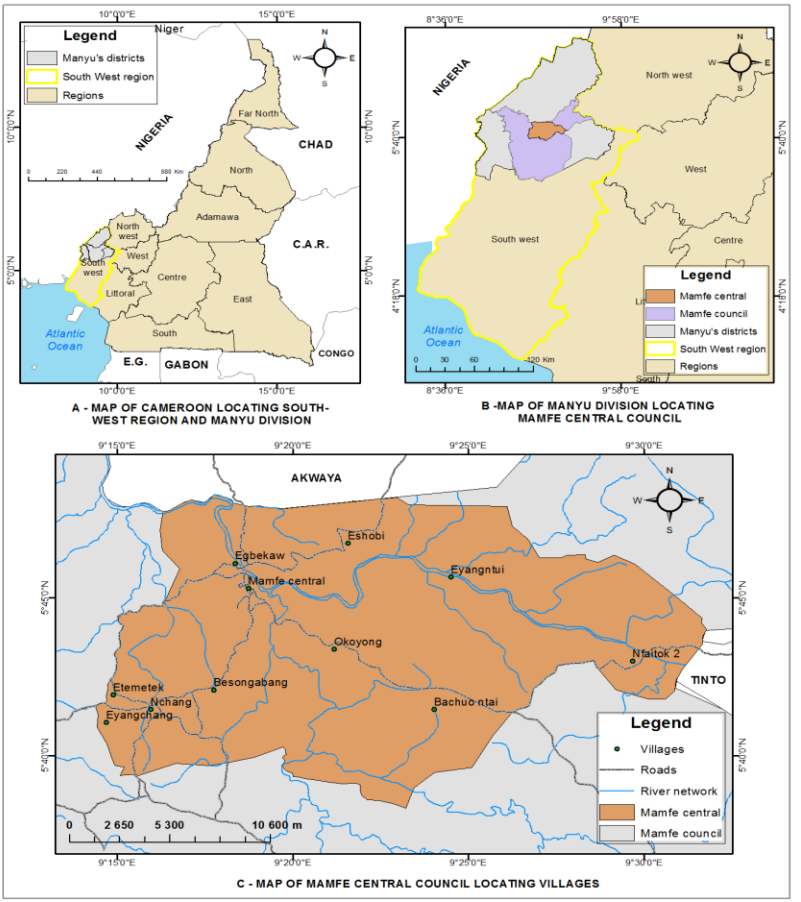


Figure 1. *Location of study area*

Mamfe Sub-division is located in Manyu Division, Southwest Region of Cameroon (Figure 1). Its geographic peculiarity furnishes a good support base for the inception of multiple and varied agro economic undertakings. Located within the vast cross river basin, it extends from the north to the south, it is hemmed within latitudes 5^0 23′ and 6^{0}′′ north of the equator and longitude $9^0$7′6″ and $9^0$35′5′′ East of the Greenwich meridian. This Sub-division is bounded to the north by Akwaya, west by Eyumojock, East by Upper Banyang Sub-divisions and to the South by Kupe Muanenguba Division (Figure 1). This geographic space is made up of 11 villages which include Nchang, Besongabang,

Eyangchang, Eshobi, Eyangntui, Small Mamfe Bachuontai, Nfaitok II, Etemetek, Okoyong and Egbekaw. The Sub-division has a total surface area of about 500 square kilometers.

Definition of terms

Oil palm

Oil palm is a tropical crop cultivated for the production of oil from palm. Botanically the oil palm is known as *Elaeis Guineens is* the first or generic name being derived from the Greek word "elaion" meaning oil, and the specific name refers to the area of its greatest occurrence, around the countries bordering the gulf of Guinea. While the oil palm is generally believed to have originated in this area, many scientific literatures claim that its real home was in Brazil and South East Asia where it was introduced in the 18th Century precisely in 1850 (Vandenput, 1981). From here it was transferred to the Portuguese slave trading settlements site on the West Coast of Africa. This initiative was promoted by American botanist O.F. Cook, a well known authority on palms. However it may be certain that the oil palm in its natural state, now finds its greatest dispersion in countries of West Africa.

Plate 1. *Fruit types of Oil palm*
Source: Adapted from Raflegeau 2008.

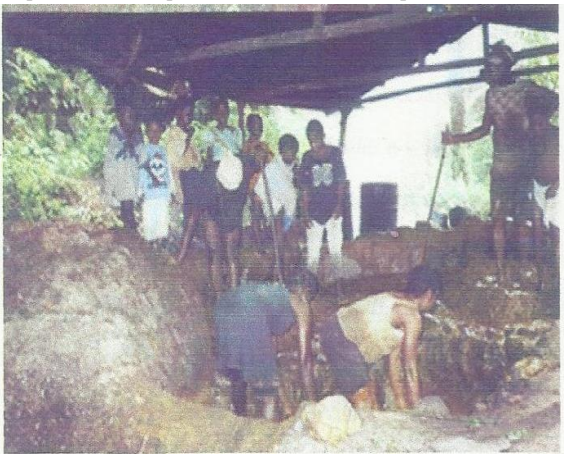
The principal African countries cultivating this crop are Nigeria, Ivory Coast, Cameroon, Angola, Guinea, Benin (Vandenput, 1981). In these countries besides industrial plantations we often find village plantations of oil palms as well as natural palms which grow at random.

Note: The improved specie growing in newly opened palm plantation with ripped FFB, Snapped by Egbe August 2018

Plate 2. *Palm Trees with Fresh Fruit Bunches (FFB)*

Note: Harvested Fresh fruit bunches assembled under a palm tree for onward transportation

Once harvested the fresh fruit bunches in Mamfe Sub-division are transported to the mill for onward processing or processed traditionally by the farmer. The traditional method is highly used in the study area as opposed to the artisanal and milling method.



Note: The Traditional method of extracting palm oil. An exercise that is very demanding in terms of human resources.

Plate 3. *Methods of Palm oil Extraction*

Note: The artisanal method of palm oil processing. It is more plausible because oily one person is needed to turn the press

Source: Field Survey, snapped by Egbe August 2018

Production

Production is broadly used in this study. From the economic perception production refers to the action of man to make goods available for consumption. The art of extraction of primary resources and the cultivation of crops meant for manufacturing processes inclusive. In a similar manner it is the role of man to

create an activity. Production is considered an activity created which involves the process of transformation of goods and services into semi finished and finished products manually or by machine that is input-output relationship (Ngo, 1988) and this is also applied to every production process oil palm production inclusive.

According to Olayide & Heady (1982) production is the process in which goods known as inputs are transformed into other goods and services known as output. This article perceived production as oil palm cultivation and processing into variable products such as palm oil, palm wine and kernel oil.

Oil palm cultivation in this paper equally means cash crop production. Oil palm is cultivated to produce palm oil used for the manufacture of soap and other related products. According to Thom Achterbosch *et al.*, (2014) cash crops are agricultural products that are marketed. This implies that cash crops are not exclusively related to plantation crops such as cocoa, coffee, oil palm production, natural rubber, banana, pineapples, oranges etc but also to staple food crops which are marketed. Several literature surveys shows that food crops generate income to rural household and also improve access to their availability for those who cultivate and earn income from the activity. The impacts of cash crop production are many; they generate income to rural households, create employment opportunities within the community involved in the activity, provide food security to population concern and serve as a source of foreign exchange earning to the state.

Within the context of this work oil palm production refers to the cultivation of palms and its subsequent processing into ancillary products such as palm oil, palm wine or kernel. Throughout this article oil palm and palm oil will be used interchangeably

Panacea

It is a hypothetical remedy for all ills or diseases once sought by the *alchemist*. Panacea stems from the Greek word meaning "all healing" and panacea was the goddess of healing in the middle ages and the renaissance alchemist who sought to concoct the "*elisair* of life" (which would give eternal life) and the "philosopher stone" which would turn ordinary metals into gold and also

laboured to find panacea. The Greek word pan means "all" (think of a panorama, a view where you can see everywhere. The Greek word for cure is *akes* (which looks like the work "aches") those are the roots of panacea, a cure for aches. But a panacea doesn't really cure everything; it just acts like it can use the word to describe unbelievable solution like a new law that will make everyone rich or robot that does your homework for you. The concept of panacea is used in this context of oil palm production as a solution to rural development that is to say the income accrued to the proliferation of palms help to ameliorate the living conditions of the masses in Mamfe Sub-division but in actual fact the contribution of oil palm production to rural development is unsatisfactory because traces of poverty are visible among the peasant community of Mamfe Sub-division thus oil palm production as a panacea cannot satisfactorily contributes to rural development.

Rural development

It is the process of improving the quality of life and economic wellbeing of people living in rural areas often relatively isolated and sparsely populated areas. Rural development has traditionally centered on the exploitation of land intensive natural resources such as agriculture and forestry. However changes in global productions network and increased urbanization have change the character of rural areas. The need for rural communities to approach development from a wider perspective has created more focus on a broad range of development goals rather merely creating incentives for agricultural or resource based business. Education, entrepreneurship, physical infrastructure and social infrastructure all play an important role in developing rural regions. Rural development is also characterized by its emphasis on locally produced economic development strategies.

Chambers (1983) defined development as the improvement of the welfare of the people and not only economic growth. Basic elements for development include the components of economic and social system, technical infrastructure and settlement network (natural and cultural) landscape as well as functional connections. Within the context of this work development is used to be equated to improvement of welfare of the peasants' population in the

agricultural sector. Development is perceived at three fold: Economic social and local development.

Rural development in this article is equally perceived as Local development which is a wide ranging concept that can best be seen as a process through which a certain number of institutions and or local people mobilise themselves and resources in a given locality so as to create, reinforced and stabilise activities using as best as possible the resources of the territory (Greffe 1989, 1990, 1993). It can be seen as bottom-up attempt by local actors to diversify and improve incomes, employment opportunities and quality of life in their localities in response to the failure of market and national government policies to provide what is required especially in underdeveloped areas and areas undergoing structural adjustment. Local development policies can also contribute towards the goal of strengthening local participation and democracy.

There are many different public and social actors involved in local development policies. The public sector is composed of local and regional authorities and offices of the central government. In the framework of this article rural development applies to socio economic initiatives realised through community's efforts and initiatives. The realisations in Mamfe settings stem from the proceeds of palms.

Theoretical framework

The theory of innovation diffusion

The diffusion of improved specie of oil palm can be explained using the innovation diffusion theory of Hagerstrand (1967). Innovation is an idea or practice perceived as new by an individual or a community. Diffusion is a process by which an idea or item is transmitted from an individual or group to another across space. Hagerstrand a Swedish researcher used this theory in explaining the spread or movement of an idea or innovation through space and time. The theory seeks to address the issues of how, why and at what rate an idea spreads through different cultures. Our aim of analyzing this is to provide useful information between one region and the other (the advent of improved specie of oil palm) in studying this theory the author emphasized the fact that in the

process of spread, the adopters must be willing and capable of adopting the innovations. Hagerstrand went further and laid down some key elements which have to be considered for a successful innovation process:

Identify the item being diffused, the route or direction taken by the idea to be diffused, the time factor, the social system through which the innovation is made to diffused. Innovation diffusion could either take the form of expansion, hierarchical, and relocation depending on how it started and where it is diffused. Expansion involves the spread of the idea or technology from one area to another. At the beginning only a few people might adopt the idea, but soon, the idea is spread to friends, neighbours and relations.

Expansion takes place in two stages: that is, the initial stage where the idea generates to the later stage which is the destination of the spread. Within the context of this study the diffusion of improved specie (Tenera), it is an innovation in this locality which started in the year 1974 when a group of youths decided to create a joint farm in Nchang village. They were led by Rev. Father Von Vogen who was the principal of Saint John College Nchang. It is equally alleged that retired workers from the Cameroon Development Corporation brought in improved seedlings. The Divisional Delegation of Agriculture equally furnished improved seeds. Through interaction or intermingling it spread to other villages of the Sub-division.

The theory of mainstream development

During the 1950s and early 1960s what may be termed the mainstream view on agriculture's contribution to development was enunciated by many African countries. This theory saw agricultural advancement as contributing factor to general economic development in four principal ways:

(a) By increasing the supply of food and of raw materials to the urban, non-agricultural sectors of the economy; the supply of food is seen as especially important since scarcities will drive up prices and hence wage levels, reducing any competitive edge developing economies may have in lower labour costs.

(b) By providing a surplus of *capital* (through taxation and/or savings) which may then be invested in urban non-agricultural sectors; similarly *labour* can be transferred out of agriculture into other sectors.

(c) By increasing foreign exchange earnings (through expanding exports) or saving foreign exchange (through import substitution of foodstuffs and raw materials) which then makes possible an increased import of capital goods to sustain the expansion of local non agricultural production.

(d) By raising rural incomes, and thus providing an expanding market for local non-agricultural sectors; in addition to this forward linkage, multiplier effects on local industry and services will also be felt as a more complex agriculture demands a higher level of inputs, additional transport services, etc.

This standard economic viewpoint sees development primarily as the growth of GDP and per capita incomes. The ability to accumulate capital so as to introduce new techniques or exploit new resources is seen as one of the main keys to economic growth. Hence, in the first three of the four roles of agriculture shown above, agriculture is seen as the sector to provide resources for industrialisation. The fourth view sees a rather more positive role for agriculture; it draws both on Adam Smith's philosophical insight thinking to the size of the market as a determinant of production methods (for an enlarged internal market created by a prosperous rural sector stimulates industrialisation and specialisation), and on Keynesian point of view is focus into the multiplier effect of raised income levels through consumer demand. It was developed by Myint (1964) in his vent for surplus model which indicated how export demand could create the market stimulus for increased agricultural production.

The theories reviewed above assume that the agricultural sector is integrated with the other sectors of the economy and that the motivations of rural and urban people are basically similar. There is a market in agricultural goods, even if not all agricultural products are sold, and agricultural workers want and buy industrial goods and services. Capital generated in agriculture can move through savings or taxation, directly or through the banking system, into other sectors. However, some economists have argued

that some countries have a subsistence agricultural sector which is basically uninfluenced by the market, and which neither uses nor generates capital to any large extent. Boeke (1953) was one of the best known exponents of this view of a dualistic economy, and through it justified the use of foreign capital and enterprise to develop 'western' enclaves, such as plantations. This led to a school of thought, now generally outmoded, which proposed a 'backward-sloping supply curve' for labour in such countries, since it held people would only work for a particular target good; the higher wages were, the more rapidly they would attain their target and return to the subsistence economy.

In oil palm production in Mamfe Sub-division the theory of Main stream development suits the activity because palm oil extracted from palm provide raw material for small scale industries for example soap industry, this is equally true with kernel oil. The palm oil produced is sold in the Sub-division and beyond used in preparing food. The revenue derived from the sale of palm products is invested in other activities in the Sub-division leading to a multiplier effect in the Sub-division.

Methodological framework

Methods adopted involved field observations, identification of targeted population, administering of questionnaire and treatment of data. The sample frame of 480 households was selected in 8 villages out of 11 villages of oil palm production. Questionnaires were addressed to peasants cultivating palm, operators in the sales of oil palm, modern and traditional restaurants using oil palm, workers in the delegation of agriculture, and hospital workers.

The main objective was to evaluate the social and economic impacts brought in by oil palm production in Mamfe Sub-division.

The collection of field data was also assisted by the use of the SWOT analysis approach. This permitted the authors to measure the strength, weaknesses, opportunities or potential and threats of oil palm production in the area. It was focused to know the actual impacts of the activity at the local community development. The collected data were treated statistically in qualitative and quantitative manner. The results obtained were presented in the form of tables, figures, and photos. All these were necessitated

through the use of soft ware like Microsoft excel and cartographic programs like Coreldraw12.

Impact of the activity in Mamfe sub-division

Employment

Before the introduction of oil palm production in Mamfe, the indigenous population of studied localities were involved in other rural activities that were highly seasonal such as fishing, lumbering, and hunting. These activities could not provide full time employment to the natives. The coming of oil palm production transformed the situation to be more permanent. Several skill and unskilled jobs opportunities were created among: growing of palm seedlings, transplanting, maintenance, harvesting and processing furnished jobs to the masses. More than 70% of the population earn a living from the exploitation of oil palm. The people of Nchang, Okoyong, Egbekaw, Besong-Abang, are fully engaged in oil production. In fact this is the main belt of oil palm activities in Mamfe.

Raw materials for small scale industries

Oil palm constitutes an important raw material for the manufacture of soap. This is by virtue of the fact that the steering product derived from the crude oil is solid at room temperature and complement caustic soda for local soap making.

As concerns modern industries the red oil is also needed for the manufacture of soap, about 70% of local soap produced in the Sub-division relies on palm oil produced by peasants. This explains why at the dawn of the industrial revolution palm oil was exported from West Africa to Europe for soap making.

Oil palm also provides robes, bamboos for weaving. These materials are used to weave baskets and hats, which are used in most homes and have several uses like carrying drying and storing of goods. Furthermore the palm fronds provide midribs from which brooms are made for sweeping. In some villages like Egbekaw the leaves are used in making thatches and mat.

Finally palm wine derived from the sap of oil palm is being distilled and transformed into "*arki*" or "*odontol*" a homemade and highly alcoholic beverage.

Improvement in farm and marketing processes

Oil palm production in Mamfe has equally led to the construction of farm to market roads. These serve the practical purpose of the transportation of farm products from the farm to the market. Presently there exist three farm-to-market roads in the Sub-division in the locality of Besong-Abang, Nchang, and Etemetek these roads were constructed through communal effort as a result of an increase in the volume of FFB. For example that of Besong-Abang village was constructed by Besong-Abang Elements Cultural and Development Association.

This road has further helped to des-enclave areas that were not accessible for several years.

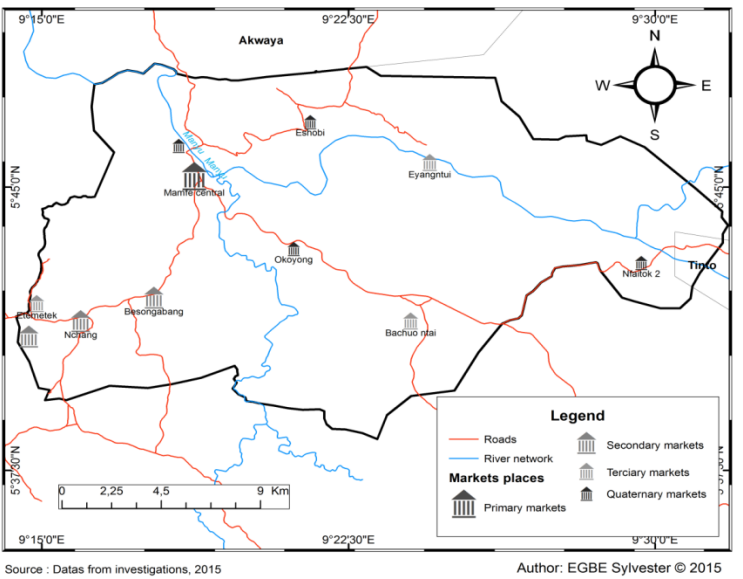


Figure 2. *Concentration of oil palm production in Mamfe*

From Figure 2, shows the flow of oil palm products that is highly concentrated in Mamfe town. This is due to the high demand emanating from its cosmopolitan population. It is important to note that the market is part of every day's life to the vulnerable population that depends on formal and informal market to sell their products. As a result of the production of oil palm, primary, secondary and tertiary markets have crop up in

most villages. Primary markets is the main market of Mamfe town which is relatively larger by virtue of its cosmopolitan population, secondary markets coincides with the traditional market calendar of each village while tertiary markets are common at the source of palm oil production at times besides the plantation.

Notes: Wholesaler transferring palm oil to the gallon of an intermediary who buy in bulk to resell to the retailer

Plate 5. *Commercialisation of palm oil*

Note: Women retailing palm oil on a favourable market day, a lucrative activity especially during the offseason when supply is low

Revenue to peasants and the state

Generally, oil palm just like other agricultural crops occupies an important place in the Cameroonian economy. It furnishes a

substantial part of the national revenue. Oil palm production in Mamfe is the main source of revenue to the peasants who depend on it. The workers of MOPCOOP (Manyu Oil Palm Cooperative Society) earn income from the services they rendered to the cooperative. Those workers involved in skilled jobs are relatively well paid compared to their counterparts in unskilled labour. The average salary for skilled personnel is about 100,000 frs while that of a labourer is 30,000 frs. Presently the cooperative spend about 20,000,000 for salaries of its members per month.

Social impact of oil palm production

The oil palm reinforces informal and formal education in the Banyang society of Mamfe. Informal education is acquired at home and work situations of which oil palm production dominate. This contrast with the formal education which is acquired through institutionalised system. The success of informal education is shaping the reasoning and habits of the Mamfe folks. The presences of cooperatives have influenced the level of education of the local population in particular and farmers as a whole. Besides their overall objective of improving agriculture, the farmers learn new ways of generating income. This is done by saving and borrowing among them to accomplish their development task. Frequent seminars and meetings are organised between agricultural extension workers and local farmers during which farmers are lectured on cooperative education, family planning, community development and basic education.

Improvement in standard of living

The oil palm economy tends to augment the standard of living of the Banyang farmer. In each family, the housewife after the sale of oil or palm wine tends to buy meat or fish to improve their diet. Oil palm is rich in vitamin 'A' which is used for cooking and preparation of tasty dishes. This nutrient intake protects the population from being vulnerable to diseases. Although the feeding habits are not the same, the traditional meal is always present which permits the researcher to say that there has been an evolution in this domain.

Furthermore, the inhabitants or oil palm farmers of this locality are now inclined to the establishment of petit businesses such as tailoring shops following the proceeds from palms.

Discussion

Research findings and examination depicts that oil palm is the panacea to rural development in Mamfe Sub-division. It contributes to rural revenues, employment, and food for strategic bargaining purposes and raw materials for small scale industries like soap manufacturer. This income generating activity is mostly carried out partly as a result of the favourable ecological conditions of the study area. As a result of short growth cycle, and steady market which in turns stems from its heterogeneous population. But the contribution of this activity to rural development is unsatisfactory reason being that the full benefits of this sector are not reaped. The justification behind this is that most peasants lack processing equipment for palm oil and traces of poverty are still glaring in the community. The proliferation of the improved specie of palms alongside the local varieties led to various choices of action. About 60% of the peasants don't cultivate the improved specie.

The researcher investigated that farmers in Mamfe locality endure lots of problems especially transportation which is glaring during the peak season in which cones of FFB get rot and decay on farms.

Conclusion

The study revealed that favorable ecological conditions in terms of sandy soils and temperatures that range between 26°C to 29°C, and rainfall that also oscillate from 1500 to 2000mm are pre-conditions for oil palm production. This is complemented with dynamics of energetic youthful population that ensure the survival of the activity in Mamfe.

The study also demonstrates that there are two types of oil palm cultivated concentrated in zones according to species: improved specie (Tenera) and un-improved specie (Dura) these zones of segregation are easily noticed among the farmers of peasant populations of Mamfe Sub-division. Generally, the un-

improve specie out-weighs the improved species of palms cultivated in the area.

It was further highlighted that the peasants derived much income from palms activity and this permit them to construct private residents, about 70% of the 350 oil palm farmers sampled own their own houses in which they live in and close to 60% of the peasants own block houses, send their children to school and their standard of living is improved owing to the provision of protein food. Local development in Mamfe Sub-division is reflected in the evolution of the activity based on villages' development.

It is partially concluded that the contribution of oil palm production to socio economic development is unsatisfactory because is plagued by several problems amongst which include, neglect by elites, inadequate capital etc. The temporal closure of the lone oil palm cooperative; MOPCOOP due to succession crisis is partly responsible for the unsatisfactory oil palm production and socio economic development in Mamfe Sub-division. This article proposes the reinstatement of MOPCOOP amongst other measures; this structure is considered as a corner-stone to the development of the sub-sector.

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3 Cameroon facing the socio-economic challenges of the XXI century

Paul MPake **Nyeke** [†]

Introduction

The history of socio-economic problems has its roots in the past and ranges from colonization to neocolonialism. Responding to André Malraux, who invited him in the 1960s, gave his opinion on the results of the French revolution, Zhon Eulai replied: "It is still too early to really know him. Beyond this joke, one could discern a will of the Chinese to show that they placed time in long history. The events of the past (past) still have an influence, the latter being evolving on contemporary realities.

Cameroon cannot therefore be on the fringes of world development and faces pressing socio-economic challenges. The story doesn't end, contrary to what Fukuyama thought. This is because events always have one on the contemporary world with its share of avatars. When we look at Cameroonian news today, the difficulties are no longer as before the explosion of new information and communication technologies and the search for

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information. Rather, it is their selection and putting them into perspective. When Cameroon's independence was forged, a pseudo-nation state was created which sixty years ago is causing socio-economic turmoil. The announcement every morning in the Cameroonian media alludes to an event that is not located in its historical, sociological, geographic or political context allowing learning something, not necessarily to understand it. This is only possible if you have the parameters that are the environment. Time is accelerating but we are increasingly lacking in perspective. Faced with the socio-economic challenges of the day, Cameroon will have to face up by mastering its governance which generates the democratic process, the mastery of its demography which is at the origin of the insalubrity and epidemics of these large metropolises, the concentration of industries in cities like Douala and Yaoundé which cause pollution, the control of its imports and exports thus making Cameroon dependent on the outside in terms of trade balance.

Social problems are the roots of colonization

When he answered the question of Joss Blaise Alima in 1972 in his book "the paths of unity" namely "what did you do best for Cameroon" the first Cameroonian President Ahmadou Ahidjo replied: "… it is to have achieved national unity". So we see that we had forced to live together since then this is causing social unrest today. Cameroon with multitude of ethnic groups which despite the forged intermingling leads to ethnic cleavages today and this accentuates the notion of belonging and tribalism. In the same way live people without any family ties to live together. So it ended up exploding, we see some dealing with other non-natives, which gave birth to the concept of autochthony in Cameroon. The situation has become unsustainable; some even declared secession (the North-West and South-West regions). Today, the national unity that the first Cameroonian president had forged is questionable. No one is talking about an intellectual scam, on the other hand talking about deception. The people are therefore trapped in the handful of rulers, everything today springs to the surface, leading to the feeling of rejection and their belonging. During independence therefore, we had subservient social

problems to political problems which for those were more important, but seeing what is happening today in Cameroon, we thought that it was only a time bomb, part surrendered and that one day everything would explode. If the reign of God is almost inscribed in the body, as we believe, we wonder why it was not inscribed in the heart of village Africans (Hoth-Guechot, 2012); and why does Christianity in Francophone black Africa still refuse to place the transmission of the message at the center, the permanent struggle against injustice, suffering and misery?

The mission of Jesus of Nazareth is a defeat of suffering and determinisms, a fight for the integrity of man, a healing practice like that formerly practiced in the Bassa'a brotherhood namely the Ngué and the Koo. Colonization has therefore come to remove all values from Africans and each day that passes, in Cameroon for example, we discover a new face of the country and we do not know which God to revere to free themselves from evils: Poverty, tribalism, war, diseases, and exclusion. Cameroon is dying very slowly. An excruciating death in a destructuring, dehumanizing and humiliating suffering for the world of the 21st century which conquered space, the moon and the stars; suffering that blurs the human image of God (Hoth-Guechot, 2012); a permanent aggression which widens a fault in the whole relational system and pulls the Cameroon and the "poor" down rather than up. The bible, sacred library, seems to reveal a God of life and death, of liberation and not of confinement, of subjugation as did colonization or of frustration and who calls for resistance in the face of suffering. This is the birth of a proliferation of sects in black Africa in general and in Cameroon in particular. This therefore, gives the illusion of an end in itself of suffering. The imported and imposed God colonized the Cameroonian almost in the marrow and it was good thinking to get the imperial message across.

Today, these years of exhilarating expectation and hope are collapsing like snow under the sun or like salt in cloudy water that can no longer be used for domestic needs. The country is slowly sinking into chaos. The mismanagement of others from the colonial administration, the economic crisis and that of values have erupted in the physical and mental environment of Cameroonians: devaluation of the CFA franc, massive dismissal of the public

service, excessive reduction in wages, non-satisfaction of the rear and unemployment of the young people… All this is the result of a policy savantly orchestrated by the colonist and Helmet Kohl former German chancellor of the 1980s does not deny it when he said in a speech I quote: "if we industrialize Africa, we are dead". Everything is therefore being done to keep the African in general and the Cameroonian in particular in a state of childhood. The people of Cameroon seem to be out of breath and the social situation in preparation is imminent explosive. The consequences of this explosive comes unsuspected. It is therefore urgent to do everything possible to put an end to social tensions, to restore trust, participation and responsibility. The socio-economic context of Cameroon out of its lethargy of colonized as is thought by Europe would allow the emergence of Cameroon in history, no longer as an object but as a subject. Always alluding to social problems, we see that colonization Balkanized Africa and thus respond to the logics which had nothing to do with the other human groups found on the spot. Opening up of sea route to facilitate the transport of the enormous riches of the continent is worried "those" who discover the manna (Nkoyok, 2017). In Africa, we see people forced to live together when they have nothing in common culturally and have formed micro-states, as Georges Balandier already said, the crumbling of Africa in this way constitutes a real time bomb. This bomb is detonating in Cameroon in the North West and South West if nothing is done.

In Africa in general and in Cameroon in particular, Professor Daniel Abwa affirms their mission, wanted to replace the indigenous power and all their approaches tended to reduce the essential role that the chief played with his own. He does not deny it when he quotes the circular of August 18, 1932 from Jules Gaston Carde, the latter speaking to their governor general declared: "Collaboration with the native chiefs imposes on us as a duty and as a necessity, it is inspired by the liberalism of our colonial policy, it responds to the legitimate aspirations of the population. It completes an organization which suffers from the shortage of European cadres; the indigenous command must be the strongest point of support, the lever with which we propose to raise the masses. "Since then, we have been tamed and the system continues

even if the skin color has changed. All the aforementioned evils plague Cameroonian socio-political life with ramifications within this economy.

Governance at the Façade

In Cameroon, everyone finds ethnic awareness a hindrance in the process of development and democratization, the societal search for self-esteem through common pride is sought by everyone at all levels. In Africa, taken as a whole and in Cameroon in particular, democratic principles seem to be flouted; no distinction is made between the executive, legislative and the judiciary. All powers are concentrated in the hands of a man, omnipotent and omniscient; some freedoms are trampled on. Tribalism, ethnic affinities have taken up residence and represent the scourges to be combated, but the persistence of this scourge does not only indicate their imposition as a way of being Africans. We represent ourselves today in relation to a group, to a community in which we belong. This is what creates cleavages, splits within the government and this gives tribal looks. The problem got it root during the establishment of the borders, where we find in the same set of groups having no cultural or even linguistic kinship.

This behavior is not specific to Cameroonians, but we do not enter into the debates having previously opposed different currents of thought on the concept of ethnicity, nor enter into the debate having opposed Emile Durkheim who distinguished societies with mechanical solidarity to organic solidarity societies. In Africa, evangelism was done in the manner of political colonization (the decolonization of Africa, 1987). The Cameroonian, fearful of God, has tumbled since the arrival of the Europeans. From this perspective, colonization is temporary assistance at believing levels. Unfortunately, the behaviour of Missionaries in Africa was quite the opposite of that of the apostles. They did colonization, in the political sense of the term; they came with the political powers of their country of origin to impose themselves on those they evangelized. They trusted more the strength of their governments than the strength of the gospel. They presented the Christian religion as that of the superior man,

the strongest, the most civilized, the most intelligent (Ibid). From there everything was distorted, the Cameroonian does not recognize himself, he is a copy center of the colonizer. He democratizes when asked (western), he frees, he sanctions, he elects in short everything seems to be dictated from France and he is not free to move.

To get out of this tumult, we can outline the measures that we consider essential for development, good democratization of Cameroon. Indispensable in the sense that they are sometimes even...: The rulers must fight impunity, proceed with the separation of powers, hand over power to the people and not to the rulers, elites who show themselves when the elections are approaching, review the educational system from primary to higher through secondary which is modeled on the Western model, master the galloping demography of large cities, master the commercial system of imports and exports. With regard to democratization, between 1990 and 1992, Cameroon after François Mitterrand's speech at La Baule crossed a plateau. If according to (Mehler, 1997), the case of Cameroon is atypical, it would be doubtful to speak of "democratization" in view of a certain number of elements which have obscured the democratization process since then in this case the questioning of some citizens, the imprisonment of others: The events of May 26, 1990 in Bamenda, the post-electoral events of 2018... But it is still important to recognize that Cameroon is one of the few countries where old and modern order seem to coexist. Still in the area of good governance, education has a special place. However, in Cameroon education is extroverted (Dumond, 1962). It is one of the few countries in the world that has three education systems. The "French speakers" sub-system has OBC (Cameroon Baccalaureate Office) and the DEXC (Direction of Examinations and Competitions). Then, the English-speaking system Cameroon General Certificate Board (CGCB) and next to it the French system inside Cameroon applied by the college Fustel Decoulange and the college Dominique Savio respectively in Yaoundé and Douala.

So we see that, the sustainability of the educational model exports, is not capable of being at the service of Cameroonian expectations and elsewhere, this is reflected in the very charter of

decolonization of Cameroon in its article 12: "The authority responsible for colonial administration must, taking into account the particular conditions of the territory, develop a general system of primary education intended to eradicate illiteracy and facilitate professional and cultural progress. The infant and adult population and must likewise provide, in the interest of the inhabitants, to students be able to receive secondary or higher education including vocational training, the facilities which will prove desirable and achievable".

So we see here that education is not a right for Africans taken roughly, even less for Cameroonians in particular as indicated in the Universal Declaration of Human Rights. The registration prescribed in the charter depends on the goodwill of the administrators of the colonies. These educational systems today in the 21st century confine us to staying in the shadows or leading to suffocating the Cameroonian. This vision is crucial and those in charge of education issues should study it in depth in order to provide Africans with the opportunity to be educated and not to be receptive to knowledge that saturates their intelligence and thus creates the illusion of 'limited intelligence. Good governance is synonymous with respect for the pillars of democracy, which are: The separation of powers, the alternation of power, and respect for freedom of expression and human rights, multiparty politics, universal suffrage. Good governance going through good governance, etymologically the term democracy is composed of two Greek words: "demos" and "kratos". The expression "demos" translates to "people" while "kratos" means "power". The whole therefore gives us a type of government in which sovereignty emanates from the people.

Going back in history, it is clear that in the Middle Ages, there were no "democratic states". After a long evolution, it was not until the twentieth century that the political ideal appeared in Africa. Chronologically, we can schematize Cameroonian democracy synonymous with good governance by "democratization by avoiding a national conference" (Akindes, 2000). Cameroonian democracy does not seem to respect the fundamental principles of the latter to make it good governance. Alternation, which is a principle, is defined as the permutation of two parties or two

coalitions, in power and in opposition (Quermonne, 1995). In order to speak of a changeover to power, a number of prerequisites and even conditions must be fulfilled. The first relates to the party system. Since it has always been thought that alternation was only conditioned if and only if, there is bipartisanship in other words the situation in which two political parties dominate the political life. However, Central African countries like Cameroon are experiencing multiparty politics. When on March 5, 1848, France became the first state in the world to adopt universal suffrage; this freedom of the polls augured to the people its responsibility. The alternation in power should be done without a hitch in Cameroon because on the one hand, we have the ruling party and on the other side the opposition. Comparing the states of West Africa to those of Central Africa, we see that there is a clear advance in the west than in the center. Apprenticeship seems difficult in Central Africa for three reasons:

¬ Leaders know how to get there.

¬ They know how they embody power.

¬ Without power, they cannot live.

The sandwich course in Central Africa is disappointing. Since 1990, there has never been alternation in power, Bongo was in power since 1967, he lost only following his death on June 08, 2009, Teodoro Obiang Nguema in Equatorial Guinea set in power since 1979, Sassou Nguesso in Congo more than twenty (20) years, in Cameroon Paul Biya has been at the head since the resignation of Ahidjo in February 1982. The questionable character of the legitimacy of these heads of state results from the fact that they were not placed in power by the choice of the majority of the governed who finds themselves trapped in a spiral of "path of no return". Consequently, in Cameroon the sociological components cannot be expressed normally. This is what can create social tensions and discomfort for social strata because their will is not expressed. Besides, alongside sociological and other problems, there are economic problems.

Cameroon economic problems and development

Cameroon's development for the 21st century also requires mastery of its economy, which has hitherto been extroverted by its

imports which are more than exports. For example, the report from the Ministry of Trade and Commerce for January 2020 says that Cameroon imported 400,000 tonnes of fish from China. In similar manner, the World Bank launched a program of concise and periodic reports on the Cameroon economy performance. Each issue, published semi-annually, takes stock of the country's economic situation (Cameroon Economic Notebooks, 2012). This study is not intended to be exhaustive, but listed specific areas to which the country should pay particular attention such as: Trade facilitation program aimed at bringing about change, which permit all stakeholders to be mobilized. Cameroon would do better to promote trade at regional and global level. The country should take advantage of trade opportunities at the regional level as a good learning ground to become competitive on the international scene (ibid). Today, Cameroon imports more than it exports, which is what leads to its dependence on the outside while it has a rich human, material and terrestrial potential. There are therefore many challenges for Cameroon to achieve performance development in the 21st century. For example, the port's efficiency should be improved and the flow of cargo within the country should be made easier and less expensive (ibid). And for that, it is necessary to establish a good road network, a more competitive transport sector and to reduce road transport synonymous with the free movement of persons and goods. Beyond the Economic and Monetary Community of Central Africa (CEMAC), Cameroon should facilitate trade between the member countries of CEMAC and the Democratic Republic of Congo (DRC) as well as other countries of the Economic Community of Central African States (CEEAC). To meet the challenges, Cameroon could trick the commercial possibilities offered by the vast market of its neighbour, Nigeria, and through the latter gain access to the entire market of the Economic Community of West African States. (ECOWAS).

Cameroon economic growth

Despite, the economic and financial crisis, economic growth resumed in 2011 after a two-year of slowdown. The World Bank estimated growth at 4.2% in 2011 against 2.9% in 2010. This was

attributed to the sustained performance of non-oil activities, the latter in turn continuing to fall because of several problems. Table 1 shows the contribution of some sectors in the economic growth of Cameroon.

Table 1. *Sector of activities*

Sectors contribution to growth (in%)	2009	2010	2011
Primary Sector	0.6	1.2	09
Secondary Sector	01	09	08
Petrol	-08	-0.6	-0.3
Tertiary Sector	2.0	1.4	2.8
GDP growth rate	2.0	2.9	4.2

Source: Cameroon archives and World Bank statistics.

The advent of Boko Haram and for three years the Anglophone crisis has slowed down economic growth, because in the affected areas there is no longer free movement of persons and goods. Taxes and fees are no longer paid, which creates economic inflation.

Inflation in the Cameroon economy

The initiatives taken by the Cameroonian government through the Ministry of Planning and Territorial Development and the National Institute of Statistics in addition to the International Monetary Fund (IMF) to subsidize food imports and improve the distribution seem to have contained the pressure exerted on food prices since in 2011.

These increases intensify during the summer (reaching 5.8% in July, compared to July 2010), but dissipate over the latter part of the year. Food price inflation is estimated to have reached 3.9% in 2011 compared to the previous year. Headline inflation therefore reached 2.7% (still compared to the previous one), a stable rate compared to 2.6% in 2010 for the same period. With the trade balance oscillating like a watch hand, Cameroon had better stabilize it for the realization of its projects and for its development which depends on it. Cameroon, to meet this greater expected funding need, has to draw considerably from government deposits at the regional central bank, the BEAC (Bank of Central African States) (ibid).

In addition, the central government seems to have been tempted to delay the transfer to the local municipalities' revenue which passes through the single treasury account (CUT). Since the introduction of the single bulletin for taxpayers who pay value added tax (VAT), income tax and business tax (above a certain amount), the share of this tax revenue which must go to the municipalities is transferred to the CUT. As a result, local governments are short of cash, this kind of delay creates arrears and further weakens the budget process. Here is the 2010-2011 budget table attached.

Table 2. *Budget performance, 2010-2011 (as a percentage of GDP)*

	2010 (Est.)	2011 (Budget)	2011 (Project rate)	2011 (Est.)
Revenue and shells	17.5	17.6	19.4	18.9
Oil revenue	4.5	3.5	5.2	5.4
Non oil revenue	12.4	13.2	13.3	13.0
Donations	06	0.9	0.9	0.5
Total Expenses	18.6	18.9	18.9	2.7
Current expenses	14.4	13.1	13.6	10.4
Capital expenditure	4.1	5.7	5.4	6.4
Overall balance	1.1	-1.3	0.4	-2.8
Arrears	-1.1	-1.3	-1.3	-0.5
Overall cash basic balance	-2.3	-2.6	-0.9	-3.4

Source: Cameroonian authorities and calculations by the World Bank.

The lack of will of the power of Yaoundé which, since the promulgation of the law on decentralization more than twenty-two (22) years later, still makes the economic apparatus heavy with: the poor who constitute the mass of the people suffer. In addition, oil production, which should resume and increase by 8% in 2012, is poorly managed (see graph below)

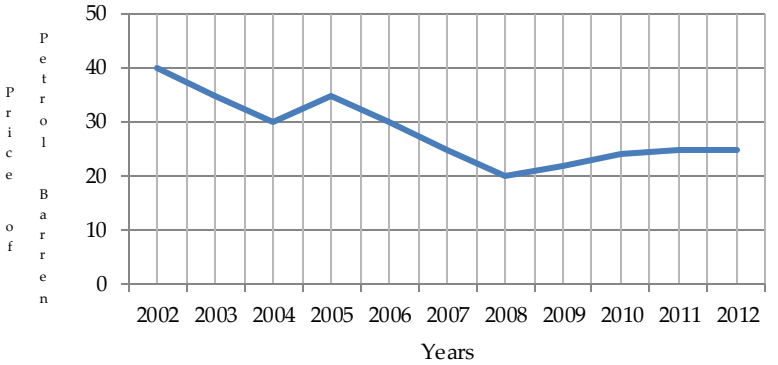

Figure 1. *Price Variation of Petrol Barren from 2002-2012*
Sources: SNH and World Bank statistics

This increase is attributable to private operators, who should see their production set at 10.1 million barrels (against 06 million in 2011), but the desire for secession of the North West and South West slowed this upturn and damaged the refinery (SONARA). The cost of repairs amounting to nearly 400 billion CFA francs (official media) spurs the recovery, because it will first be necessary to make the refinery operational and then allow its economic recovery. But oil alone does not constitute the Cameroonian economy, more worrying, the latest publications of the outlook for the world economy of the International Monetary Fund (IMF) indicate successive downward revisions for the projections of imports for the main markets of Cameroonian exports; in most markets, demand is now expected to decline. Although remaining positive, even demand in China slowed down even more seriously with the advent of the coronavirus which took its essence in China.

For a good performance in order to always face the challenges of the emergence of development, Cameroon must slow its dependence on the outside by stopping its cunning towards foreign loans commonly called debt which is given in installments. Indeed, Cameroon has borrowed from multilateral and bilateral partners to modernize its agricultural equipment from which the products dedicated to export come, from which the country derives most of its income (Yombi, 2010). Loans from "friendly" countries will be used to buy manufactured goods abroad (ibid).

With the fall in commodity prices and dysfunctions (poor choice of profitable projects, absence of control of state-owned enterprises, corruption which plagues society and which awaits its climax ...). Cameroon has been unable to honour its debt service (repayment of debt principal plus interest plus possible delays in installments). The Bretton Woods institutions (they are so called because they have their headquarters in Bretton Woods, in New Hampshire in the USA), i.e. the World Bank (WB) and the International Monetary Fund (IMF), putting pressure to obtain the scheduled reimbursements, this resulted in the imposition on the Cameroonian government by the programs of structural adjustment plans (SAP), the budgetary authority (layoffs in the public, cessation of subsidies, reduction of lifestyle ...), the privatization of public enterprises. The liberalization of trade and prices, paying public services (university fees and hospitals that became paying with the PAS, the devaluation of the CFA franc, the HIPC initiative (Heavily Indebted Poor Countries). The history of this initiative being: "… for a dollar owed in 1980, Africa reimbursed 04 times, but it still owes 04 times… " (Toussaint, 2004). Between 1992 and 1997, Cameroon spent 30% of its budget on debt service that is to say to reimburse its creditors. For the remaining 70%, she paid her charges: Health, education, public investments. The HIPC initiative is seen as a real solution to deleveraging.

The demographic challenge

Despite unreliable statistics, the phenomenon is clear: Africa is a continent that was sparsely urbanized half a century ago, is catching up quickly. The proportion of city dwellers will outweigh the recent population by 2025 under the effect of urban sprawl which is extremely strong and cannot slowdown in the short term (guide terminal, 1998). No big city in Africa reached the million inhabitants, fifty years ago with the exception of Cairo (02 million around 1950, more than ten million today). For more than 25 years, some cities have exceeded this figure (ibid). Despite the recent character of massive urbanization in Africa in general and in Cameroon in particular, urbanization is not everywhere the same

and it is specific to each country because of constraints of local sites or particularities and even of importance.

The growth of the largest cities such as Douala, Yaoundé ...in Cameroon nevertheless continues to grow thanks to the rural exodus from the countryside in favour of the big Cameroonian metropolises and the natural balance remains very high. There are indeed in these cities a large demographic surplus plus low mortality, high fertility of youthful population (generally each woman has four children on average (guide terminales, 1998). This galloping demography in Cameroonian cities remains a crucial problem for the development of the country which remains a major challenge. Indeed, the poverty of the whole population, the insufficiency of material means to ensure the functioning of public services, the difficulty in controlling all that results from the agglomeration of population and the intermingling of various people by their beliefs, their forms of organization, projects, and these are the conditions that govern the daily life of the majority of the inhabitants in large Cameroonian cities. This swelling of cities going with serious consequences: crowding of urban populations, mediocre constructions (even in green or prohibited areas), epidemics (cholera...) and pandemics (coronavirus...), unhealthy conditions, pollution. Scourges very difficult to eradicate and which the government must control to achieve its development objective. What is more, in Cameroon with the advent of external and internal conflicts, populations displaced to refugees are gathering in large Cameroonian metropolises because of their openness to the world and by the presence of high-level of national or international public authorities, Cameroonian cities are therefore a safe heaven and also a scene of many atrocities such as banditry, theft, illnesses, underemployment, congestion, promiscuity, small trades that are not profitable for the finances of the country. Organize in such a way that population growth does not hamper development (Ngandjeu, 1988). Indeed, according to an American company specialized in demographic studies, the Cameroonian population will pass according to different fertility hypotheses of; 6.4 children per woman, 04 and 03 from: 8.44 million inhabitants in 1980 to 21.6 million in 2010 and 37.7 million

in 2025; from 17.9 million in 2010 to 24million in 2025 (The futures group).

Pollutionist challenges target development

Cameroon is currently facing pollution problems which can also prevent its development. So, among other things, we have household pollution that comes from urban waste. The term urban waste designates the urban collection product containing exclusively household waste (Tiani, 2013); port pollution from maritime traffic, to which is added the discharges of bilge water, the washing of tanks, ballast water from oil tankers, anti-algae and anti-shellfish paints applied for the protection of boats (ibid). In general, the development of ports involves several sources of pollution, from wharves, boats and dredging operations. Recent studies on metal contamination show that a number of these elements are introduced into the sea by ships, and that harbor-related activities can be a major source of contamination. In addition, there is industrial pollution, which includes the food industries, chemical industries (textiles), plastic industries, the wood industry, telecommunications industries, cyber metric industries and electrical industries. The agro-chemical and food industries produce pesticides (phytosanitary products), pasta and confectionery…. Among these industries, we can cite: La Minoterie du Cameroun, Les Brasseries du Cameroun, Chococam, Union Camerounaise des Brasseries (UCB) and Sodepa, of which a Cameroonian minister during the coupled campaign of the legislative and municipal elections of 2020 said that 'You would think in ancient times because of the outdated facilities (the Minister of Cameroonian SMEs). During their production cycle, these companies are likely to release abundant organic matter, nitrates and phosphates, through wastewater (ibid). The chemical industries produce soaps, cements, paints, dyes and other commonly used products: These are mainly CIMENCAM (Cimenterie du Cameroun), PILCAM (Pile Camerounaise), ALUCAM in Edéa (Cameroonian alumina). All these chemical industries produce a harmful effect on the health of Cameroonians thanks to their effect on the ecosystem, human health other.

Industrial pollution can therefore prevent the development of Cameroon towards its emergence.

Corruption: The great challenge for Cameroon

The impunity which has its origins in corruption plagues the development of Cameroon. In Cameroon, it has names like: Okra, beer, tchoko, motivation, what do I know!

At all levels in Cameroon, from top to bottom, corruption has become a reality. The most obvious example is that of civil servants who, in order to obtain their position or to be transferred, must be "sponsored" or "helped", often from the ENAM (Transparency International, 2004). Thus, Cameroon must face this gangrene which is opposed to its development in the 21st century. The Cameroonian must give bribes to civil servants whose salaries cannot be enough to make a decent living. According to Transparency International in 2005, each Cameroonian household spent approximately 102,500 CFA francs (156 euros) on average and that would represent one third to one fifth of the income of the least well-off households. According to Christol Marron, President of the anti-corruption observatory in Cameroon, 40% of the revenues recorded each year are not used for development because of corruption.

For Samuel Ekoum, President of the Cameroonian NGO SOS-Corruption, the State of Cameroon loses an average of 400 billion CFA francs a year due to corruption. In the forestry sector, the report made by the NGO "Friends of the earth" and written by a former European forester who says the system of corruption is so generalized that, "even those who would like to do things honestly donot ". On May 18, 2004, Cameroon ratified the United Nations convention on corruption. But against everyone's incivism, corruption persists and prevents the take-off and the development of the country. This corruption is in the process of contaminating the private sector, since more and more, it is necessary to "motivate" the cashier to obtain his salary or his settlement. According to a 2003 Global Corruption Barometer survey by Transparency International, corruption in Cameroon is rampant in the justice system at 31%, 14% for the police. In 2004, the same barometer mentions that the most corrupt sectors are the customs

and the police. The Cameroonian NGO SOS-Corruption believes in 2004 that the most corrupt administrations would be: Taxes, customs, stock accounting (public contracts), public works, forests, police and gendarmerie, industry and commerce, national education, transport, civil service, health.

We therefore see that in Cameroon no sector has been spared from this scourge and rumors even report the "sale" of ministerial posts and the management of public enterprises by the presidency. At this pace, despite the anti-corruption measures taken by the government to fight against corruption with the setting up of an inter-ministerial cell, as well as an observatory of the fight against corruption, the arrests within the framework of the "Sparrow-hawk operation" is all counterproductive. This has little long-term effects, so it must be decried, the lack of follow-up and real will, what interests Cameroonian opinion is the impunity that is reserved for these hijackers. The embezzled money interests the people better, not the arrests. Because this money would have allowed its development and not always reach out to donors.

Conclusion

The path of development is marred by many pitfalls and Cameroon must face it to finally be able to resolve the evils that undermine its development. To do this, the country must get rid of its colonized complex, balance its imports / exports, put in place good governance and a more reliable education system and no longer modeled on the West. Today in Cameroon, more than half of the population lives on the informal sector, so those in government must emphasize the concept of entrepreneurship and encourage banks to grant loans to small and medium-sized enterprises. Faced with the thorny problem of corruption, the state must be uncompromising and punish fraudsters with the highest energy; all it takes is real will from the public authorities.

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4 Social determinants of urban-rural health inequalities in Cameroon

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Introduction

Health can be considered the most vital capital (asset) of a nation through the amount of healthcare people receive. Effective and meaningful contribution to the development of a nation can only be achieved by a population that is healthy. Hence the promotion, preservation and restoration of the health of citizens through healthcare that is accessible to all are a sine qua non and not an option in a nation. The health of citizens must be prioritized. It should come before any personal, financial or political gains. Good health is central to human happiness and

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well-being and it is likely to be determined by one's socio-economic status such as availability of modern medical facilities, educational attainment, age, marital status, to name just a few as well as residential location (Field & Briggs, 2001).

Health is not just the outcome of genetic or biological processes, but is also influenced by the social and economic conditions in which we live. We call these factors the social determinants of health-inequalities in social conditions give rise to unequal and unjust health outcomes for different social groups and environments (Farrell *et al.,* 2008). These social conditions powerfully influence people's chances to be healthy as they are very important determinants of most diseases and deaths between and within countries (Bates *et al.,* 2009). Asiskovitch (2010) documented that society no longer views access to healthcare and mortality as being controlled by biological, genetic and microbial processes. Rather, access to healthcare is determined by faults in social arrangements that influence and interact with the life of individuals and populations.

We observe inequality in health when there is inequitable access to healthcare and when the Social Determinants of Health (SDH)- access to modern healthcare facilities, educational attainment, age, marital status, to name a few, are not fairly distributed (Rid, 2008), especially across rural and urban areas. Inequality in healthcare which is marked by differences in health status or distribution in health determinants, (WHO, 2013) arises from differences in socio-economic and environmental factors which have an influence on the opportunities available to people, the choices they make, their behaviour, their risk of poor health and their resilience. It is worth noting that such inequalities are evitable therefore considered avoidable and unjust, yet they persist. This is why there should be attempts to reduce them by policymakers (Marmot *et al.,* 2010) especially between rural and urban areas.

Social and economic determinants of access to healthcare are very important. Much of early public health attention was focused on them, particularly attention towards living conditions. Apart from improving on the treatment of diseases and risky lifestyle (smoking), socio-economic factors that that drive these habits need

to be taken care of. Greenwood & de Leeuw, (2012) posit that a person's social and economic circumstances affect their access to healthcare throughout their life and that the most profound differences in access to healthcare can be seen between the most disadvantaged (rural dwellers) and least disadvantaged (urban dwellers). This is confirmed by the Materialist explanation of health inequality.

The uneven distribution of the factors affecting the access to healthcare implies that access to good health may also be disproportionately distributed. Inequality in access to healthcare is a serious public health problem because it produces health disparities, interferes with society's functioning, affects life expectancy and is noticeable in all areas (Odekina, 2015; Wilkinson & Pickett, 2010). Achieving equality in access to good healthcare is a major concern for all policymakers and serves as a measure of the performance of the healthcare system. According to the World Health Organization (WHO, 2000) improving the health attainment of the population is the main goal of any healthcare system.

The persistence of social inequalities in access to healthcare is well established (WHO, 2000): People with higher education, access to healthcare, usually living in urban areas have lower mortality rate and longer life expectancies (Eikemo *et al.*, 2017). It is likely to be the reverse scenario for their rural counterparts. Since inequalities (health inequalities) are hardly conducive to societal development, this has made people unable to contribute to societal production and development. A good state of access to healthcare will make people to live the life they value; hence reduction of health inequalities is the priority (Mackenbach, 2012).

Social injustice across Cameroon has been created and continues to deepen because of the non-observance of the basic principles hence further accelerating inequity and inequality in our nation especially in the domain of access to healthcare between urban and rural residents (Tandi *et al.*, 2015). Despite good economic performance, Cameroon's health indicators (availability of healthcare services, life expectancy, mortality rate, etc.) have not improved over the past two decades (WHO, 2013). Substantial disparities exist in health outcomes between urban and rural areas,

caused by the differences in socio-economic opportunities available to them. According to the 2006 World Health report, the WHO estimated that Cameroon is impaired by geographical distribution of health facilities (personnel) that is even more severe in the rural areas (Tandi *et al.*, 2015).

Evidence from the current Cameroon Household Consumption Survey, CHCS IV, indicates that 32.14% of the 45, 560 household heads considered were reported to have been sick two weeks before the survey as opposed to 67.7% who reported not to have been sick, 16% did not report their status. The interesting observation here is that, out of the 31, 521 who were reported to have been sick two weeks before the survey, 19,435 (corresponding to 61.66%) are based in urban areas and 12,086 in rural areas (corresponding to 38.38%) (National Institute of Statistics, 2014). This evidence is indication of existing health status differentials between urban and rural dwellers in Cameroon. It is imperative to understand how socio-economic factors such as access to healthcare services, education, age, to name just a few, which predominate in the urban areas contribute in explaining these visible health status inequalities.

The public health sector of the country is pyramidal, and has a centralized system of administration that runs from the central (ministry), through the intermediary (regional delegations), and cumulating at the peripheral (health districts) levels. Three different levels of healthcare delivery services exist in Cameroon; the tertiary, the secondary, and the primary services. However, intra-regional differences in health personnel availability which may be associated with urban/rural divide also exist in most African countries like Cameroon (MOH, 2017)

Inequality presents a lot of challenges to a country as many people die on daily bases due to unequal access to healthcare. Therefore, identifying the determinants of this healthcare inequality will help bridge the disparity in access to healthcare, as such reduce the number of deaths as (Marmot, 2005) points out, that a call for concern for every nation is ensuring equality and equity in access to healthcare services.

Cameroon is a country with huge gaps in access to healthcare, which means that there are many people who do have access to

quality healthcare, and many other people who do not have access to quality care. For example remote areas which are small communities with small populations have inadequate health facilities and the returns thereof are inappropriate. Physicians which are scarce are sent to hospitals where they serve no purpose just because such hospitals exist. This depicts a situation of waste, while depriving those in dire need of these resources from having access to them; this is tantamount to creating inequality in the access to quality care across the nation and the population. This is, indeed, saddening owing to the observation that there is shortage of physicians and other health personnel and infrastructure, yet we notice a huge discrepancy in their distribution across the nation.

This observation is supported by Tandi *et al.,* (2015) who states that Cameroon is classified by the World Health Organization (WHO) as having a great inaccessibility to healthcare. They add that this is further complicated by the geographic distributional inequalities of the workforce. The demand for all types of health services and equipment is high and constant especially in rural areas. The need for modern equipment is especially urgent, with many clinics using outdated equipment, some of which is imported illegally from Nigeria. Some regions have a higher number of physicians (per person) than others leading to poor health outcomes across the regions. 70% of regions have a density of health personnel to population per 1000 that is less than 1.5% implying acute shortage of health personnel instead of 2.5 per 1000 as recommended by the 2006 World Health Report.

Looking at the poorest 20% of households in the country, about 19% of children die before they turn five, compared to about 7% of children in the richest 20%. Cameroon registered 35% of diarrheal deaths (Tandi *et al.,* 2015). Malaria remains a serious endemic matter and the first cause of mortality and morbidity invulnerable groups (pregnant women and children under 5 years of age). It is responsible for 35 to 40% of deaths in health facilities, 50% of morbidity for children under 5years of age, 40 to 45% medical consultations and 30% of hospitalization. It is responsible for 26% of absence in professional milieu and 40% of household expenditure. At the national level, only 36% of households possess

mosquitoes treated nets, peculiar to rural areas (National Institute of Statistics, 2014).

The Inequality- adjusted Human Development Index (IHDI) recorded an upward trend - from 0.330 in 2013 to 0.344 in 2015 indicting a rise in inequality in living standards in the country (Anand, 2016). The wealthiest layers of the population, for example, urban dwellers - have greater access to public health facilities. For instance 46.7% of deliveries were assisted by qualified staff in rural areas against 86.7% in urban areas. Despite the drop in the incidence of monetary poverty nationally by 2.4 points between 2007 and 2014, (37.5% in 2014 against 39.9% in 2007), rural poverty has not decreased. The incidence of poverty stood at 56.8% in 2014 representing an increase by 1.8 points compared to 2007. On the contrary, the urban area presents a poverty rate of 8.9%, representing a drop by 3.3 points compared to 2007. Preventive practices which can act as a proxy for current state of health are better in urban than rural areas. The contraceptive use rate is up to 16% in rural areas and 36% in urban areas. (National Institute of Statistics, 2014). Despite government efforts to curb these inequalities in terms of improved and low cost medical services, specifically targeting the rural population (division of treated mosquito nets, pipe born water, free vaccination, free malaria treatment or kids and pregnant women, low cost tests, health outcomes have not improved in rural areas.

Following the recent CHCS (Cameroon Household and Consumption Survey), household heads were asked to report their current health status. 45.11% had good health, 26.01% had fairly good health, 16.17% had acceptable health and only 3.72% had bad health. Essentially, 34.21% of those in good health were residing in urban areas compared to 19.9% in rural areas. 15.81% of those with fairly good health were in urban areas as opposed to 10.20% in rural areas. Concerning the variable having malaria two weeks before the survey, 57.48% had no malaria as opposed to 42.52% who suffered from it. Like in the case of current health status, majority of those who did not have malaria two weeks before the survey were in urban areas (66.0%) compared to the rural areas with 34.0%. we can observe that the urban areas dominate the rural areas in terms of good health status. the same evidence is observed

for cases of diarrhoea and respiratory problems. The problem which is yet to receive adequate attention from researchers and policymakers in Cameroon is to quantify the relative contributions of socio-economic factors (access to modern health services, educational attainment, age, just to name a few) in explaining health status inequality between urban and rural areas and to evaluate the extent of the discrimination component. It is against this background that this chapterhas as main objective to investigate the implications of socio-economic factors for urban-rural health inequalities in Cameroon. Specifically, it (1) constructs and compares the composite index of health endowments in urban and rural Cameroon, (2) assesses the urban-rural disparities in the effects of modern healthcare use on health endowments in Cameroon, and (3) evaluates the extent of the discrimination component in accounting for urban –rural health inequalities in Cameroon.

After the introduction, the rest of the chapter is organized as follows: Section 2 reviews the literature in an attempt to underline knowledge gaps which this chapter intends to fill; Section 3 presents the methodology and the data used; Section 4 hosts the empirical findings and discussions; and Section 5 provides the concluding remarks and policy implications ensuing from the results.

Literature review

Pantyley (2017) investigated the Health inequalities among rural and urban population of Eastern Poland in the context of sustainable development. The primary method of data collection was used whereby questionnaires were administered. The Chi Square test and contingence quotients were used to analyse the data and test hypotheses and the results indicated a correlation between the state of health and the following independent variables: age, life quality, social position and financial situation; a statistically significant yet weak correlation was recorded for gender, household size, place of residence and amount of free time. The conducted analysis proved the existence of a huge gap between state of health of the population in urban and rural areas. The above study is in tandem with Walters & Suhrcke (2005) who

wrote on the socio-economic inequalities in health and healthcare access in central and Eastern Europe. The primary method of data collection was used whereby structured questionnaires were administered to respondents in rural and urban areas. His findings showed that there exists an inequality in healthcare between rural and urban areas.

Eikemo *et al.,* (2008) investigated social inequalities in health and their determinants across Europe. They used the primary method of data collection consisting a series of hour-long, in-person interviews. The strict random probability sampling was used in selecting the respondents and the survey research design was equally used in the study. As concerns method of data analysis, simple descriptive statistics was used. The findings showed the main mechanisms explaining educational inequalities in poor self-reported health, and suggested that the mechanisms linking socio-economic position and health vary across countries and that health inequalities are the result of a complex interplay of national, behavioural, occupational, and material conditions. Equally, it was realised that education also accounts for health inequality in Europe. Sanders *et al.,* (2006) investigated the social determinants of health and the prevention of health inequities and found out that education, employment, disposable income, residence all account for health inequality. The work of Eikemo *et al.,* (2008) focused on the social determinants of health inequality. Their study employed onlydescriptive analysis which failed to explain the disparity in health status.

Kopp *et al.,* (2005) looked at sub-regional variation in mortality rates in Hungary. They found that among men, socio-economic status, collective efficacy, social distrust, competitive attitude, reciprocity, and membership of civic organizations explained 68% of the sub-regional variation in mortality rates. Among women the same factors explained only 29% of the difference, and official income was found to be the most significant determinant of sub-regional mortality rates.

Rarani *et al.,* (2018) investigated the changes in socio-economic inequality in Neonatal mortality in Iran between 1995-2000 and 2005-2010. The main objective of the study was to decompose inequality in neonatal mortality into its contributing factors and

exploring changes from 1995-2000 and 2005-2010 in Iran. Their study decomposed the concentration index and used it to analyse the determinants of health inequality at a point in time and the Oaxaca decomposition method was equally used to analyse how the socio-economic inequality in health changed over time. The results revealed that there was an inequality that benefitted the urban areas in both years.

Heaton *et al.,* (2016) investigated the social inequality in health in Africa. Their work focused on examining the socio-economic inequality in health and also the factors that moderate this health inequality. Socio-economic variables such as household wealth, maternal education, urban/rural residence, access to healthcare, health expenditures were used. The study used data from the Demographic and Health Surveys conducted between 2003 and 2012 in 26 African countriesand a logistic regression was used to predict health inequality over time, cox regression was used to predict child mortality measured in months and the linear regression model was also used to analyse health inequality across countries. Their results indicated that children from wealthier homes have good nutritional values than children from poor homes. Thus income and family wealth account for inequality in health. Also it was found that children have improved health if their mothers are well educated thus education also accounts for disparities in healthcare. In addition, residence was found to have a great effect on health inequality as people who reside in urban areas have access to good and well-structured healthcare as compared to those located in the rural areas. However, Heaton *et al.,* (2016) failed to examine disparity in health caused by socio-economic factors in terms of gender that is if this disparity is more for female than male and also examined factors only in children not the entire population.

Pincus *et al.,* (1998) argued that factors related to the geography of human location and social support systems are likely to affect health much more than the risks in the human biology or biological exposures. Wilkinson & Marmot (2003) and Schäfer & Bamberg (2008) have similarly noted that when the root causes of ill-health and early deaths are individualised, the remedies also are individualised, and health promotion efforts become

individualised too; these potentially break the will for collective intervention. Still, other studies have equally revealed that health promotion and disease prevention efforts targeting individualised root-causes are inadequate (Marmot *et al.,* 2008; Pickett & Wilkinson, 2015). Pincus *et al.*, (1998) also added that countries where the wealth is more equitably distributed enjoy the highest life expectancies and thus little or no health inequality.

A related argument by Kawachi (1999) noted that the practice of victim blaming, especially the act of blaming an individual's poor health status on his or her behaviours, obscures the relationship between the human population and the social situations of their environment. Current debates suggest that the responsibility for inequality and health disparities is shared between governments, the private sector, the community and individuals, and that the causal dynamics could operate top-down, bottom-up, or both directions (Marmot *et al.,* 2008).

According to Gorski (2008), inequalities separate populations through their influence on human freedom, social justice, attitudes, characters, behaviours, and human actions. The problems associated with inequalities affect the wellbeing and the quality of life; and as such, create health disparities. Inequalities do not only separate populations, but also partition societies through fostering the emergence of a continuum of inclusion and exclusion. The inclusion and exclusion processes deprive some populations from partaking in the common pool of resources, thereby creating health disparities that translate into a gulf between the health of the haves and the have-nots (Rispel *et al.,* 2013). By implication, this could eventually generate and self-propagate cycles of inequalities in power relations across cultural, socio-economic and political horizons.

Skalická *et al.,* (2009) wrote on material, psychosocial, behavioural and biomedical factors in the explanation of relative socio-economic inequalities in health. The study examined the relative contribution of (i) material, (ii) psychosocial, (iii) behavioural and (iv) biomedical factors in the explanation of relative socio-economic (educational and income) inequalities in health. The study found out that there were no socio-economic inequalities in health among women, while health inequality was

found among men caused by income and education. That is, men with low educational level and lower income did not really access healthcare services as compared to men with higher education and income level. Therefore from the findings, there existed a positive relationship between income and education and health inequality. A study by Novak (2010) examined social inequity in health: an explanation from a life course and gender perspective. The main objective of the study was to examine the patterns of health inequities and the pathways by which health inequities develop from a life course and gender perspective. The primary method of data collection was used whereby self-administered questionnaires were used to capture the various variables. The result revealed that there were no class or gender differences in health inequality among youths. The result also showed that socio-economic status such as education, employment status, access to healthcare also account for the inequality in healthcare service in most African countries.

Goli *et al.*, (2014) studied socio-economic determinants of health inequalities among the older population in India, using a decomposition analysis. This study quantified and decomposed health inequalities among the older population in India and analysed how health status varies for populations between 60 to 69 years and 70 years and above. Data was gotten from the 60th round of the National Sample Survey (NSS). Socio-economic inequalities in health status were measured by using Concentration Index (CI) and further decomposed to find critical determinants and their relative contributions to total health inequality. The results suggested that poor health status is more concentrated among the socio-economically disadvantaged older population. Also, the Decomposition analyses revealed that poor economic status is the dominant contributor to total health inequalities in the older population, followed by illiteracy and rural place of residence. In addition, other indicators, such as religion, gender and marital status were found to be positive.

Odekina (2015) investigated social determinants of health inequality and life expectancy among women of Edo State, Nigeria. Nutritional status, access to household sanitation facilities, and literacy/educational attainment were used as independent

variables while the dependent variables were health status or life expectancy depending on the context of the analysis. This quantitative study used secondary data (from the 2008 and 2013 Nigeria Demographic and Health Survey, DHS) containing information assembled from a field survey that used a standard questionnaire. The multivariate logistic regression was used in the analysis to provide a clearer view of the role of confounding factors in the final determination of the health outcomes. The results revealed that the younger generation of the women of Edo State, Nigeria is more likely to enjoy the benefits of education and literacy to health than their older counterparts. The analysis also showed that women in the urban areas have higher parity than women in rural areas suggesting that the type of place of residence has significant association with the life expectancy.

Tandi *et al.*, (2015) looked at Cameroon public health sector; shortage and inequalities in geographic distribution of health personnel. The national health personnel availability and distribution were assessed using the end of year census data for 2011 collected from the MoPH (Ministry of public Health) data base. The inequalities and distribution of the workforce were estimated using the Gini coefficient and Lorenz curve and linear regression was employed to determine the relationship between health personnel density and selected health outcomes. Social determinants of health were decomposed using concentration curves. The results showed that there exist significant inequalities in the distribution of available health personnel in Cameroon. Some regions were found to have a higher number of physicians (per person) than others leading to poor health outcomes across regions. Their study however failed to elaborate on the socio-economic determinants of health status.

For the present purpose, there are some important limitations to this literature. Firstly, most of the above literature was based on countries like Nigeria, Iran, Norway, etc. Equally, some of the literature was based across continents like Africa, Europe with very few on Cameroon. This study will attempt to bridge this gap. Again, from the literature above, most of the writers use either the Gini coefficient or the concentration index as a measure of health inequality but this study uses a composite health status index that

will be constructed using the Multiple Correspondence Analysis (MCA). The Oaxaca-Ransom decomposition technique (Oaxaca & Ransom, 1994) as documented by (Álvarez & Barranquero, 2009) whose aim is to decompose the various types of inequality into the endowment effect and the discrimination effect will be used in this study. It is an innovation in this area of study contrary to the traditional Oaxaca-Blinder (Oaxaca, 1973 and Blinder, 1973) decomposition as documented by (Jann, 2008) which is used in most studies of this nature.

Methodology and data

The Oaxaca-Ransom (Oaxaca & Ransom, 1994), which is an inequality regression-based decomposition, is used to explain inequality in health status in terms of socio-economic characteristics between urban and rural areas. An index composed of 3 indicators of health status (current state of health, not having malaria last two weeks, not having diarrhea last two weeks) is composed in order to have a quantitative/continuous variable, which is our dependent variable. It is constructed using the Multiple Correspondence Analysis (MCA). Furthermore, a t-test is conducted to show the statistical significance of the mean difference between urban health status and rural health status.

Oaxaca-Ransom decomposition

This decomposition model developed Oaxaca & Ransom (1994) helps us to distinguish between the explained and unexplained components of the urban-rural health status gap. This model starts by running three different regressions for urban, rural, and pooled specifications against several socio-economic factors. For the first two regressions, the following equation is applied:

$$H_i = X_{ij}\beta_{ij} + \varepsilon_i \quad (1)$$

Where

H_i is the health status of individual i,Xj is the vector of socio-economic characteristics (access to modern health facilities, education gender, marital status, among other correlates.), βj are

the estimated coefficients of the socio-economic determinants of health status, and μ_i is an error term with expected value of 0.

From the above equation, we derive the functions for urban and rural as follows;

The health production function for urban is:

$$\overline{H}_U = \overline{X}_{Uj}\beta_{Uj} + \varepsilon_U \quad (2)$$

and that of rural is:

$$\overline{H}_R = \overline{X}_{Rj}\beta_{Rj} + \varepsilon_R \quad (3)$$

Where;

$\overline{H}_U$ and $\overline{H}_R$ are the mean values of the health status indicator for urban and rural areas, respectively,

$\overline{X}_U$ and $\overline{X}_R$ are the mean values of different socio-economic characteristics for urban and rural, respectively, and

β_U and β_R are the estimated coefficients from regression analysis, showing health status sensitivity to different socio-economic characteristics for urban and rural areas respectively;

For the pooled regression, a resident/area dummy for the rural area is added. This is the estimation of the non-discriminatory health status structure. Thus the regression is specified as follows:

$$H_i = X_{ij}\beta_j^* + S + \varepsilon_i \quad (4)$$

Where;

S is the dummy variable for rural;

β_j^* are the estimated coefficients for the pooled model, showing non-discriminatory health status sensitivity to different socio-economic characteristics.

This regression shows what would be health status sensitivity to different socio-economic factors if there was no discrimination in the health market. After running regressions we find the return on different characteristics (e.g. access to modern health facility, education gender, marital status etc.) for urban and for rural separately.

When the coefficients are estimated we turn to the next step; namely, calculating the urban-rural health status gap. We calculate the difference between the mean health status indicator for urban and rural areas. The following formula is employed for this calculation:

$$\bar{H}_U - \bar{H}_R = \overbrace{\beta_j^*\left(\bar{X}_{jU} - \bar{X}_{jR}\right)}^{\text{EXPLAINED COMPONENT}} + \underbrace{\underbrace{\bar{X}_{jR}\left(\beta_j^* - \beta_{jR}\right)}_{\text{RURAL DISADVANTAGE}} + \underbrace{\bar{X}_{jU}\left(\beta_{jU} - \beta_j^*\right)}_{\text{URBAN ADVANTAGE}}}_{\text{UNEXPLAINED COMPONENT}} \quad (5)$$

Subscriptions U, R, and * indicate urban, rural and pooled models respectively;

The mean urban-rural health status gap equation is decomposed into three parts as follows;

$$\bar{H}_U - \bar{H}_R = E + U_a + R_d \quad (6)$$

Where;

$E = \beta_j^*\left(\bar{X}_{jU} - \bar{X}_{jR}\right)$

$U_a = \bar{X}_{jU}\left(\beta_{jU} - \beta_j^*\right)$

$R_d = \bar{X}_{jR}\left(\beta_j^* - \beta_{jR}\right)$

The first part, E, indicates the proportion of mean urban-rural health status gap that can be explained by the differences in socio-economic characteristics for urban and rural areas weighted by the non-discriminatory coefficients from the pooled model. This is called the explained component (E) of urban-rural health status gap. The second and third parts, R_d and U_a, are called unexplained or discriminatory components of urban-rural health status gap. It shows how the returns (previously estimated coefficients) on different socio-economic characteristics differ for urban and rural areas. The difference of the coefficients demonstrates that the same characteristics are valued differently for urban and rural dwellers, leading to discrimination. The first part of unexplained urban-rural health status gap, R_d, shows rural disadvantage in

terms of health endowments compared to non-discriminatory health structure.U_a, is the second component of unexplained urban-rural health status gap, which indicates urban advantage in terms of health endowments relative to non-discriminatory health structure.

To answer our first specific objective, we construct tables showing the current state of health across residence. Current state of health across residence will either be good health or poor health. The reference group is good health. Malaria status last two weeks will be reported. It will either be having malaria or not having malaria. The reference group will be in terms of those not having malaria. Diarrhoea status will also be reported. It will comprise of having diarrhoea and not having diarrhoea. Focus will be on not having diarrhoea.

To address the second specific question, another regression will be run. This will comprise the rural and the interaction between rural and modern health facilities. This will enable us to be able to determine the level of modern healthcare use in urban and rural areas.The decomposition of the discrimination coefficient into urban advantage and rural disadvantage will permit us address the third objective.

Data used

ECAM IV was conducted by the government's institute of statistics in the months of October, November and December 2014. ECAM IV is aimed at providing needed information to evaluate and monitor monetary poverty in the country. Unlike previous Cameroon Household Surveys, ECAM IV is peculiar since it employed the electronic field data collection called 'Computer Assisted Personal Interviewing' (CAPI) as opposed to 'Paper and Pencil Interviewing' (PAPI). ECAM IV sample was made up of 46,560 individuals drawn using a random sampling plan stratified at two levels. The strata were obtained by combining the 12 survey regions (all 10 regions of Cameroon with Yaoundé and Douala considered separately[2]) with the area of residence (urban, semi-

[2]Considered separately due to their very large sizes.

urban and rural)[3]. A total of 32 survey strata were constituted of which 12 urban strata (Yaoundé, Douala, and the urban stratum of each of the 10 regions of the country), 10 semi-urban strata and 10 rural strata of which one stratum per region. At the first level, the Enumeration Areas (EA) were drawn independently in each stratum with a probability proportional to their size in terms of number of individuals in households. In total, 1,024 EAs were drawn among which 639 in urban strata, 99 in semi-urban strata and 286 in rural strata.

At the second level, from each EA drawn, a sample of individuals was drawn using the systematic drawing with equal probability, from the lists of households got during the numbering. The number of households sampled per EA was 10 in Yaoundé and Douala, 12 in other urban strata, and 15 in semi-urban and rural strata. The final sample of ECAM IV was 46550 individuals for the individual data set and 10,303 households for the household data set. The difference between the sample at the beginning (12,847 households) and the sample at the end (10,303 households) comes from the non-responses during data collection and from the fact that some households were deleted from the data base because of the poor quality of their questionnaire (for instance, households with food consumption expenditure equal to zero were deleted). This study employs the individual data set.

Definition of variables

Table 1. *Variables used and descriptions*

Variable	Description
Dependent variable	
Health Status indicator	This variable is a composite index constructed using three health endowments indicators: -Current state of health (= 1 for good health and 0 otherwise). - Malaria (= 1 for not having malaria and 0 for having malaria in the last two weeks before the

[3] The urban is made up of towns having 50,000 inhabitants or more; the semi-urban, towns of 10,000 inhabitants to less than 50,000 inhabitants; and the rural, towns of less than 10.000 inhabitants.

	survey). -Diarrhoea (= 1 for not having diarrhoea and 0 for having diarrhoea in the last two weeks before the survey).
Independent variables	
Gender (dummy)	(= 1 for female and 0 for male).
Access Modern healthcare (dummy)	(= 1 for modern hospitals or health centres or clinics or health NGOs or pharmacies and 0 for tradi-practitioners.
Level of education	-no education (reference category) -Primary education(dummy) -Secondary education(dummy) - Tertiary education(dummy)
Age	Continuous variable
Age square (Age2)	Continuous variable
Married (dummy)	(= 1 for married and 0 otherwise)
mhresidual_hat2	This is a residual that combines two instrumental variables including access to TV and formal employment, all captured at cluster level to reduce the problem of endogeneity in the model.

Source: Defined/designed by authors

Emprical findings and discussion

This section focuses presents and discusses the results obtained. It hosts the descriptive statistics of the variables used, a t-test of mean difference, the regression analyses and the Oaxaca Ransom decomposition.

Structure and characterization of urban-rural health status

Table 2a hosts the reported current state of health across residence. From the table, we can observe that out of the total number of individuals with current good health, 14,002 are rural dwellers and 23,264 are urban dwellers. Specifically, 37.57% of rural dwellers are reported to be having good current health as opposed to 62.43% in urban areas.

Table 2a. *Reported current state of health*

Current health status	rural	urban	Total
Poor current health	3,521	5,773	9,294
Good current health	14,002	23,264	37,266
Total	17,523	29,037	46,560

Source: calculated by author, 2019.

This is evidence that those in urban areas enjoy better current health than those in rural areas.

Table 2b. *Reported malaria status last two weeks*

Malaria status	Rural	Urban	Total
Having malaria	2,484	3,882	6,366
Not having malaria	15,039	25,155	40,194
Total	17,523	29,037	46,560

Source: calculated by author, 2019

Table 2b presents the reported malaria status across residence. We can witness that out of the total number of individuals who did not have malaria in the last two weeks, 15,039are rural dwellers and 25,155are urban dwellers. Explicitly, 37.42% of rural dwellers reported not to have had malaria two weeks before the survey compared to 62.58% in urban areas. This shows that those in rural areas suffer more in terms of malaria than their urban counterparts.

Table 2c. *Reported diarrhoea status last two weeks*

Diarrhoea status	Rural	Urban	Total
Having diarrhoea	220	292	512
Not having Diarrhoea	17,303	28,745	46,048
Total	17,523	29,037	46,560

Source: calculated by author, 2019

Table 2c shows the reported diarrhoea status across residence. We observe that given the total number of individuals who did not have diarrhoea in the last two weeks, 17.303 are rural residents and 28.745are urban residents. Precisely, 37.58% of rural residents are reported not to have had diarrhoea two weeks before the survey compared to 62.42% in urban areas. This shows that those in rural

areas suffer more in terms of diarrhoea than their urban counterparts.

Table 3. *Levels of the health endowments indicator by residence*

Health endowments indicator	Rural	Urban	Total
0	869	1,170	2,039
0.462227	1,615	2,712	4,327
0.537773	2,652	4,603	7,255
1	12,387	20,552	32,939
Total	17,523	29,037	46,560
Mean	0.830889	0.836207	
Std. Dev.	0.28282	0.272667	

Source: calculated by author, 2019

The health status indicator was normalised to fall between 0 and 1, with a value towards 1 indicating better health and a value towards 0 indicating poor health. We can observe that as we move towards the value 1, the proportion of urban dwellers with better health is more than among rural dwellers. We can also observe that the mean value of the health status indicator stands at 0.836 in the urban and 0.831 in the rural, showing that health status, on the average, is higher in the urban than in the rural areas.

The purpose of the normalisation procedure was to turn the health status indicator into a continuous variable.

Socio-economic determinants of health endowments in urban and rural Cameroon

Descriptive statistics of variables used in the regression

Table 4 (see Appendix 1) shows the descriptive results obtained from the 2014 household survey on overall health status in Cameroon. The number of observations stands at 46,560. The results show that on average, 83.42% of individuals surveyed had good health status. This means that majority of individuals had good health status. This could possibly be linked to improved efforts on the part of government in terms of ameliorating on the health services provided and also greater awareness on the part of individual households on the importance of good health. It is also revealed from the results that on average, 34.69% of the total

population had access to modern healthcare. By implication, majority (65.31%) visit other health facilities like tradi-practitioners and road side vendors.

As far as education is concerned, results revealed that on average, those who at least attended the primary level of education stood on average at 36.31%. Those who attended the secondary level of education stood on average at 28.56%. Those with tertiary education on average were 4.86%.

The variable gender shows that on average, 51.08% of the sampled individuals were females. Only 48.92% were males. Results equally revealed that those individuals surveyed had an average age of 22 years. The study equally showed that on average, 25.27% of the sampledindividuals are married. On average, 37.64% of the sampled individuals resided in rural areas while 62.36% of the sampled individuals resided in the urban areas.

Tables 5 and 6 (see Appendix 1) present descriptive statistics for rural and urban dwellers respectively. From the tables, it is revealed that on average, 83.09% of rural dwellers had good health status and 83.62% of urban dwellers had good health status. This is indicative of the fact that those in urban areas enjoy better health status than rural dwellers. This could be explained by the fact that urban dwellers have greater access to modern hospitals, equipment, staff and specialised equipment. They are usually more educated too especially from higher institutions of learning and are therefore more informed about the importance of health and also possess the relevant means to purchase their healthcare services.

It is also revealed from the tables that on average, 26.71% of rural dwellers and 39.49% of urban dwellers had access to modern hospitals. The implication from this is that slight residence discrimination existed in the health market. Urban and rural dwellers both had access to modern hospitals but the urban areas were more favoured. On average, 41.02% of rural dwellers and 33.46% of urban dwellers had primary education. There is discrimination here in favour of the rural area or dwellers. It can be explained by government's policy to at least promote reading and writing which makes primary schools available in all corners of the national territory especially in the rural areas at little or no cost. At

the secondary level of education, on average, 17.44% and 35.27% points were recorded for rural and urban dwellers respectively. At the tertiary level of schooling, the rural dwellers scored on average 1.07% and the urban dwellers scored 7.14%. Looking at gender, it is seen that on average, 51.24% of rural residents are female while 50.99% of urban dwellers are female. Looking at marital status, results further suggest that on average, 28.73% of the rural residents are married and only 23.18% of urban dwellers are married.

The t-test results are displayed in the appendix (Appendix 3). The t-test value of 1.992, and p-value of 0.0232, show that the difference between urban health status and rural health status (which equals 0.005317) is significant at 5%; health status being higher in urban than in rural areas. So thischapter is aimed at explaining this significant difference in health status between urban and rural dwellers.

Regression results: regressionwith and without the interaction of modern health with the rural component

Table 7 shows two regression results aimed at addressing the second objective of this study. The coefficients on column two (coefficient R), show the pooled regression involving rural residency while those on column three (coefficient R+I) indicate the pooled regression involving rural residency and the interaction between this component and access to modern healthcare facilities.

Table 7. *The pooled rural, rural-modern health facilities interaction function*

Health status indicator	Coefficient R	Coefficient R+I
Access to Modern health	-0.125***	-0.113***
	(0.003)	(0.003)
Primary education	0.012***	0.013***
	(0.003)	(0.003)
Secondary education	0.031***	0.032***
	(0.004)	(0.004)
Tertiary education	0.069***	0.069***
	(0.007)	(0.007)
Female	-0.008***	-0.008***
	(0.003)	(0.003)

Age	-0.0005*	-0.0005*
	(0.0002)	(0.0003)
Age2	-0.00002***	-0.00002***
	(3.31e-06)	(3.31e-06)
Married	0.008**	0.008**
	(0.004)	(0.004)
Interaction (access to modern health and rural)	_	-0.035***
		(0.006)
Rural	-0.011***	-0.0003
	(0.003)	(0.003)
Const	0.894***	0.889***
	(0.004)	(0.004)

Source: Generated by authors using ECAMIV
Standard errors in parentheses; Legend: *** p<0.01, **p<0.05,*p<0.1

From the results as shown on the second column of table 7, access to modern healthcare is negative. This means that access to modern healthcare facilities reduces health endowments. Specifically, it shows that those who are using modern hospitals or health centers and clinics, experience poorer health than those who visit tradi- practitioners and road side Vendors as given by a coefficient of -0.125. The coefficient is significant at 1% level. In column three, the variable access to modern healthcare is negative. This means that access to modern healthcare reduces health endowments. Specifically, it shows that those who are using modern hospitals or health centers and clinics, experience poorer health than those who visit tradi- practitioners and road side Vendors in rural areas. This result also implies that just mere access may not be health enhancing; as shown by the negative coefficient of -0.113. This is a call for policy to lay more emphasis on the use of available healthcare facilities especially in the rural areas. The coefficient is significant at 1% level.

Educational attainment, in column two was found to exert a positive influence in generating good health at the primary, secondary and tertiary levels. This is to say that those who attended school generated better health than those who did not attend as shown by the positive coefficients (0.012, 0.031 and 0.069 for primary, secondary and tertiary levels respectively). Results are significant at 1% level. Educational attainment (column 3) was found to exert a positive influence in generating good health at the

primary, secondary and tertiary levels. This is to say that those who attended school generated better health than those who did not attend as shown by the positive coefficients of 0.012, 0.032 and 0.069 for the primary, secondary and tertiary levels of education respectively. It is equally important to note that the ability to generate better health increases with increase in the level of education. Results are significant at 1% level.

From results on column two, we can observe that being a female doesn't really lead to generating better health compared to being a male as depicted by the negative coefficient in the model (-0.008). Specifically, females experience a fall in their health endowments compared to their male counterparts as shown by the negative coefficient. Results are statistically significant at 1% level. We can observe from the third column that being a female doesn't really lead to generating better health compared to being a male in the rural area as depicted by the negative coefficient in the model of -0.008. Results are statistically significant at 1% level.

Results on the second column show that as people get older in rural areas, their health endowments begin to fall as shown by the negative coefficients (-0.0005 and -0.00002). Results are statistically significant at 10% and 1% levels respectively. The age and age squared coefficients in the third column show that as people get older in rural areas, their health endowments begin to fall as shown by the negative coefficients of -0.0005 and -0.00002 respectively. Results are statistically significant at 10% and 1% respectively.

Marital status was found to have a positive influence on obtaining good health in the second column as depicted by the positive coefficient of 0.008. This is to say that those who are married enjoy better health than those who are not married. Results are statistically significant at 5% level. Column three results move in the same line and show that marital status has a positive influence on obtaining good health as depicted by the positive coefficient (0.0083). This is to say that those who are married enjoy better health than those who are not married. Results are statistically significant at 5% level.

Looking at column two, we see that rural dwellers obtain poorer health outcomes as compared to urban dwellers as shown

by the negative coefficient (0.011). Results are significant at 1% level. The coefficient for rural in column 3, is negative (-0.0003). This means that rural dwellers experience poorer health than their urban counterparts. This is to say health outcomes in terms of modern healthcare use are better in urban than in rural areas. Results are however not significant.

These results clearly show that access to modern healthcare facilities has an effect on rural residency.

The interaction coefficient, involving rural residency and modern healthcare facilities use has a negative coefficient as shown on column three. The negative coefficient indicates that health outcomes, in terms of modern health facilities use are poorer in rural areas compared to urban areas in Cameroon (-0.035). We see here that despite the fact that rural areas have greater access to modern healthcare facilities, they do not use them as much as their urban counterparts. Coefficient shows that mere existence of modern health facilities in the rural areas is not enough to improve health status. Results are significant at 1%. This means that modern healthcare use is more effective in enhancing health status in urban than it does in rural areas in Cameroon.

It is worth noting that results on table 7 are basically the same, apart from results for rural residency. This can be accounted for by the introduction of an interaction component, involving rural residency and access to modern healthcare facilities in the second regression. In this case, modern healthcare facilities may be modulating the effect of location on good health and\or the estimates may be contaminated by the endogeneity of access to healthcare facilities[4].

Regression results: Socio-economic determinants of health status in urban and rural areas

From the results on table 8, the variable access to modern healthcare is positive in the urban, rural and pooled samples. This means that access to modern healthcare facilities is likely to be

[4] To settle this problem of endogeneity, a reduced form equation (see Appendix 2) was specified (using access to television at the cluster level as an instrument) from which a residual was predicted (mhresidual_hat2) and included in the structural equation.

health enhancing. Specifically, it shows that those who have access to modern hospitals or health centers and clinics, enjoy better health than those who visit tradi-practitioners and road side Vendors.

Table 8. *The health production function: Dependent variable is health status indicator*

Variables	Urban Model	Rural Model	Pooled Model
Modern_health	0.0500*	0.411***	0.0997***
	(0.0287)	(0.0761)	(0.0246)
Primary education	0.0127***	0.0648***	0.0277***
	(0.00493)	(0.00721)	(0.00366)
Secondary education	0.0236***	0.0444***	0.0299***
	(0.00509)	(0.00661)	(0.00389)
Tertiary education	0.0457***	0.0274	0.0427***
	(0.00831)	(0.0223)	(0.00745)
Female	-0.0237***	-0.0475***	-0.0258***
	(0.00385)	(0.00738)	(0.00318)
Age	-0.000295	0.00332***	0.000662**
	(0.000368)	(0.000551)	(0.000286)
Age2	-2.73e-05***	-6.52e-05***	-3.50e-05***
	(4.93e-06)	(7.36e-06)	(3.75e-06)
Married	-0.0105*	-0.0485***	-0.0148***
	(0.00544)	(0.00997)	(0.00440)
mhresidual_hat2	-0.164***	-0.560***	-0.226***
	(0.0287)	(0.0762)	(0.0247)
Constant	0.850***	0.0682***	0.811***
	(0.0113)	(0.0247)	(0.00899)
Number of obs	29,037	17,523	46,560
R-squared	0.067	0.074	0.067

Notes: Standard errors in parentheses; Legend: *** p<0.01, **p<0.05,*p<0.1
Source: Generated by authors using ECAMIV

Looking at the coefficients of the urban and rural areas for access to modern healthcare facilities, it is evident that access to modern healthcare facilities is more potent at improving health in rural than in the urban areas (0.411 > 0.05). These results suggest that access to modern healthcare services is an important determinant of good health as the study earlier predicted. This outcome could be possibly explained by the fact that government has put in place a number of measures to reduce the health status

gap by increasing the degree of sensitization about the importance of modern healthcare services especially in the rural areas. Such measures include offering of door- to -door vaccination services, free malaria treatment for children and pregnant women, worm medicines offered to families, Subsidizing treatment costs, free hepatitis B tests and giving out free mosquito nets, just to name a few.

The variable primary education is positive in the urban, rural and pooled Samples. Looking at these coefficients in the urban and rural areas for primary education, it is obvious that primary education improves health more in rural than in urban areas as shown by the values of 0.0648 and 0.0127 respectively. The results indicate that people with primary level of education, enjoy better health than those without primary education as shown by the positive coefficients in all three sub samples. The coefficients are significant at 1% level.

Similarly, secondary education was found to exert a positive influence in generating good health. It was found that secondary education is positively related to generating better health in the urban, rural and pooled samples as shown by their positive coefficients. Thus, those with this level of education enjoy better health than those without this level of education. Looking at these coefficients for urban and rural dwellers, we witness that secondary education generates better health in rural than in urban areas shown by coefficients of 0.0444 and 0.0236 respectively. Results are significant at 1% level.

At the same time, tertiary education coefficients are positive and indicate that those with tertiary education are more likely to enjoy better health than those without this level of education. Looking at the coefficients of the urban and rural areas for tertiary education, it is evident that tertiary education is more potent at improving health in urban than rural areas (0.0457>0.0274). The results are not significant for the rural sub sample, but statistically significant at 1% level for the urban area. However, it is important to note that the ability to generate better health increases with increase in the level of education in the urban areas. In the rural areas however, increase in the level of education, leads to falling levels of health status as shown by falling coefficients. This is in

conformity with the materialist theory which states that education is an important determinant of health status.

The Grossman theory equally supports this outcome. It is also confirmed by the study of Eikemo *et al.*, (2008). This result can be explained by the observation that education enables us to get better jobs which can even provide us with health-promoting benefits such as health insurance, paid leave and retirement. On the other hand, those with less education are likely to work in high risk occupations with few benefits (see Ndamsa & Baye, 2013). Education equally provides us with higher earnings. Such income has a major effect on health status and workers with more education usually earn more money. There is also the possibility of acquiring resources for good health by those who are educated. Families with higher incomes can easily buy healthy food, have time and money for regular exercises, and pay health services and transportation. On the other hand, job insecurity, low wages, lack of assets associated with education can make individuals and families more vulnerable during hard times leading to poor nutrition, unstable housing and medical bills that cannot be paid. Education equally reduces stress through high incomes, boosts social and psychological skills important to health (sense of personal control) and social networks that reduce stress and improve health. These persons equally learn about healthy behaviours.

We can observe that being a female is not very imperative in generating better health compared to being a male, be it in the rural or urban areas and the pooled model as depicted by the negative coefficients in the models. From the urban and rural perspectives, the coefficients for female are -0.0237 and -0.0475. This means that females in the urban areas have more improved health than those in the rural areas. Results are statistically significant at 1% level.

The negative and significant relationship between being female and health status is feasible. This could be explained by the fact that depression and mental health issues are slightly higher among women than men. Females are also less likely to pick up well-paid jobs like their male counterparts which can enable them to finance their medical bills and also take care of themselves properly. Given

the greater involvement of men in well-paid jobs and their higher earnings even when the monetary value of domestic and other activities of women are included, they generally enjoy more autonomy and higher social status and purchasing power affects the health seeking behaviour and health outcomes of men than women. Even in terms of physical exercise, females are less likely to be committed. The degree to which women are excluded from schooling and from participation in public life equally affects their knowledge about health problems and how to prevent and treat them. Child bearing equally has a health impact on women. This finding is not in conformity with the study by Kopp *et al.,* (2005). Results equally reveal that females in the urban areas enjoy better health outcomes than those in the rural areas. This can be explained by the observation that urban women are more enlightened and know more about the importance of good health.

Marital status was found to exert a negative influence on obtaining good health as depicted by the negative coefficients in the urban, rural and even the pooled regressions. This is to say that those who are married do not enjoy better health than those who are not married. Looking at the urban and rural areas and their coefficients for those who are married, urban dwellers that are married enjoy better health than their rural counterparts as given by figures of -0.0105 and -0.0485 respectively. Results are statistically significant at 1% level for the rural and significant at the 10% level for the urban areas.

We can also observe that as people in the urban area get old; their health condition deteriorates opposed to younger persons as shown by the negative coefficient. Since the coefficient of age is negative for urban dwellers: implying that as people get older in the urban areas, their ability to generate better health reduces maybe due to vulnerability to diseases. It is however not significant. In the rural areas however, people generate better health as they get older as shown by the positive coefficient. This is opposed to the a priori expectation that health deteriorates as people get older. The results are significant at 1% level. This means that as age advances, health status is better in the rural than in the urban areas from the values of 0.00332 and -0.000295 respectively. Age square (age2) was found to reduce the ability of generating

better health status as given by the negative coefficients in the urban, rural and pooled samples. In the urban and rural areas, as shown by their coefficient, it is evident that age2 is more potent at improving health in the urban than rural areas (-2.73>-6.52). The results are also significant at 1% level of significance.

Age being positively related to health status in the rural area indicates that as people get older, their health outcomes are likely to improve. This can be explained by the fact that people in rural areas have supportive environments that help people to do what is important to them despite losses in capacity. The absence of stressors like pollution and other social ills can also act as enablers to the health of the rural dweller even at old age. This is closely linked to the physical and social environments in which these people live. Moreover, people in these areas usually live on natural food stuff which is also a plus to their health. Also, they combine traditional ways of enhancing health and the modern(see Pantyley, 2017).

Oaxaca and Ransom decomposition results of urban-rural health status gap: Specification for explained and unexplained factors showing urban advantage and rural disadvantage

Table 9a shows the explained component of the Oaxaca-Ransom decomposition. Xu stands for the urban mean, Xr stands for the rural mean, βu depicts the urban coefficient, βr is the rural coefficient while β* denotes the coefficient for the pooled regression. The table shows that up to 83.18% in health status inequalities in urban and rural areas are explained by the socio-economic factors considered in this research. Only 16.82% of this health status gap is explained by factors not mentioned in the model.

Table 9a. *Oaxaca-Ransom decomposition of urban-rural health status gap specification for explained factors*

							Explained
	Xu	Xr	βu	βr	β*	Xu-Xr	β*(Xu-Xr)
Modern_health	0.3949788	0.2671346	0.049993	0.4105341	0.09974	0.1278442	0.01275118
Primary	0.3346764	0.4102037	0.0127247	0.0647826	0.0276668	-0.0755273	-0.0020896
Secondary_educ	0.3526879	0.1743994	0.0235514	0.0443995	0.0299258	0.1782885	0.00533543
Tertiary_educ	0.0714261	0.0106717	0.0457187	0.0274069	0.0427279	0.0607544	0.00259591
Female	0.5099356	0.5123552	-0.0237322	-0.0474965	-0.0257665	-0.0024196	6.2345E-05
Age	22.67156	22.65571	-0.0002953	0.0033207	0.0006622	0.01585	1.0496E-05
Age2	837.4103	936.1116	-0.0000273	-0.0000652	-0.000035	-98.7013	0.00345455
Married	0.2318077	0.2872796	-0.0105041	-0.0485393	-0.0148434	-0.0554719	0.00082339
Mhresidual_hat2	0.0308461	-0.0512048 1	-0.1638405 0.8498134	-0.5602599 0.6820259	-0.2255072 0.8114586	0.0821055 0	-0.01851538 0
TOTAL							0.00442831
% Contribution							83.180242%

Source: Computed by authors

Specifically, modern healthcare facilities, secondary education, tertiary education being female, age, age2, being married increase this inequality by 1.28%, 0.53%, 0.26%, 623.45%, 104.96%, 0.35%, 0.08% respectively. Primary education is the only variable that mitigates in reducing this inequality by 0.21%.

Table 9b. *Oaxaca-Ransom decomposition of urban-rural health status gap: Specification for unexplained factors showing urban advantage (urban adv) and rural disadvantage (duraldisadv)*

	unexplained	components	unexplained	components	
		Urban adv		Ruraldisadv	Raw Gap
	ßu-ß*	Xu(ßu-ß*)	(β*-βr)	Xr(β*-βr)	
Modern_health	-0.049747	-0.01964901	-0.3107941	-0.08302386	-0.08992169
Primary	-0.0149421	-0.00500077	-0.0371158	-0.01522504	-0.02231541
Secondary_educ	-0.0063744	-0.00224817	-0.0144737	-0.0025242	0.00056305
Tertiary_educ	0.0029908	0.00021362	0.015321	0.0001635	0.00297303
Female	0.0020343	0.00103736	0.02173	0.01113348	0.01223319
Age	-0.0009575	-0.02170802	-0.0026585	-0.06023021	-0.08192773
Age2	0.0000077	0.00644806	0.0000302	0.02827057	0.03817318
Married	0.0043393	0.00100588	0.0336959	0.00968014	0.01150942
Mhresidual_hat2	0.0616667	0.00190554	0.3347527	-0.01714095	-0.03375078
constant	0.0383548	0.0383548	0.1294327	0.1294327	0.1677875
TOTAL		0.0003593		0.00053614	0.00532375
% Contribution		6.74897345		10.0707845	

Source: Generated by authors

Table 9b presents the unexplained component (discrimination effect). This effect is divided into the urban advantage (urban adv) and the rural disadvantage (rural disadv). Specifically, the urban advantage of this component makes up 6.75% of the total discrimination effect; meanwhile the rural disadvantage presents a greater effect of 10.07%. In terms of magnitudes, we see that the rural disadvantage is greater than the urban advantage. This depicts a situation of discrimination against the rural areas.

The following table presents their percentage contributions.

Table 10. *The percentage contributions of each component to the urban-rural health status gap*

Component	Coefficient	% Contribution
Explained (E)	0.00442831	83.18
Unexplained		
Urban advantage (Ua)	0.0003593	6.75
Rural disadvantage (Rd)	0.00053614	10.07
Discrimination effect (Ua + Rd)	0.00089544	16.82
Total (E + Ua + Rd)	0.00532375	100

Source: Generated by authors

From Table 10, we observe that the explained component contributes 83.18% of the overall urban-rural health status differential in Cameroon; this constitutes the endowment characteristics. Again, the unexplained component that constitutes the discrimination effect makes up 16.82% of total urban-rural health status differential out of which the rural disadvantage is overwhelming.

Conclusion and policy implications

Conclusion

As seen from the discussion above, socio-economic factors are responsible for creating a very huge portion of healthcare inequalities in Cameroon between urban and rural areas. A smaller portion of health inequalities is explained by the urban advantage and the rural disadvantage, which sum up to the discrimination or unexplained effect which greatly disfavours rural areas in terms of all of these factors. Improving on health status therefore means

there should be outright efforts to reduce this discrimination in terms of socio-economic factors.

Policy implications

Based on the findings from this work some policy implications could include;

Setting up domestic policies targeting training, recruitment, retention and effective deployment of motivated and supported health workforce to rural areas coupled with the development and improvement of health infrastructure in such areas. Qualitative and quantitative improvements of public expenditures related to health and basic infrastructure (portable water, electricity is recommended. The use of these facilities should equally be enhanced.

Need for joint actions between the government of Cameroon, Stakeholders, professionals and international partners to direct policies that will address key issues surrounding rural-urban socio-economic health inequalities improvement involving more educational establishments (especially tertiary institutions) in the rural areas with scholarships. Greater accent should be laid on the availability, use and returns to higher institutions of learning in the rural areas. This will go a long way to mitigate the discrimination experienced.

Making available and at low cost essential medicines. Vaccines and consumables as well as laboratory tests at all levels of the health system should be made affordable for rural dwellers. There should be improvements in access and use primary care for indigenous people. This will lead to the targeting of the rural-poor and vulnerable regions and populations if these and other healthcare reforms are introduced. Above all, the rural population should be sensitized on how important and safe modern health facilities are compared to tradi- practitioners. This is in order to enhance the use of these facilities.

Appendixes

Appendix 1

Table 4. *Descriptive statistics of variables for the pooled sample*

Variable	Obs	Mean	Std. Dev.	Min	Max
Health status indicator	46,560	0.8342053	0.2765408	0	1
Modern_ health	46,560	0.3468643	0.4759772	0	1
Primary	46,560	0.3631014	0.4808989	0	1
secondary _educ	46,560	0.2855885	0.4516991	0	1
tertiary_ educ	46,560	0.048561	0.2149507	0	1
female	46,560	.5108462	.4998877	0	1
age	46,560	22.66559	18.99567	0	99
age2	46,560	874.5568	1353.102	0	9801
Married	46,560	0.2526847	0.4345563	0	1
Mhresidual_hat2	46,560	9.32e-12	0.4669918	-.9609429	.8659186

Source: Generated by author (2019) using STATA 14.2 and CHCS 2014 data.

Table 5. *Descriptive statistics of variables for the rural sub-sample*

Variable	Obs	Mean	Std. Dev.	Min	Max
Health status indicator	17,523	0.8308892	0.2828202	0	1
Access to Modern health	17,523	0.2671346	0.4424759	0	1
Primary education	17,523	0.4102037	0.4918846	0	1
Secondary education	17,523	0.1743994	0.3794634	0	1
Tertiary education	17,523	0.0106717	0.1027541	0	1
Female	17,523	.5123552	.4998616	0	1
Age	17,523	22.65571	20.56343	0	99
Age2	17,523	936.1116	1523.607	0	9801
Married	17,523	0.2872796	0.452506	0	1
Mhresidual	17,523	-.0511145	.4385537	-.7205256	.8659186

Source: calculated by author using Stata 14.2 and CHCS, 2019.

Table 6. *Descriptive statistics of variables for the urban sub-sample*

Variable	Obs	Mean	Std. Dev.	Min	Max
Health status indicator	29,037	0.836205	0.272668	0	1
Access Modern health	29,037	0.3949788	0.4888546	0	1
Primary education	29,037	0.3346764	0.4718854	0	1
Secondary education	29,037	0.3526879	0.4778148	0	1
Tertiary education	29,037	0.0714261	0.2575397	0	1
Female	29,037	0.5099356	.4999099	0	1
Age	29,037	22.67156	17.98393	0	99
Age2	29,037	837.4103	1237.453	0	9801
Married	29,037	.2318077	0.4219941	0	1
Mhresidual	29,037	.0308461	0.480713	-.9609429	.8629906

Source: Generated by author using Stata 14.2 and CHCS, 2019

Appendix 2

Reduced form estimates of access to modern health facilities

modern_health	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
access_tv2_psu	0.094465	0.01515	6.24	0.000	0.0647704	0.124159
improved_SOL	0.016283	0.004924	3.31	0.001	0.0066321	0.025934
primary	-0.06727	0.005777	-11.64	0.000	-0.0785925	-0.05595
secondary_educ	0.015843	0.00681	2.33	0.020	0.0024959	0.029189
tertiary_educ	0.138392	0.011589	11.94	0.000	0.1156772	0.161107
female	0.080936	0.00438	18.48	0.000	0.0723515	0.08952
age	-0.00496	0.000453	-10.94	0.000	-0.0058466	-0.00407
age2	7.16E-05	5.80E-06	12.34	0.000	0.0000602	8.29E-05
married	0.099167	0.006436	15.41	0.000	0.086552	0.111783
_cons	0.252902	0.014897	16.98	0.000	0.2237041	0.282101
					Number of obs =	46,560
					F(9, 46550) =	142.5
					Prob> F =	0.000
					R-squared =	0.0268

Appendix 3

Two-sample t test with unequal variances

```
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |  29,037    .8362065   .0016001    .2726668    .8330702    .8393429
       1 |  17,523    .8308892   .0021365    .2828202    .8267014    .8350769
---------+--------------------------------------------------------------------
combined |  46,560    .8342053   .0012816    .2765408    .8316934    .8367173
---------+--------------------------------------------------------------------
    diff |           .0053174   .0026693                .0000855    .0105493
------------------------------------------------------------------------------
diff = mean(0) - mean(1)                                      t =   1.9921
Satterthwaite's degrees of freedom =  35879.5

                                               Ha: diff > 0
Pr(T > t) = 0.0232
```

The difference (mean of urban minus mean of rural) is significant at 5%.
The test shows that there exist a significant difference between the health status of.

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5 Valorization of the cassava economy as a social livelihood between Bonaberi to Souza in the North-West of Douala-Cameroon

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Introduction

The modern society is characterized by a multitude of activities which shape and model geographic territories according to the socio-cultural characteristics of the locals. Cassava cultivation in Cameroon just as in most parts of the developing countries has generally been on an increase as far back as in the 19th century where technological developments were not well advanced and many operations were been done manually. The advent of the industrial revolution saw great improvement in the agricultural sector and the industrial sector. As time unfolds giving rise to more discovery, new varieties of cassava were discovered and modern tools to process the cassava were equally

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discovered (Fregene, 2003). In some parts of the world like in Brazil and Costa Rica, the cassava economy has recorded great improvements thereby pulling more attention from other actors into the sector (Bhikaji-Khandare, & Pholwat, 2019). The economic crisis of the late 80s laid more pressure on local government making this latter to be unable to adequately cater for its citizens who have been left in a situation of survival of the fittest or better still the struggling for existence. Cassava being a widely cultivated food crop in the tropical zones and more precisely in the North-West of Douala has become a staple food crop cultivated in this study area due to its perennial nature and its nutritive values. Njukwe *et al.,* (2012) holds that this energizing food crop secures the livelihood of the locals who mostly practice a subsistence farming method due to its perishable nature. Closely linked to this is the PNDRT (2005), which gave an estimate of the cultivable surface area of about 204,548 hectares including an annual production of about 2.3 million tons. Though the cassava economy is highly valorized in this study area as a social livelihood, it as well faces a lot of challenges just as Bakia *et al.,* (1999) outlined some of these challenges to be the paralyzed communication network systems and the poor organization systems generally witnessed.

Methodology

Choice of the study area

The study area is located between latitudes 4º25′ N to 3º 99′ N and longitudes 9 º 50′ E to 9 º 76′ E. It is found in the North West of Douala metropolis between Bonaberi to Souza. These areas are found between two major Divisions; the Wouri with the study area in the North West engulfing Bonaberi and its neighbouring quarters, and Mungo, with its study area in the South enclosing Souza and Dibombari and her neighbouring ethnic groups. The chosen area of study finds itself at the interface of an urban and a rural milieu called the suburban area. The study area is shared into three geographic units: urban, suburban and rural, within which are found three subdivisions Douala IV, Dibombari, and Bonaléa subdivisions. This study area shares boundaries to West with the Atlantic Ocean, to the East by the Wouri and some part of the

South West region of Cameroon and to the North by Mbanga and Yabassi Sub Divisions. The fieldwork permitted this area to be further divided into quarters and villages where the cassava activity is practiced in small and in large scales (Engwali & Temkeng, 2017; Watana & Reinhardt, 2018).

Data collection

Primary data were collected through field observations, questionnaires were administered to the producers, consumers and traders, and interviews were conducted to individuals and groups of individuals. Secondary data were obtained from the Regional Delegation of Agriculture and Rural Development, Regional Delegation of Property and Land Affairs, Regional Delegation of Forestry and Wild life, Regional Delegation of Environment, Nature Protection and Sustainable Development, Regional Delegation of Public Health, Douala urban council. Social data from in-situ observations, investigations and interviews were treated in accordance to thematic approach; implying that it groups information according to a well-defined plan. Physical data were treated according to their nature to verify the genuineness of the existing data. The data were later analyzed following a horizontal and vertical approach in a systematic and transversal manner. The spatial analysis took into consideration the repartition of the study area into geographic units while considering the demographic composition of the population, administrative delimitation and socio-cultural characteristics of the locals.

Results and discussion

The socio-cultural characteristics of the population

Population composition

The town of Douala being the economic capital of Cameroon exercises great influences on its territorial composition both the central business district and the suburbs undergo transformation in time and in space. Just as the entire town of Douala is said to be a cosmopolitan town, so too is the area between Bonaberi to Souza. The cosmopolitan nature of this area (Bonaberi to Souza) owes it

origin from migration (international migration, inter-urbanism, inter-regional migration and rural exodus) and from demographic explosion. This area has been witnessing an unprecedented increase in population size which is first of all accounted for by demographic growth.

The demographic growth has revealed to be the major factor of increase in population size over the years. Unlike the pyramid of population structure in developed countries, that of this study area squarely respects and represents the pyramid of age structure in developing countries known as regressive pyramid of age structure. Children, teenagers and youth account for the majority of the population and the youth are the main force in economic development.

The aged population are mostly the natives, followed by some allochthonous population who happen to own an estate or were born and bred and others who live temporary paying rent.

The study area between Bonaberi to Souza reveals a situation of dynamism mostly caused by the migration population from different ethnic backgrounds, region and countries. The table 1 represents the various areas of origin of the population in study area.

Table 1. *Population origin in the North West front of Douala*

Origin	Maroua	Garoua	Adamawa	West	Centre	North	South	Littoral	East	South	Foreigners
Percentage	1	2	3	13	2	14	13	45	1	2	4

Source: fieldwork 2019

From the analyses of the field works, it is realised that the youths are the main strata of the population who are actively engaged in the various stages of production-processing and commercialisation (PPAAO, FIRCA 2013). This is so because they are the most energetic and dynamic than the children and the aged population who are rather fragile. The male accounts for less than 50% of the total population while the female outweighs, this gender inequality set the pace for the male to over-exhaust

themselves in both physical and psychological labor. The situation of unbalance between the masculine and feminine population as noticed on the field is accounted for by: the heavy and tough duties carried out by the masculine population, engagement in high risk operations and other biological reasons.

Due to the background of the male youthful population energetic and dynamic, not leaving out the unbalance of sex, the male youthful population is seen operating several focus at a time in a day.

Population involved in the various stages

The first phase of cultivation known as the planting stage is mostly carried out by the female population and they do the upkeep till maturity where the tubers would be uprooted. This phase of uprooting is mostly done by the young energetic population with the use of machete and others farming tools. The peeling phase is done by all the age groups.

Transportation is usually done in two stages; the first is form to park (collection point) loaded in bags and transported on the head; secondly, from the park to the processing point (home) transported on motorcycle, vehicle, trucks and bicycle. It should be understood here that transportation on head to processing point is only possible with short distances and most farmers prefer to peel the cassava at the cultivation site or the park to reduce transport cost and draw close to the notion of weightless products.

Considering the multiplicity of tasks imposed by the cassava products, the actors in this sector are obliged to have and engaged many family members to ease the job and in cases where the family structure is small, the local actors are obliged to hire labor for the cumbersome processes. It is from this fact that many youth have become hired-men to perform one or two tasks in the process. More over the demography study of the population reveals the percentages of school attainment levels of primary, secondary and high levels which stand at about 30%, 60% and 10% respectively. This reveals a situation of stagnation and very little changes in this sector since the majority lacks sound education and skills to boost the sector. Furthermore, the socio-cultural analysis from the field

work unveils some pertinent details about cassava economic which are summarised in the table 2.

Table 2. *Percentages of population involve in the cassava economy*

% of pop involved in production		% of pop involved in cassava processing	% of pop involved in commercialisation
Ownership=38%	Tenants=47%		
85%		90%	80%

Source: fieldwork 2019.

From table 2, out of 85% of the total population involves in cassava cultivation, 38% are those who own lands which were obtained either from heritage 15% or from direct and/or indirect purchase. The tenant average to 47% comprising of individual tenants 30% and grouped tenants 17%, this latter mostly comprised of social groups/associations or family members and friends practicing amalgamation in their business. It is noted that not all the actors involved in cassava cultivation proceed in processing it. The next phase is processing which represents 90% of the total population engaged in cassava business. The increasing numbers of actors from 85% (those in cultivation phase) to 90% (processing phase) is due to the fact that some farmers cultivate and do not process it while other actors come in just to buy the crops from the farms and process them. Commercialisation in the cassava economy represents 80%, this takes into consideration the two phases of the system. This is so because some people sell directly from farm to processor while others process themselves, selling still go on during the processing stages. Each producer is the first consumer of cassava and its products hence, it would be judicious to give the consumption percentages of each cassava product mostly consumed in the North West of Douala.

Table 3. *Percentages of cassava products consume in the North West front of Douala*

Consumption varieties	Boiled cassava	Gari	Baton,bobollo, myondo	fufu	Cassava paste	starch	flour	mintumba	Water fufu	beignets	kwem
%	5	15	30	2	3	3	7	7	20	3	5

Source: fieldwork 2019

The data from field investigations presented on the table place *Baton, Bobolo* and *Myondo* as the most consumed cassava products in the field of study being 30%. The local population is addicted to this and it is part of their socio-cultural lifestyle in the area. The second widely consume cassava product is *water fufu* being 20% and later by *Garri* 15%. The local populations prefer this first set of cassava product to boiled cassava (5%), cassava paste (3%), etc because they derive more satisfaction from them than any other cassava product (USAID/CORAF/SONGHAI. 2011).

Socio economic characteristics

The main economic activity in the north west of Douala between Bonaberi to Souza is agriculture. Agriculture, mostly the peasant type has never been the dream of many respondents but due to the persistent economic crisis couples with very high demographic growth rates leading to massive unemployment and underemployment in mostly the urban area, the population have adopted what they called "plan b" also known as a substitute plan by adapting themselves to the realities of the society. The cassava economy which has been neglected in the past now comes in through its valorisation as an indispensable remedy to the challenges of the society (Kehinde & Aboaba, 2016).

Cultivation pattern

Unlike the VON THUNEN model of agricultural practices, the field work presents a situation of increase and intensive cultivation of cassava toward the interior than at the centre or toward the main road. It is realised that beside the main road and the centre of

localities, farm sizes drastically decrease to less than one hectare while the sizes increase toward the suburb. This situation is accounted partly due to the fact that many unemployed leave the centres to cultivate cassava in the interior; it is also because many of the locals and those out of this study area prefer to invest in the suburbs than at the centre. The figure 1 represents the cultivate pattern of cassava in the north west of Douala.

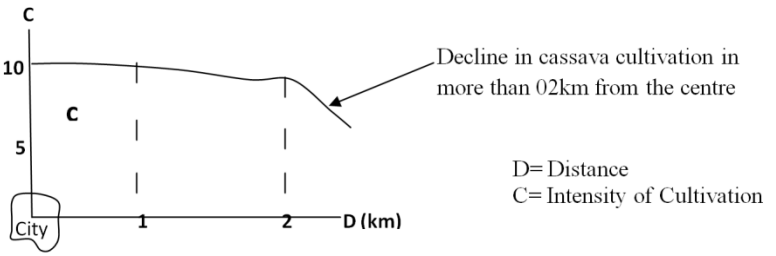

Figure 1. *Decline of cultivation with increase distance*
Source: fieldwork 2019.

The figure represents the correlation between the intensity of cassava cultivation (C) and the distance factor (D) from the centre to the interior.

Any increase in distance from 500m-1km would obviously leads to increase cultivation from 01-02 hectares, but any increase in distance above 02km discourages cultivation. The graph shows that cultivation is high at 10 units when the distance is less than 01 km to the centre but any further increase above 02 km leads to decline cultivation since extra costs eat the marginal profit. Moreover, as distance increases from the centre to the interior, so too is labor which becomes more intensive to meet up with expenses like transportation of crop. It is worthy of note here that cassava cultivation at the centre is mostly practice by land owner who do not want to cover great distances but give out their farms located in distance areas for rent. On the other hand, tenants prefer to rent farm lands located in the interior due to their moderate costs. A farmer (tenant) prefers to go into the interior and rent a piece land of about one hectare for 50 000FCFA/year than to rent the same number of hectare at the centre and pays 100 000FCFA/yr. More than 75% farmers prefer to cultivate in the

interior than the centre because the soils in the interior are more fertile and productive than the over used and heavily leached soils at the centre. This preference is further justified by the fact that they are rational human beings who want to maximise profit and minimise cost. Considering the analyses of the realities from the field on the cultivation pattern and more, it is clear that the cassava economy and its practice systems fully respect the Sinclair's model.

Farming system

Considering the socio economic background of the farmers in the north west of Douala between Boneberi to Souza, most farmers are from poor economic background couples with illiteracy rates which do not permit the farmers to carry on heavy investments of millions of thousand. As a result during preparation; clearing, bush burning and gathering are the main stages involved before tilling and planting the cassava which have been cut into about 10 to 15cm length. This stage is also accompanied by the selection of varieties of cassava species which would be planted to obtain better yield (Ricardo, Tesfamicheal, & Dung, 2017). The fallow system of cultivation is mostly practiced in the interior than at the centre due to availability of land in the interior. Farmers cultivate cassava on a piece of land for about two to three planting seasons and later abandon the area for another, thereby permitting the land to regain fertility. Closely associated to this system is shifting cultivation system. Here a farmer cultivate cassava on a piece of land for about 1-2 planting seasons and moves to another portion to cultivate it. In this case the cassava stems are easily transported from one portion of the farm to another. The last and most practiced farming system in this study area is mixed farming system. Mixed farming system is practice at the centre as well as in the interior. Here, the cassava is most grown with crops which take barely 3-4 months to get ripe and harvested so that the crop shouldn't end up dying as the cassava start spreading. The figure 2 below gives the types of farm systems practice in the study area

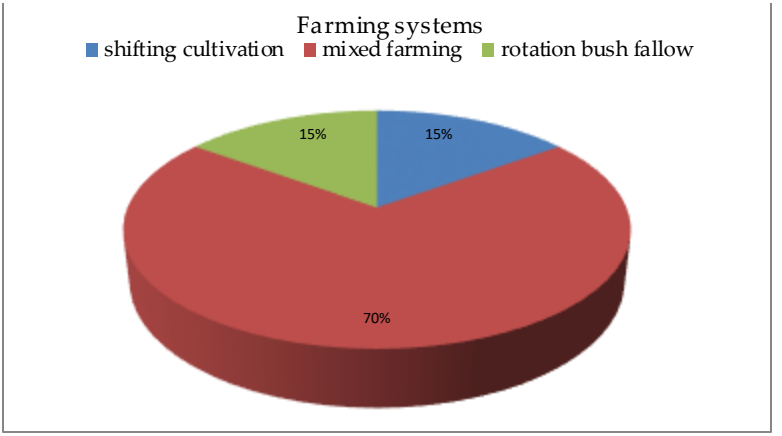

Figure 2. *Farming types in the North West front of Douala*
Source: fieldwork March 2019.

Field investigations revealed that mixed farming system is widely practiced at about 70% in localities between Bonaberi to Souza. Cassava is grown alongside other crops like maize and groundnut which generally takes 03 months to attain maturity before harvesting begins. This system is largely practiced in farm plots of less than 01 km from the settlement areas. Shifting cultivation and rotational bush fallowing is practiced mostly in distant farm areas of more than 01 km from settlement zones.

Production capacity

The supply of commodity has always been in function to the prevailing price in the market just as the second law of demand and supply stipulated. The valorisation of cassava as the staple food by more than 80% of the entire population of Cameroon in general and the population of the north west of Douala is already a major factor which goes a long way to ignite production capacity, the cassava cultivated in this study area is not only consume locally but it is equally exported to other countries like Gabon, equatorial guinea etc. The high demand from within and out of the country directly affects supply, further leading to a chain effect of increase production, increase farm sizes and increase use of farms inputs (Scott, Rosegrant, & Ringler, 2000). Cassava is cultivated throughout the year but the main cultivation periods begins in the

month of January with the preparation of farm lands using cutlasses, hoes, rakes, sticks, etc..., and planting begins in the month of March/April to the month of August/September. Harvesting of cassava is done one year or one year two months after planting. Just as the cultivation is practiced throughout the year, so too is the harvesting carry out throughout the year. The intensity of harvest increases with increase needs of the local populations, thus, farmers harvest in large quantities in the months of July and August against school reopening in September and in October, November and December against the end of year feasts. The capacity of production of a given plot depends on other factors such as; soil fertility, farm size and chemical fertilizer input. On average, production per hectare is between 8-12 tons though the number of tons can decrease below the average due to pest invasion and climatic influence through temperatures and precipitations.

Unlike the rainy season (especially from March to October) where large quantities of cassava are harvested and sold at relatively low prices, the dry season (especially from November to February) records decrease in quantity harvested and sold at relatively high prices due to the high demands on the local markets couple with limited supply as the ground become dry rendering harvesting difficult.

Contribution of the cassava economy to the social welfare of the locals

Studies have proven that the development of a given locality depends on its resources which are: physical (natural resources) and human resources. The natural resources in this study does not consider fossil fuel but it's centered on cassava cultivation while the human resources refers to the actors involve in the various chains of production, processing and commercialization. The above statement is valid in the North West of Douala between Bonaberi to Souza because the cassava economy has greatly contributed and positioned this study zone to the present state of socio-economic development. The development aspects which shall be examined in the subsequent paragraphs would mainly

emphasized on infrastructural development and socio cultural development which all portray a tendency of valorization leaving from the interior to the center.

Infrastructural development

The infrastructural development resulting from the valorization of the cassava economy as a social livelihood shall be explained under two subheadings: construction of building, improvement in communication lines, etc (Oladele, 2014).

Construction and amelioration of building.

Speediness in house construction within the interior of the study area has been very remarkable as the local actors valorize the cassava economy to be their social livelihood. Result from the field shows that an average number of about 100 houses/year are built in the interior compared to about 50 houses at the center. This simply means the construction of houses is more accelerated in the interior than at the center; hence, the construction process is extending toward the center. This tendency of more newly constructed houses from the valorization of the cassava economy is accounted by the population preferences. Some respondents acknowledged that they constructed in the interior due to the fact of nearness to the source of raw materials. Since cassava is a weight loss product; locating close to the source of raw material would be a reasonable potion to any rational human being. Given the insufficient financial resources available to the local actors, they prefer locating near the supply source where they would easily process the goods without endorsing heavy costs.

Moreover, this tendency of house construction extending toward the center is usually observed when an individual sets up a structure in the interior and provide basic necessities like water and electricity, what follows next is that in less than no time others individuals starting his perimeters would equally set up structures in a vertical and horizontal order toward the center.

Furthermore, the valorization of the cassava economy as a social livelihood is proven in the house structures and the settlement patterns. Part of the profit made from the cassava economy is used not only to construct new houses but to

rehabilitate, ameliorate house quality and house sizes. As a result of the cassava economy, house structure is taking a different tendency from horizontal construction to vertical construction. Some local actors have completely changed their ideology on construction models though with limited means they now opt for vertical growth especially those with a reasonable amount of money. The cassava economy has equally seen the rehabilitation of former structures which have been neglected, abandoned and dilapidating due to lack of sufficient finances.

Today, some of these structures which have been rehabilitated from the interior to the center are breathing since the rehabilitation works privileged durability of the structures. The local actors of the cassava sector now go in for durable construction materials of high quality rather than low quality and temporal materials. The changes observed from one year to another are explained by the rate of valorizing the cassava economy by the locals. This means there is a direct proportional relation between valorization and house quality beginning from the interior to the center. The change from single room to studio is mostly practiced by tenants and to a lesser extends by landlords while the change from studio to an apartment concerns both tenants and landlords. The rest of the changes are performed essentially by landlords and to a lesser extent by the tenants. It should be understood here that most of these changes are done in function of the family size and desires.

Construction of other structures

The valorization of the cassava economy has further led to the proliferation of many structures such as church building, private health center, private schools, and construction of warehouses and restructuring of local market. More than 20 church buildings have been constructed by Christians who are actors in the cassava sector. They usually mobilized in groups to cultivate or process and commercialize cassava for such development projects.

Individuals and family members often engage in this sector in order to realize a project either in the education or in the health sector. It is from this angle that the proliferation of private institution of learning has today records a total of at least 40 establishments. Moreover, the market structure is not left out from

this infrastructure development. Basing on the fact that the cassava happens to be the population' staple food and its high rate of valorization, a good section of the local markets in Bomono, Nkapa and Souza has been constructed and reserved for cassava alone.

Communication lines

Looking back in some 10 years one can easily notice the high magnitude of poor and degradative communication lines linking the interior to the center, farm to market and linking other communities. At this time, communication systems were poorly developed, natural and human barriers could not permit easy circulation of goods and services within the study area. However, the increasing rate of valorizing the cassava economy has led to great improvement of communication systems especially roads and bridges. The local population as a result of the importance given to the cassava economy; has from time to time been engaged in road rehabilitation at a local level. This informal rehabilitation works of both the main road and the secondary roads mainly concern the use of local tools such as: spade, cutlass, hoe, rake, digger, bucket, trucks and wheelbarrow; to do infilling of potholes. The respondents equally confirmed that they at times make use of modern machines like the caterpillar to create roads leading to their farms.

In areas where crossing a particular point is a challenge the population rehabilitate and construct bridges though they are usually temporally made with planks, sticks and stones to permit easy cross over with the cassava. The realization of these projects from the interior to the center is mostly done with money from the sale of cassava.

Socio-economic development

On the socio economy plan the valorization of the cassava economy as a social livelihood has led to unforetold advantages on the field of study.

Increase in general living standards

The populations in the North West of Douala just like those in many other societies have a basic challenge which is to satisfy some elementary needs. These needs are in order words called physiological needs by Maslow. According to him, every individual irrespective of his status seeks to satisfy the first need which is found at the bottom of the pyramid of hierarchy need; the needs are mainly: food, water, air and light…etc. Considering the economic crisis at hand and the recent plague which destroyed good species of coco yams and worsen by demographic explosion, the population are living no-stone-unturned by seriously valorizing the cassava economy as a social livelihood. Cassava is not only a staple food in this study space but it is also a highly enriching food which is consumed in various forms. Cassava is one of the few crops whose leaves and roots serve as food and the stew is re-planted for the vicious cycle to proceed.

The valorization is also enhanced by the fact that cassava is a consistent foodstuff; the sad truth is that majority of the Africans in general and more than 95% of the total population in this study area prefers eating qualitatively. Some respondents considered first of all that this study zone is an urban zone (26%), to others it is a periurban area (40%) and the last group considered it to be a rural setup (34%). The interviews which those respondent who considered the study space to be rural or periurban that some of the locals have made to their mind to stop eating consistent quantitative only when they shall settle in an urban center and having sufficient resources to meet up needs.

Investigations revealed that more than 70% of households in the North West of Douala eat cassava every blessed day. Such high consumption rate is justified by large family sizes which can further be explained by the polygamous marriages, six children on average per family and the present of relatives and friends in a household. As the standard of living is improving as a result of the cassava economy, cost of living on the contrary is decreasing because people can meet up basic need and can fulfill the first desire on the Maslow pyramid of needs (Nareenat, 2006).

It should however be noted that despite the economic crisis and demographic explosion at the moment, the general living standard

are rather increasing. This reverse situation is valid in the sense that the producers make money from sales, traders make money from purchase and consumers consume varieties to their satisfaction. Part of the profit from the cassava economy is used to buy house equipment and appliances such as: TV, fridges, grinding machines…etc. This gives a direct proportionate relation of" the more the cassava economy is valorized, the more standard of living increases".

Furthermore, the valorization of the cassava economy in the North West of Douala between Bonaberi to Souza has led to increase use of mobile phones even in the most remote areas people can communicate from far distances. Today every eight (08) or ten (10) houses has at least a mobile phone in the study area. Closely linked to the above is the increase number of Moto-cycles, bicycles, vehicles and grinding machines. Most of these elements listed above came as a result of the cassava economy and they are still used in the continuity of the process to better the social welfare of the actors.

Increase literacy rate

The populations in the North West of Douala have made that statement which reads "education is the key to success" to be their motto. Unlike in the previous years where very high rate illiteracy was reigning, just of recent with the valorization of the cassava economy as a social livelihood, the desire for knowledge and wisdom is seriously gaining ground in this study area. As a result, the rate of illiteracy has been drastically dropping; that is to say there exist an inverse relation between the rate of illiteracy and the rate of literacy. The literacy rate increases due to the presence of more schools more from private sector. The increase in the number of schools is also accompanied by increase in the number of teachers and students in quest for knowledge. It should be retained here that most of these private schools were constructed with funds which came directly or indirectly from the cassava economy. Once in school, the students are obliged to pay school fees and given that more than 90% of their parents are involved in the cassava economy, it is very obvious that money they gain from the cassava economy would be used to sponsor the children.

Moreover, the education of the inhabitants is not only limited within the school milieu but it extends out from the school premises to other spheres in the community. The local churches which were built mostly with money from the cassava economy equally contribute in educating the population through bible studies, seminars and conferences. Individuals, groups, association and NGO equally participate in educating the population through the organization of seminars and others important programs. Some examples are educative programs to farmers. The government of through the provision of free primary education has also contributed in reducing the rate of illiteracy. Another impact of the cassava economy through education is that the local populations are now able to manipulate technology devices with ease. For example instance; the number of android phones which were bought with money from the cassava business are been manipulate by children, youth and adult without stress other devices like; TV, machine and appliances are now easily manipulated by population whereas this was taboo in the past since the rate of illiteracy was high and cassava economy valorization was low.

Conclusion

This paper elaborated from different perspectives on the fact that cassava is the staple food of the population in the North West front of Douala and the livelihood of this population depends largely on the production and commercialization of cassava and its varieties. Cultivation and harvesting are carried out throughout the year though with specific variations in different months and production per hectare of land depends on other physical and human factors. Productivity also depends on stakeholders' logics and strategies on the majority smallholder scheme of practices. The cultivable product serves for home consumption, commercial purposes and further contributes to the GDP of the country (Renkow & Byerlee 2010; Iyasere, 2015). The contribution of the cassava sector to the livelihood of the local populations is not only limited to home consumption but equally propels social and infrastructural development of the local communities which hitherto were lacking behind. Civilization has gained grounds as social awareness is uprising; illiteracy rate is drastically reducing

with the proliferation of lay private schools, road networks are being rehabilitated to easily transport cassava. Considering the progress made already in this field of study from the cassava sector, more progresses of higher magnitudes are expected in the nearest future pending huge investment in the sector to move from smallholder scheme and peasant type of cultivation to industrial cultivation type.

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6 Malaria, labour productivity and poverty in Cameroon

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Introduction

The health of the population is a key factor for labour productivity, poverty reduction and overall economic development. Healthier workers are physically and mentally energetic and productive; they tend to earn higher wages and less likely to be absent from work due to illness (Bloom, Canning & Sevilla, 2004). The links between health, economic productivity and poverty have recently become a significant issue to policy makers (Tompa, 2002). Diseases including malaria constitute both a public health problem and a social problem. Malaria adversely affects individuals, families and the entire economy. It has a significant effect on human capital accumulation, and a negative effect on growth.

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Malaria has a direct impact on household's income, wealth and labour productivity. This negatively impacts on economic growth and leads to poverty (McCarthy & Wu, 2000). Malaria kills millions of people in Sub Saharan Africa daily with the most affected of the population being women and children. In 2009, 781,000 persons died of malaria with 85% of this population from Sub-Saharan Africa with children being the most affected (WHO, 2010). Among other Sub Saharan African countries, Cameroon is well known for the high prevalence rate of malaria, which is a leading cause of morbidity and mortality in the country (Cameroon Coalition against Malaria, 2008).

Country-specific evidence shows that malaria is a major public health problem in Cameroon, with transmission or prevalence in almost all the regions. This is a strong evidence that malaria is the deadliest tropical diseases and stand out as a major hindrance to African economic development (Sachs & Malaney, 2002). It retards investment by discouraging tourism and multinational corporations from setting up their firms in malaria endemic zones and demobilises the economically active population in endemic zones. It was estimated that malaria is responsible for an average of 1.3 percent reduction in economic growth annually and costing the government some $8.8 million yearly (Johnson, 2012). Though, government has made significant efforts in solving malaria related problems, its magnitude keeps increasing (Johnson, 2012).

In present-day Africa, malaria is understood to be a cause and a consequence of poverty and a major constraint to economic development at micro and macro levels (Gallup & Sachs, 2001). Poverty also leads to poor health outcomes, low levels of education and a fall in labour productivity. An analysis of the poverty situation in Cameroon reveals that most Cameroonians are unable to afford basic needs such as food, shelter, clothing and basic health care. Poor health outcomes may result from undiagnosed and poorly treated episodes of the malaria illness. The estimated poverty level in Cameroon which is as high as 29.9 percent (National Institute of Statistics, 2010) can be attributed to many factors which affect the socio-economic status of the country among which is the endemic nature of the malaria scourge with its debilitating effect on labour productivity. This leads us to argue

that a bi-causal relationship may exists between malaria and poverty. Against this background, this study undertakesan empirical examination of the nexus between malaria, labour productivity,and poverty in Cameroon.

The next sections of this paper is designed as follows: section 2, focus on the literature reviews, section 3 presents the methodology and the data description is done in section 4 while section 5 present the findings and section 6 concludes the paper.

Literature review

Economic theory establishes two channels by which health status affects individual's earnings. These are the effect of health on wage rate and the role health plays in the decision relating to the supply of labour and equally decisions relating to the number of hours of labour supplied. Grossman (1972) describes good health as a produced commodity, which is consideredas part of human capital and as such determines the amount of time individuals spend on productive activities in both the market and non-market sectors. The individualdemands health capital up to the point where the cost of its additional unit, is equal to the value of additional time available for productive use, plus the utility of being healthy that an additional unit of good health creates, (Grossman, 2000).

Jacobson (2000) extended the Grossman's (1972) framework to include cooperative relationship within the household in the collective model of household functioning. This framework suggests a family utility function that does not explicitly reflect potentially conflicting or non-cooperative preferences among family members. Furthermore, this framework assumes that families will allocate health investments up to the point where marginal benefits equal the net marginal cost of the health capital. There exists a causal relationship between the cost and benefits of health, in terms of increase in productive potential. This follows improvements in health, as a change in productive potential, thought of as outward movement of the individual's transformation curve between market earnings and, marginal productivity of labour and leisure (Baldwin & Weisbrod, 1974).

Health of the population is a key factor for labour productivity, poverty reduction and overall economic development of a country. Healthier workers tend to be physically and mentally more energetic and robust, productive and henceearn higher wages. As such they are less likely to be absent from work because of illness (or illness in their family) (Bloom, Canning & Sevilla, 2004). Most recently, the links between health and economic productivity have become an issue of significant policy concern (Tompa, 2002).

Good health therefore, can increase household income and national economic growth. On the other hand, poor health inflicts pains and sufferings, which affect the welfare of individuals and the society at large. Given the stock of physical capital, land and other complementary resources, the productivity of a worker depends on the quantity and quality of various components of human capital embodied in him. Health is an important determinant of labour force participation and productivity besides some other unquantifiable factors like innate ability and motivation. Health is directly affected by nutrition, housing, clothing, personal and medical care etc. The nutritional deficiencies and thus poor health especially due to malaria would adversely affect the capacity of an individual to carry on sustained and prolonged physical activity and thus reducing their level of productivity (Dhesi & Dhariwal, 1990).

Equally still, the link between malaria and productivity has been shown by Klarman (1965), Leighton (1993), Goodman, Coleman & Mills (2000) and Shiflet & Shiflet (2002) who assessed this relationship and conclude gains from good health include opportunity to work maximally without being interrupted by illness, greater opportunities to obtain better paying jobs and longer working lives. These factors combine together to increase both short and long - term productivity of individuals. Generally, accepted measure of productivity is earnings, with wages and salaries.

Poor health resulting from malaria episode, directly affects individuals output and income. It however impairs the individuals' productive capacity and the demand to work. This may most probably translate to reduce income and even to extreme poverty, which directly leads to poorer health status. Loss

of productivity includes inability to work to maximum daily capacity, complete absence from work, and a drop in the number of hours dedicated to work especially at the onset of the illness.

The effect of health on productivity seems to be complex. Efforts have been made to determine the effects of malaria (health) on individuals and households. This analysis has received great attention in recent years (Frank & Mustard, 1994; Hamoudi & Sachs, 1999; and Bloom *et al.*, 2001). Health impacts directly on household income and wealth, labour productivity as well as on labour force participation. Weisbrod *et al.*, (1973) equally affirms malaria diminishes a worker's productive capacity for a given number of hours worked. He measured worker's actual productive capacity by their earnings, which comprise the type of job done and number of days worked per week.

Ryan & Wallance (1986) found out that health has a significant positive effect on males but not on female wage rates. Records also show that of all tropical diseases malaria singly slowed down economic growth in Africa by 1.3 percent each year (WHO, 2005). These estimates includes loss of work efficiency and time leading to loss in income earning capacity, family welfare, premature deaths of children and the non-improvement of living standards for future generation (Morrow, Smith & Nimo, 1982).

Malaria affects the economic status of households through days off from productive activities. Studies on the effects of malaria on labour productivity yield varying results. Some researchers have argued that malaria reduces agricultural production by reducing the working capacity of farmers (Brinkmann & Brinkmann, 1996; Gazin *et al.*, 1988; Wernsdorfer, 1980) while others have found no effect on agricultural output (Audibert 1986). The difference in results could be explained by variations in study methods and context. However, it is generally accepted that malaria affects the quality of labour (and hence productivity) during acute attacks.

Even though an acute malaria attack might not prevent people from working, it can reduce the quality of productivity and output (Goodman *et al.*, 2000). Hong (2005) argues that increased exposure to malaria infections significantly reduce labour productivity of migrants by 8.9 percent compared to when they are healthy. Hence the labour productivity of infected persons when they return to

work would not resume at prior levels. Therefore, the economic loss from lowered productivity would be substantial most especially for labour intensive occupations that require physical strength. He further concludes that malaria's economic burden extend far beyond direct measures of income loss, considering the reduction in labour productivity over their lifetime. Malaria therefore, has an effect on labour supply and productivity of workers when working though the measurement of worker productivity and is often difficult to capture this when worker performance is not directly tied to an observable output as in piece rate work.

Methodology

We assume a household utility function following Deleire & Manning (2004), which has health, household consumption, labour and leisure as major components. The general form of this is given as:

$$\text{Max } U = U_j (H_j, X_j, l_j, Z_j) \quad (1)$$

Where H_j is the stock of health allocated to each household member, Z_j represents leisure, l_j represents labour market activities by household members, X_j represents non-health related consumption in the household. The equation above is subject to three main constraints which are earnings, household time available for labour market activities such that the effect of malaria will be felt by the duration of the illness or the number of days lost to illness and the health production constraints. From the above, the wage rate constraint is given as:

$$W_j = \beta_j Y_j \quad (2)$$

Y_j is the monthly earnings of households and W_j represents wage rate of households.

The second constraint is given by:

$$T_j = l_j + Z_j + P_j \quad (3)$$

and the third constraint is given by:

$$N = N(C, G, \varepsilon_1) \quad (4)$$

Long-term health status might be approximated by body mass index (Glick & Sahn, 1998). Equally health status may be influenced by current inputs to health, I.

$$h = h(I, N, \varepsilon_2) = h'(I, C, G, \varepsilon_2) \quad (5)$$

Where ε_2 is the second error term and h(.) could be viewed as a dynamic structural equation and h' (.) is the final form for health production. Following equation (1), the logarithmic form of an individual's earnings per hour worked, W which is a proxy for labour productivity is related to acquired skills, given by education, E, and age, X, the objective heath status h^* measured by duration of illness and finally the household size Z.

$$W = w(E, X, h^*, Z, \varepsilon_3) \quad (6)$$

Model specification

In studying the link between malaria, labour productivity, and poverty, two basic models were specified and the causality between malaria and poverty were also considered.

Drawing from Mwabu & Fosu, (2007) in calculating the economic burden of malaria in Kenya, the malaria variable was aggregated at the household level (that is given as number of malaria patients/non-affected malaria patients). According to Mwabu & Fosu, (2007), the general model for the impact of malaria on poverty is given as:

$$Y = h(S, V, M) \quad (7)$$

Where; Y represent the household expenditure per capita, S, the number of years of schooling of the individual, V, is a matrix of covariates representing the demographic characteristics of (age, sex, household size, and residence location) while M represents

malaria prevalence at the individual level (dummy indicating whether an individual has malaria or not).

From the general model above, the major problem is that, it ignores the duration of illness and other variables used in measuring household poverty. These are very important variables required in our case. The duration of illness for instance helps us to know the length of time an individual or member of a household suffered a malaria attack and how it affects the income of this particular individual or household. Mwabu & Fosu, (2007) however, based his analysis at the individual level but due to the nature of our study, we base our analysis at the household level. Secondly, we make use of variables describing households' characteristics (sex and age of the household head), human capital variables (years of schooling), areas variables (rural versus urban) as well as other socio- economic variables such as cost of treatment and the sector of consultation used by the patient. Drawing from Tabi (2009), the following equations are estimated in this study:

$$\log Y_{1i} = \alpha + \beta_1 malattack + \beta_2 sex + \beta_3 age + \beta_4 area + \beta_5 edu + \beta_6 dur + \beta_7 size + \beta_8 \cos t + \beta_9 \sec tor + \beta_{10} age^2 + \varepsilon_{1i} \quad (8)$$

$$malattack = \alpha + \beta_1 \log Y_{1i} + \beta_2 sex + \beta_3 age + \beta_4 area + \beta_5 edu + \beta_6 dur + \beta_7 size + \beta_8 \cos t + \beta_9 \sec tor + \beta_{10} age^2 + \varepsilon_{1i} \quad (9)$$

Where: $logY_{1i}$, is the household expenditure per capita for household *i* in equation (8); *malattack*, the ratio of malaria patients to non-malaria patients in the household in equation (9); *sex*, the sex of the household head (1= male and 0 = female); *age*, the age of the household head in years; *area*, is the region of residence for the household (1= urban and 0 = rural); *edu*, is the level of education of the members of the household; *dur*, is the duration of illness variable measured in days; *size*, is the size of the household; *cost* is the cost of treatment of the disease in CFA; age^2 is the age squared of the household head; *sector*, is the sector of consultation used for treatment of malaria (private, public and tradi-practitioners) and $\varepsilon_i$is the error or disturbance term.

The household expenditure function (equation (1)) above was derived in the situation where the household member has malaria, that is, assuming malattack = 1. The major innovation here is the presence of the interaction variables which are the maldu and maledu variables representing the interaction between the malaria attack and duration of illness on one hand, and interacting the malaria attack and the level of education on the other hand. The interaction variables are included to ascertain their impact on poverty in the households.

Variables and a priori expectation

The study makes use of the log of household expenditure as a proxy for poverty and log of earnings to determine labour productivity at the household level. Hence, the behaviour of the households was examined in monetary terms by making use of these measures to ascertain the link between malaria, labour productivity, and poverty. The use of household expenditure has been used to proxy for poverty in the study because given the availability of data. Household members generally find it difficult reporting their income which could also serve as a measure for this. Household expenditure has been used in the literature by several authors to proxy for poverty (e.g. Mwabu & Fosu, 2007; Fambon *et al*., 2001).

Malattack*:* This represents the incidence of the disease in the household. When a member of the household is affected such individual will become less productive hence a drop in the income of that household. It is important to note that during a malaria crisis episode, large amount of cash is spent by both the members of the household and the individual directly affected. Hence, it may lead to a drop in the level of productivity of that individual and hence poverty, especially in the case where it is an elderly member of the household that suffers the attack, or even the household head. UNICEF (2008), supported this in her study on malaria and poverty in Cameroon. According to her findings, malaria leads to a substantial increase in poverty because much is spent to cater for the sick. Malaria attack is, therefore, expected to have a negative relationship with earnings and a positive relationship with expenditure.

Sex: The data set used in this study presents a slight margin between the male and female group. This means that the proportion of male to female differs slightly. However, it shows that the population of Cameroon consists of 51 percent females and a 49 percent male population. This trend tends to increase in favour of a higher proportion of male to female ratio when one looks at the proportion of household heads. Female-headed households consists of less than three out of every ten households in our sample. Female-headed households tend to face a much more crippling burden of the malaria attack than male-headed households, hence, bringing about a drop in labour productivity and thus a rise in the level of poverty in most of these households. Kuate (1997), in his study clearly notes that malaria strongly affects women more than men, especially during pregnancy, leading to a fall in their labour productivity levels as such making it difficult for these women to engage in income generating activities.

Age and age2: Generally it is seen that poverty is rampant among children and women. The World Health Organization (2005) confirmed that age generally affects poverty. The young are dependent on their parents as they cannot work and are not of the working age group. For this reason we expect that age will have a negative relationship with labour productivity and hence earnings. Equally, the health status of an individual as well as his/ her level of productivity gradually deteriorates with age as well as his/her level of productivity (Ben–Porath, 1967).

Area: The choice of this variable strongly reflects the social and health status of an individual or household. The reasoning here is that, a large concentration of rich people will be found in the urban than in the rural areas where there are better income generating activities unlike in rural areas where the primary activity is mostly farming. Also, the affected households in the urban areas will have the necessary finance to treat themselves since they earn better incomes than their rural counterparts. As such, the incidence of poverty in this area will be reduced. Contrariwise malaria prevalence is more in the urban than in the rural areas due to pollution and other environmental issues. For these reasons the area/ region of residence variable is expected to have a positive relationship with expenditure and earnings.

Education: This variable measures the number of years of schooling. The variable plays a vital role on the income of an individual as well as on the entire household. A more educated person will, ceteris paribus, earn more than a less educated person because he/ she is expected to be more productive than his/ her uneducated counterpart. For this reason, poverty and a drop in productivity will be experienced more in households where the level of education of the individuals is low. Hence, we expect a positive relationship between level of education and earnings.

Hhsize: This measures the number of people living in the same household. Generally, the number of people in a given household will determine whether that particular household is poor or non-poor.

Maldu: When a malaria episode last for "too long" (say more than a month) it may lead to poverty since much is spent in treating the disease. The longer the duration of the illness, therefore, the higher are the chances for these affected individuals to experience a drop in their productivity on the job hence less income will be earned by both the care takers and the sick persons. Barlow, (1979) investigated and concluded that long episodes of malaria impairs individuals ability to withstand demands of work and productive capacity. This however, translates into reduced income and then to poverty, possibly also of the extreme type. This implies the existence of a fall in labour productivity as proxy by earnings. In the second model we specify the determinants of productivity as it relates to health (malaria). Therefore, our primary indicator here is the duration of illness variable. Theoretically, a lower level of productivity will be achieved than would be possible if workers were healthy and not absent from work due to a malaria attack. We expect a negative relationship between earnings and labour productivity, which is our main dependent variable for the second model as represented in equation (9). Productivity is thus determined based on earnings received from an individual taking part in labour market activities.

Sector: Thisis measured using either public or private facilities. The literature suggests a positive relationship between this variable and earnings.

Estimation technique

The study makes use of the Three Stage Least squares (3SLS) method to ascertain the causality that exists between malaria and poverty in Cameroon. The causality problem is addressed by employing the three stage least squares method. The 3SLS method remains the most convenient way of dealing with the causality problem. We also estimate a Mincerian wage equation, which considers health status (malaria attack) as an independent variable by using the OLS method and the Heckman Maximum likelihood method. The model estimates differences across gender and the sector of employment of the household head. However, given that in the existing literature earnings theoretically measure productivity, the effect of ill health on productivity can be determined by estimating the impact of malaria on the logarithm of earnings as seen in equation (8) and (9).

Data source and description

The study makes use of data from the third Cameroon's Household Survey (ECAM 3, 2007). This survey was compiled and carried out by the National Institute of Statistics, Department of Statistics and National Accounts. This is the third household survey conducted in the country. The first two were carried out in 1996 and 2001 respectively. This survey aimed at identifying various indicators showing the poverty profile and the standards of living of Cameroonians. More specifically ECAM3 aimed at: examining poverty both at the regional and national levels; examining the dynamics of poverty since 1996 and more precisely examine poverty levels between 2001 and 2006; examining the different macroeconomic programs and policies put in place in the past to ameliorate standards of living; evaluating and identifying the demand for the determinants of education in the country and finally, to serve as a base for the improvement of official statistics throughout the national territory.

It was carried out with administered questionnaires and provides information at the household and individual levels on various demographic, economic, social and education characteristics. The survey questionnaire contains 17 sections covering poverty as main theme and other related topics such as

health. This survey presents a sample size of about 12000 households. From the first two household surveys (ECAM1 and 2), ECAM3 presents survey statistics with a 5-10 percent margin.

Results and discussion

Descriptive statistics

Table 1 below provides the descriptive statistics of the variables used in the study:

Table 1. *Descriptive statistics*

Variable	Observation	Minimum	Maximum	Mean	Standard Deviation
Sex	11391	0	1	1.2670	0.4424
Age	11363	11	95	41.7818	14.9475
malaria attack	11359	0	1	0.0722	0.2589
duration of illness	657	1	3	1.3866	0.6577
sector of employment	10317	1	2	1.8011	0.3992
Educ	11363	1	5	2.5081	1.2275
Area	11391	1	2	1,4412	0.4966
Size	11391	1	43	4.4939	3.0687
Sector ofconsultation	5151	1	3	2.0845	0.9965
Cost of treatment	4991	0	99997	970.9982	2517.624
Log y	11391	11.1852	16.2438	12.7750	0.7380
Logw	6665	0	10.2797	4.3900	1.1430

Source. Based *on Authors calculations using ECAM3*

The dependent variable, the log of household expenditure as in model one and log of earnings as in model two shows a mean of about 13000 francs CFA and 4000 francs CFA respectively. According to this data set the ages of household heads vary from 11years to 95years with an average household head living for up to 42years. With respect to the area of residence, households were selected from urban and rural areas. The level of education ranges from no education to higher education. Equally, households are made up of an average of 4persons. However, in this sample there are households with up to 43 individuals. Finally, we notice that most households spend about 9000 francs CFA of their total monthly earnings on treatment. They make use of different health facilities ranging from the private to the state owned hospitals.

Other statistics show that households were selected from both the formal and informal employment sector with at least one member of every household being gainfully employed.

Econometric analyses

Table 2 above, shows the results of the analyses of the link between malaria, labour productivity and poverty in Cameroon. The results show some degree of significance between malaria attack, sex, age, age2, level of education, area of residence of the household, household size and cost of treatment of the disease in the Cameroonian households.

Table 2. *Estimation of results with log of household expenditure as dependent variable measuring poverty*

Dependent variable Logarithm of household expenditure	Three stage least squares for eqn 4.3.1(situation with malaria and other independent variables)	Three stage least squares for eqn 4.3.2 (situation with malaria and interacting variables)
Malattack	-12.1498(-1.16)	0.3455(8.11)***
Sex	-0. 0616(-3.63)***	-0054 (-3.03)***
Age	0. 0061(2.17)***	0. 0083(2.79)*
age2	-0.0001(-1.63)***	-0. 0001(-2.57)*
DURATION		
(2 weeks – 4 weeks)	-0. 3150(-0.31)	-0.1732(-0.66)
(4 weeks – 12 weeks)	-0. 7337(-0.46)	-0.4203(0.64)
EDUCATION		
Primary	0.1306(5.67)***	0.1974(7.97)***
Junior secondary)	0. 2993(11.27)***	0. 4245(15.33)***
Senior Secondary)	0. 4984(17.19)***	0. 653 (21.12)***
Higher Education	0. 8807(26.25)***	1.0870(31.52)***
Hhsize	-0. 1005(-37.97)***	-0. 0979(-35.18)***
Area	-0. 3824(-23.01)***	-0.3892(-23.39)***
Sector	-0. 0373(-4.82)***	-0. 0337(-4.14)***
Costtreat	0.001(9.89)***	0.0001(11.47)***
MALARIA AND DURATION		
maldu (2 weeks -4 weeks)	_	-0.4291(-7.37)***
maldu (4 weeks – 12 weeks)	_	-0.0802(-11.01)***
MALARIA-ATTACK AND EDUCATION		
maledu (primary)	_	0.0036(0.08)*
maledu (junior secondary)	_	-0. 0006 (-0.01)*

Maledu(senior secondary)		0. 0038(0.08)*
Maledu(higher education)		-0. 0031(-0.04)*
Constant	13.5872(180.52)***	12.8503(177.78)***
R squared	0.0268	0.2640
Chi2	84.87	3013.62
Prob>chi2	0.0000	0.0000
Number of Observation	4974	4974

Notes: Z-statistics in parenthesis; *, **, ***, indicate significant at 10%, 5% and 1% respectively

Source: Basedon Authors calculations using ECAM3

Malaria attack has a negative but insignificant effect on household expenditure (poverty) in the first specification while in the second specification it has a positive significant effect on poverty. This is shown by the negative and positive coefficients in the first and second specifications. The negative sign confirms the a priori expectation. For the second regression analysis where we interact malaria attack with some of the explanatory variables, the sign of the malaria attack variable is positive and significant. This shows that the incidence of malaria attack on household poverty (proxied by household expenditure) is negative though statistically insignificant in the first specification. In the second specification, the positive significant effect on poverty means that the higher the incidence of the malaria attack on the household, the higher the households expenditure. Therefore, in the event of malaria attack households' expenditure will increase and in most cases may lead to poverty.

In addition to the forgoing, the positively signed level of education in both specifications reveal that education is significant at 1 percent level starting from the junior secondary level to higher level of education. The result is striking because a more educated person tends to be more productive and thus will earn a higher income ceteris paribus, than an uneducated person. As such in a household where the individuals are educated their productivity will tend to increase hence expenditure levels will be high, an indication of lower levels of poverty. This high expenditure means that, the individual is able to meet better health needs for themselves and their households. It is interesting to note from the results that, education assumed a consistently greater level of significance with improvements in the level of education in both

specifications. This is both in line with theoretical expectations and consistent with the notion in the literature that education exerts a downward pressure on poverty. Mwabu & Fosu, (2007) conclude that education mitigates the negative effect of malaria on income hence leading to a drop in poverty.

Other variables of interest that show some level of significance in specifications include the sex of the household head. This is significant at 1 percent and has a negative effect on poverty. Assuming the household head is female (with reference male) as shown in the analysis the coefficient for sex is negative and significant at 1 percent level. This suggests that the incidence of malaria attack is higher among households with femaleheads compared to households with maleheads in Cameroon. This may support the fact that female household members are more vulnerable to malaria attack especially during pregnancy. Duration of illness, equally show some interesting results. In both specifications, the duration of illness shows a negative relationship with household expenditure for episodes lasting for up to three months. This situation is further confirmed by the presence of the interacting variable maldu (interaction between malaria attack and duration of illness). This agrees with a priori expectation probably due to the presence of the maldu variable (interaction between malaria attack and duration of illness) that has a negative and significant effect on expenditure. A one percent prevalence of malaria attack may lead to a substantial reduction in income and thus increase the incidence of poverty. During long episodes of a malaria attack, households spend more money in trying to take care of themselves and those affected in their households. The negative signs of the malaria attack and the maldushow that the incidence and persistence of the disease serves to engender household poverty. Corbett (1998), concluded that when a malaria episode stays for long it is translated to a reduction in household income, reduces productivity and hence provokes poverty in the household. The results for the area of residence is also negative and significant at one percent level in both models. This suggests that as compared to urban residents, the incidence and cost of treatment of malaria is higher for rural residents than for urban residents. This might be due to the fact that since the incidence of

malaria is highly related to the environment, the occurrence is more likely to happen for rural households than for urban households. However, most health facilities are located in urban areas. Thus, the increase in the cost of treatment for the rural households may be the cost of travel to the urban centre to seek medical care, or the few health facilities located in the rural centres might be charging a higher rate than the urban facilities.

The empirical results equally show that household size is significant in both specifications. The data average households size is forty-three. This indicates a situation where living conditions are poor, poor sanitary conditions and greater risk of an attack by the disease. Hence more is spent on sickness. This suggests that expenditure levels will increase with larger household size. This implies, the larger the size of the household, the higher will be the incidence of poverty. This is in conformity with a priori expectations. The coefficient of the age is positive and significant implying that at the onset of a working career by a household member, he/she is able to contribute substantially to the up keep of the households, leading to a reduction in poverty. However, a negative sign for age-square show that the health status of an individual declines with age making it difficult for him/her to engage in productive activities that make higher household expenditures possible, resulting in an increase in poverty in such households. The result of the cost of treatmentsuggests that household expenditure is positively influenced by the cost of treatment of the incidence of malaria. Since malaria treatment comes with cost, even in cases where treatment is free. Aside from the direct cost incurred in the hospital and the purchase of drugs, there is the requirement of eating well which also adds to the cost of treatment for any incidence of malaria

Table 3. *Estimation of results with malaria attack as Dependent variable*

Dependent variable (Malaria attack)	Three stage least squares for eqn 4.3.1′	Three stage least squares for eqn 4.3.2′
Logy	1.0001(2.03)*	2.9366 (3.47)***
Sex	0.0370 (3.72)***	0.1674 (2.38)***
Age	0.0001 (0.09)*	0. 0002 (2.38) *
age2	-0. 0012 (0.75)	-0.0231 (-2.45)
DURATION		
(2 weeks – 4 weeks)	-0. 0301 (-0.25)	-0.0297 (-0.13)

(4 weeks – 12 weeks)	-0. 0778 (-0.52)	-0.1280 (0.42)
EDUCATION		
Primary	-0. 0189(-1.40)	-0. 5499 (-4.31)***
Junior secondary	-0. 0174 (-1.11)	-1.1907 (-4.52)***
Senior Secondary	-0.0207 (-1.22)	-1.8466 (-4.30)***
Higher Education	-0. 0579 (-2.94)***	-3.1028 (-4.14)***
Hhsize	-0. 0040 (-2.54)*	0.2881 (3.37)***
Area	0.0185 (1.89)***	1.0415(3.19)***
Sector	-0. 0130 (-2.85)	0. .0987 (2.58)*
Costtreat	0.0006 (0.35)	0.0001 (3.88)***
MALARIA AND DURATION		
maldu (2 weeks -4 weeks)		-0.0910 (-1.37)
maldu (4 weeks – 12 weeks)		-0.1133 (-1.33)
MALARIA-ATTACK AND EDUCATION		
aledu (primary)		0.2303 (0.94)
maledu (junior secondary)		0.3773 (1.35)
maledu (senior secondary)		0.6751 (2.09)***
maledu (higher education)		0.3701 (0.64)**
Constant	1.5369 (5.19)***	8.0733 (3.31)***
R squared	0.4702	0.3921
Chi2	4414.20	4820.50
Prob>chi2	0.0000	0.0000
Number of observation	4974	4974

Notes: Z-statistics in parenthesis *, **, ***, indicates significant at 10%, 5% and 1% respectively

Source: based on author's calculations using ECAM3

Table 3 above shows a scenario where poverty causes malaria in households, hence malaria attack becomes a dependent variable. The analysis serves to show the causality that exists between poverty and malaria. The results implies that rising household poverty levels resulting from an increase in household expenditure raises the incidence of malaria attack on the household. This may be due to the fact that, household members lack the necessary funds needed to cater for proper control, prevention and treatment of a malaria attack on their household members. This infers an aggravated situation of the malaria scourge in such households. Other variables that lead to poor health (malaria) in the Cameroonian households include: area of residence, level of education, and household size among others. The extent to which an individual member of a particular household is educated is of paramount importance in the poverty – malaria relationship. This is represented by the interaction between the malaria attack and

level of education. Education is negative and significant at the 1 percent level. This suggests that education lessens malaria attack. Particularly, those with higher education are less likely to experience a malaria attack compared to those with no education. Thus, an improvement in the level of education is likely to reduce the incidence of malaria attack. This is because educated people may be able to afford better accommodation and sanitary conditions by living in areas that are cleaner compared to those without education. Equally, another reason is the fact that, educated people are more conscious of the need for proper health care control and treatment.

Contrariwise, empirical findings arising from the interaction between the incidence of malaria attack and level of education (maledu) do not conform to a priori expectation. The positive sign of the maledu variable at all levels of education shows that, the incidence of the malaria attack on more educated household members is high. This is contrary to expectations and falls short of reality. This may be due to the fact that, more educated household members though being aware of the devastating consequence of the malaria scourge on their health, may lack the time to seek proper treatment during a malaria attack episode. The results of the area of residence on malaria attack show a positive and significant effect. Just like in Table 2 above, empirical analysis presents us with only results for the urban area of residence. This suggests that, the incidence of household poverty on malaria attack is felt more in the rural than urban areas. The positively signed coefficient suggests that, household expenditure in the event of a malaria attack is higher in the rural households than urban households and hence this serves as a leverage to increase the incidence of poverty in these households.

The results presented in Tables 1 and 3 show that malaria attack serves as a drag on labour productivity and cause poverty in Cameroonian households. The level of education of the household head, area of residence, household size, age, age-squared, duration of illness are other factors that determine labour productivity as well as poverty in the households. Worthy of note too is that area of residence of the household is an important instrument in endogeneity problem and selection bias that exists between

malaria attack, labour productivity and poverty. Chuma *et al.*, (2006) noted that malaria may cause poverty in households through spending on health care, income losses and premature deaths. This means that, malaria exerts a significantly adverse effect on household expenditure, thus engendering poverty.The results emanating from this findings further reveal that an increase in the incidence of malaria attack on households increase household expenditure and hence beget poverty in Cameroonian households.

Conclusion

The empirical results obtained reveal that malaria negatively affects productivity and increase poverty in Cameroonian households. A percentage incidence in malaria prevalence leads to about 12 percent reduction in household income and hence leading to poverty in these households. On the other hand, the results reveal that, poverty equally engenders the incidence of malaria attack. The results reveal too that there exist a negative relationship between the incidence of malaria attack and labour productivity. The results further show a negative relationship between the incidence of malaria attack and labour productivity. These findings suggests that households lost many productive days during crises of malaria episodes. This results suggest that material, financial and human resources are being lost to the incidence of malaria attack in Cameroon. This has the potential to bring about welfare losses to families through a reduction in productivity and hence an increase in the level of poverty. The study found that malaria remains a major problem in African continent and despite various declarations by African governments in the 1990s and efforts promised in the main content of the Roll Back Malaria campaign and initiative, malaria still remains a major public health problem. Therefore, poverty reduction strategies should incorporate elements that touch the households directly. Implementing strategies that target households directly will reduce the prevalence of malaria and arrest its growing effects on the economy. More specifically, government should consider the households in decisions relating to poverty alleviation. The government should give more attention to the health sector

especially those in rural areas by investing more in these health facilities, hence, rendering them more efficient and effective. In addition, policies aimed at increasing the use of ITNs, should be adopted. Such policies can take the form of freely providing bed nets to the entire population in their houses. This will reduce the long-term effects of malaria on labour productivity. Educating the individuals on personal and community hygiene can also be strengthened to increase understanding of the mode of transmission of Malaria.

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Disclaimer

The authors alone are responsible for the views expressed in this publication.

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7 Cartographic representation of risk zones in the flooded drainage basin of Bobongo and socio-economic problems in Douala, Cameroon

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Introduction

Floods are one of the common and challenging problems of urbanization in Cameroonian cities and especially that of Douala. The State of Cameroon to deal with floods has set up sectoral policies for natural risk management, such as the ORSEC plan, the national contingency plan (NCP), the national management plan of the environment (PNGE) etc. Regarding the technical measures focused on the hazard, we retain several in the city of Douala: the city drainage project initiated by the MINHDU (Ministry of Housing and Urban Development) in the 1980s and

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this "crash program" aimed at cleaning the main drains of the city. The results did not mean that territorial vulnerabilities to flood risks in the peripheral areas of the city, such as Bonaberi (Mabanda), Village (Cité-berge, Bobongo, Ndogpassi, etc.), would be reduced. It is in this perspective that "It became clear that relying essentially on these technical methods of analysis and risk management, we did not always get the expected results." Geographers are gradually integrating "subjective space" into their analytical approach. This new approach imposes on geographers a complete paradigm shift, a new vision. Natural risks today must no longer be unilaterally defined by technicist approaches of "experts", but rather an exercise resulting from a process of interaction, of confrontation in which the laymen play a role Charlier, (1997). Because the technical measures taken by its risk experts are increasingly ineffective and also make vulnerability more and more virulent. Indeed, it is the ability to take into account the vision of others that can result from dialogue and the improvement of vulnerabilities because the "laypersons" or inhabitants often have a better knowledge of environment risk and, in this respect, meaning, listening to them and taking into account their remarks often make it possible to improve control measures. Showing the ways of seeing the space at risk of each other is already beginning to talk to each other and thus, enter a more efficient management process, respectful of spaces and inhabitants. The hypothesis defended in this article is that taking into account of the spatial representations of the inhabitants of the Bobongo sub-basin is an important element likely to improve the urban resilience in the face of the flood hazard. The objective is to demonstrate that the study of spatial representations via the "mental maps" of the inhabitants of the Bobongo sub-basin can help to understand and analyze vulnerable territories. The use of GIS via ArcGis 10.2.1 software has been essential in the production and analysis of mind maps.

Concepts and conceptualization

Representations

The term representation is used in many disciplines in the humanities (and beyond), with very different meanings, and often

very vague. The word thus lends itself to many definitions according to the contexts in which it is used. In Psychology, according to Moscovici (1961) who reformulated the concept of collective representation of Durkheim by proposing that of social representation. For him "social representation is an organized corpus of knowledge and psychic activities through which men make physical and social reality intelligible, fit into a group or a daily relationship of exchange, and release the powers of their imagination". For Abric (1987), social representation is "the product and process of a mental activity by which an individual or a group reconstructs a real idea to which it is confronted and attributes to specific meaning"

In philosophy Ladriere (1985) defines "representation as a kind of transfer of attribution". For this author, this definition brings out ideas:

1. The representation is a staging, or a highlight, as a screen that is both the surface on which we project reality and a barrier between reality and our perception

2. The representation is a substitution of someone by another who represents it: here a representation of words to say a material or immaterial object.

3. The representation is a mental image, a representation of the object in the brain:

- Either it is related to the physical forms of the material object with analogy of form

- Whether it is a point of view of its own, an impression: a child's drawing tells us how it feels about a situation, a drawing of a journey tells us the impression of distances,

- Either it comes from a convention of language: the word "chair" does not form the chair, while the word "ticking" has an analogy of sound form with the object that it designates.

In sociology according to Abric (1994) the notion of social representations refers to "the socio-cognitive set, organized in a specific way, and governed by operating rules of their own". This central element is for us the link maintained between the actor and the territory and the way in which it mobilizes this link for argumentative purposes of defense or appropriation. In the same order, representation is also "a form of knowledge, socially

elaborated and shared, having a practical aim and contributing to the constitution of a reality common to a social group" Jodelet, (1989). In geography several authors have synthesized these questions, notably Gumuchian (1991): for him the representation is "every place charged with multiple meanings by its coordinates, by its limits, by its values, and finally by the symbolic properties and / or functional assigned to it; it's up to us to decipher it (...) ". For Lardon (1999) the notion of representation refers to "the action of putting in front of the eyes" and "the idea that we make of the world". For Sébastien (2006) "a representation is at the same time the process that makes it possible to make known, to render comprehensible a phenomenon, an idea, an object (...) and the result of this process: an image, a map, a diagram, a table, a model (...) the specificity of a spatial representation results in the analysis of the relative positions of objects or phenomena in space. It thus involves the analysis not only of objects or phenomena, but also of the relations that exist between them (...).

The representation of space is an individual affair but more or less determined by cultures, information, even myths or collective representations ". Spatial representations are an integral part of the process of appropriating space. The most common definition of the concept of "spatial representations" is the one given by Piaget & Inhelder (1973): "social or individual creation of relevant patterns of reality within the framework of an ideology; it consists either in evoking objects in their absence, or, when it doubles the perception in their presence, in completing the perceptual knowledge by referring to other objects not currently perceived ". This creation is accompanied by a reconstruction of the coherence of places since the individual has at every moment a very fragmented vision (Bailly, 1977).

Risk

Before establishing a definition of risk, it seems appropriate to approach risk by its simple semantic meaning, in order to precisely evaluate the meaning of the term. Three origins are attributed to the word risk: one of the Latin resecum, "that which cuts (Watel, 2000)"; one of the Greek rhiza which "alludes to the dangers of sailing on a reef" (Cardona, 2001); and one of the Italian risico or

rischio. For Pigeon (2005) the risk is the "probability of occurrence of damage taking into account the interactions between physical processes of damage [hazards] and population factors [vulnerability]". This is the conjunction of a hazard and a vulnerability that supposes that we simultaneously deal with a threatening phenomenon and a vulnerable society (Fabiani & Theys, 1987).

The risk is then the equation between: Alea x Vulnerability. If the hazard is the threat, it is the source of the danger; vulnerability is the propensity of a society to suffer damage in case of occurrence of a harmful event.

Mental maps

The various authors, especially geographers who have used the "mental maps" in recent years, have all sought to clarify the terminology of the tool. Thus, Debarbieux (2004) spoke of "graphical interpretative diagram of the planar-like space made of memory". Gumuchian (1991) who is the author who has probably worked the most with this tool speaks of "mental representations of the geographical environment of an individual whose development refers to all cognitive activities that can select and to manipulate geographic information. Brunet (1992) spokes of "map that transmits spatial representations of people, desired places, and fantasized places, known and unknown places". Di Méo (1998) is part of "ideological and political representation of a cultural artefact territory that records the contingencies of the geographical environment." Two elements emerge from these definitions:

- The mental map is a map in our eyes
- These are external representations from internal representations, formed mentally by the interviewed actor.

Bobongo watershed

A watershed is defined as an area drained by a watercourse and its tributaries bounded by other watersheds. It is a surface or receptacle of water with a point of convergence through which any water received by the basin can transit (Musy & Higy, 2004). It is then the place of the points such that the meteoric waters which fall there infiltrate or evaporate by section (a point) of said basin

called outlet. Outlet is therefore a mandatory exit for each droplet dripping in any watershed, so any droplet flowing out of this funnel is external to the watershed. The watershed corresponds to the geographical unit on which the analysis of the hydrological cycle and its effects is based. The set of characteristics (geometric, geological, physiographic, human) will play a role not only in the hydrological response of the basin to a solicitation of precipitation (flow regime) but also upstream for some of them (altitude, exposure, etc.), directly in the process of forming the rain. The Bobongo sub-watershed, which is the spatial unit of the study, is one of the largest watersheds in the city of Douala with an estimated area of 650 ha. The study site is limited to the North by the Bilongue district, to the West by the Song-Mahop district, to the East by the Boko district, to the South by the airport zone (Fig.1).

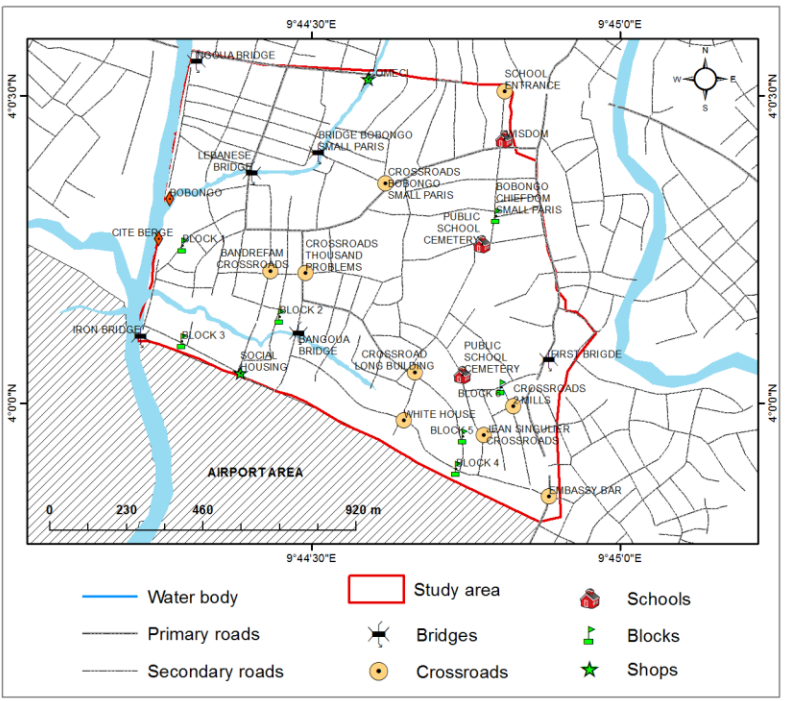

Figure 1. *Location of the study area*

Data and methods

Methodological reflection is organized in several stages: the collection, analysis and interpretation of data. The Cité-berge and Bobongo small-paris neighbourhoods are the main neigh bour hoods of the Bobongo sub-watershed that were the focus of our study.

The mental map data

The realization of mental maps in this research required several types of data. Material, physical, perceptible, descriptive and human data, for physical data such as the base map of the geo-referenced study site, perceptible and descriptive data such as lanes, boundaries, neighbourhoods, intersections, landmarks, and the hydrographic network of the study site were identified. These materials, perceptible and descriptive data are inspired on the one hand by the work of Lynch (1960) who classified the elements on a mental map. The human data in this research concern the lived experience, the population's experience with flood risk in the study site. Its human data is translated by the identification of the areas judged to be at risk of flooding by the populations of the study site. As part of this article, two techniques namely identification, and location were retained to capture the data of mental maps.

Data identification technique on the field of study

Three methods can be used to develop mind maps (Zimmermann, 1995): Map made by the respondent, in free sketch or map background Card made by the "specialist" based on information obtained orally from the respondent, Map centred on behaviours and not on perceptions. The first method is actually more frequent but less adapted to the socio-spatial context of the study for one reason: the lines can be distorted by the ability of individuals to draw (Cauvin, 1999). The second technique is more appropriate in this study because it will take into account any slice and layer of the population to be surveyed, a larger sample of study and above all it will facilitate the collection of data by limiting the margins of error. This identification was made possible

through this question asked to all inhabitants surveyed "What are the areas at risk of flooding in your place of residence?" Once the question was asked the respondent through his personal experience on the ground, his cultural and socio-professional influences identifies to us the spaces that he would judge at risk of flooding in his place of residence. This technique leads to the identification of these sites, cited by respondents, or recognized by the respondent as being at risk of flooding in the Bobongo sub-basin.

Data localization technique on the field of study

After the identification of material and human data; Localization techniques consist in obtaining the places identified by the investigator. This exercise was made possible using GPS (Garmin® version 5.0) which identifies by XY coordinate pair the material elements (intersections, landmarks, boundaries, lanes, etc.) and the human data translated into this search by the location of the areas considered at risk of flooding by the inhabitants of our sample. After the strictly individual process of collecting the material and human data of the mental maps, a social regrouping of the XY coordinates was necessary because the spatial representations are part of a social coherence which makes possible the cohabitation of city dwellers, or groups of city dwellers in the same city (Serrière, 1992). There would therefore be mental maps common to social groups, or groups, professionals. The data collected in this research will be grouped into socio-professional factors.

Mental mapping

GIS via ArcGIS 10.2.1 software is used as a tool for processing and representing survey data. The choice of GIS in this study comes from the fact that some authors insist on the qualitative interest of GIS and their ability to account for "marginal" representations and spatial practices (Cope & Elwood, 2009). The method of deterministic interpolation among the other methods of realization of mental maps like free mind, Mind Mapping, X Mind

to mention only these resides because the data collected whether they are material or human have been geo-referenced. The IDW technique is a local deterministic interpolation technique that calculates the value of a point by averaging the values of the points in the neighbourhood weighted by the inverse of the distance at the calculated point: the closer the points are, the more the assigned weight is strong. She believes that the points closer to the location to be calculated will have more influence. The reasons for the choice of the IDW technique for the realization of the mental maps resides in the fact that the maps reproduced by the IDW technique better illustrate the different pedological units than those reproduced by the Spline technique Benazzouz (2011), it is easier to use and provides acceptable results relatively better representing the reality of the field.

Analysis of mental map data

The analysis of the mental map data was done in several stages, which can be summarized in the following figure;

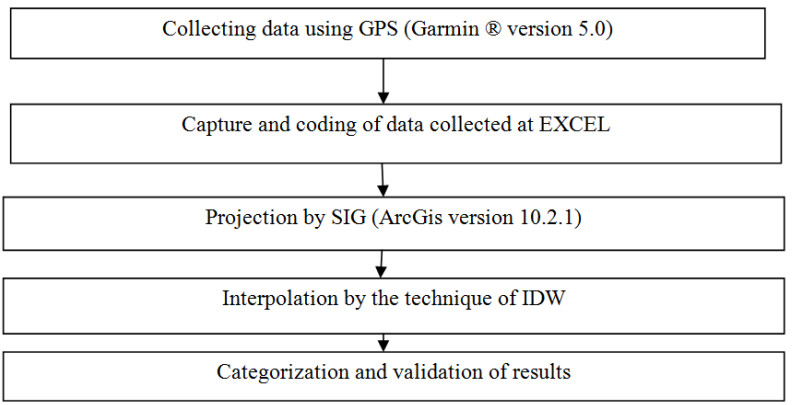

Figure 2. *Mental maps analysis approach*

This figure 2, gives a summary explanation of the various steps taken in the analysis of mental maps. The selected spatial interpolation method (IDW) is repeated for all social groupings of the XY coordinates to be modelled, which is then imported into Arc Map. In general, spatial interpolation of data in Arc Gis

generates raster-sized surfaces that completely cover the modelled area. To extract the study area, we will apply a mask; this mask will be applied to the named raster surface. The spatial extension obtained at the end of these different stages obviously shows the presence of polygons of different sizes belonging to the variables considered mental maps.

Interpretation of mental maps

The interpretation of mental maps was based essentially on the observation of the raster layers produced. The IDW method attempts to bring layers of similar characteristics closer together. The probability of likelihood between the values of the polygons near the sampled polygons is higher than for the distant polygons. And then the more the polygon occupies a large area, the more important the expressed variables are.

Results and discussions

The constituent elements of mental maps in the watershed of Bobongo

Lynch (1960) is one of the first authors to take stock in the 1960s of a classification of elements on a mental map: the ways, the boundaries, the neighborhoods, and the nodes, the landmarks that are perceptible and descriptive physical elements of the urban ensemble. They serve the individual to communicate his representations. The elements that appear in the mental maps are not necessarily those that the individual knows personally, they can be linked to media or cartographic experiences for example Bachimon, (1997). The various elements identified were located by the XY coordinate pair of the GPS (Garmin® version 5.0) and projected via the GIS (Arc Gis 10.2.1) on the mental map support. These projections provide precise information on the position of the constituent elements of the mental maps in the study area. It is from these projected elements that the reading of the mental maps takes all its meaning. These elements allow the specialist to locate the natural phenomenon in relation to a known spatial reference.

To produce the mental maps of the populations of the Bobongo sub-catchment, it was necessary to establish a grid of appreciation

of the variables used. These variables are of a social order because, as Serrière (1992) affirms, spatial representations are part of a social coherence that makes possible the cohabitation of city dwellers or groups of city dwellers in the same city. Table 1 highlights the different variables of the mental maps of the inhabitants and the modalities of variables which constitute the grids of appreciation of its different variables in the study.

Table 1. *Variables of analysis of population maps of the Bobongo sub-catchment*

Variables	Descriptions of variables	Modalities of variables
Degree of vulnerability	Distribution of zones in function to perception	1= Weak 2= relatively weak 3=relatively high 4= high
Length of residence	Distribution of spaces considered risky in function to time	1=6 month to 1 year 2=2 years to 3 years 3=5 ans à 10 ans 4=10 years& more
Risk awareness	Distribution of spaces according to the knowledge of the area deemed to be at risk	1=yes 2=No, I did not know 3=A little
Experience of risk	Distribution of spaces according to the experience in condition of territory	1= High experience 2= Low experience

Note: Field Survey 2017.

These variables and modalities of variables were important in the realization, analysis and reading of the different mental maps produced in the study site.

The different mental maps of the populations of the Bobongo watershed

1. The mental map according to the degree of vulnerability of the populations of the Bobongo sub-catchment

The first variable emitted in this research is the degree of vulnerability which results in the degree of appreciation of the hazard by the populations. This variable is broken down into

several categories of variables including: the low degree of vulnerability, the relatively low degree of vulnerability, the relatively high degree of vulnerability and the high degree of vulnerability of the inhabitants in the study site. Figure 2 highlights the mental map of populations by degree of vulnerability in the Bobongo sub-watershed

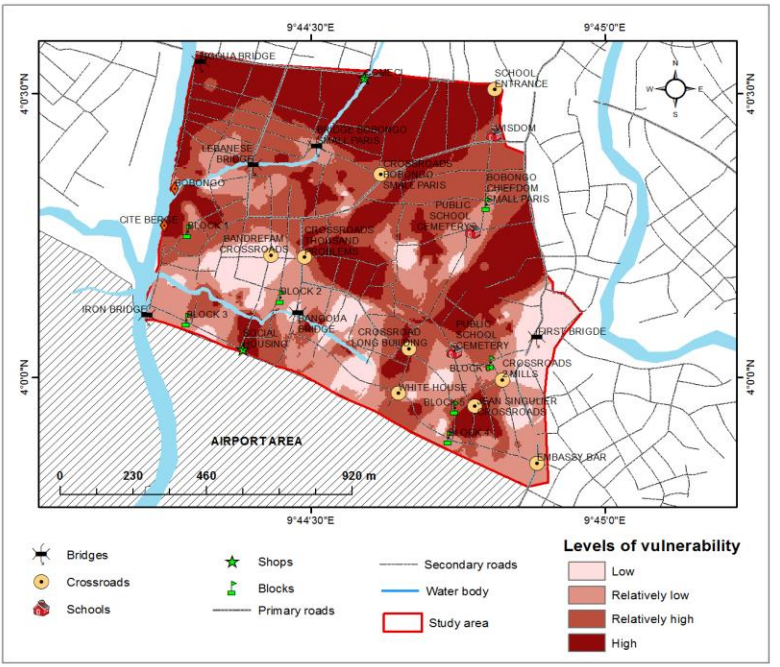

Figure 3. *Mental map of populations by degree of vulnerability*

The observation of the RASTER layers produced informs us about the degree of vulnerability to flood risk by the inhabitants of the study site. It emerges from this mental map that the modalities of variables of degree of vulnerability relatively high to the risk of flood are observed at the places known as: block 1, crossroads thousand problems, Lebanese bridge, white house ... And the degree of high vulnerability to the risk of flooding. The flood is located at the places known as: social housing, block 3, COMECI, crossroad long building, Carrefour jean singulier. Without pretending to an objective observation, the representations of the inhabitants of the site are close to the scientific reality with regard

to the modalities of variable expressed, because these are spaces located along the water-lines which are permanently subject to the tide phenomenon and moreover these are spaces with reliefs concealed with average altitudes less than 5m; a soil constantly waterlogged or hydromorphic.

The modalities of variables low degree of vulnerability to the risk of flood are observed at the places known as: First Bridge, crossroads Bandrefam, Bobongo, crossroads 2 mill. And the relatively low degree of vulnerability is located in the landmarks: embassy bar, iron bridge, Cité-Berge, public school cemetery, bridge Bobongo small paris ... This space reality is explained by the fact that these spaces are places of transition between swampy lowlands and high terrain with average altitudes between 5 to 9m. However, it is important to note that there are some distortions between the mental representations of the populations and the objective view of the flood risk specialist in the study site. This distortion between experts 'and inhabitants' knowledge will be developed in future research.

2. The mental map of length of residence of the populations of the Bobongo sub-watershed

The second variable emitted in this article is the duration of residence that results in the time spent in the study site by the populations of the Bobongo sub-watershed. This variable is divided into several categories of variables including: the length of residence between 6 months to 1 year, the duration of residence between 2 years to 3 years, the duration of residence between 5 years to 10 years and the duration of residence between 10 years old and over. Figure 4 highlights the mental map of the length of residence of populations in the Bobongo sub-watershed.

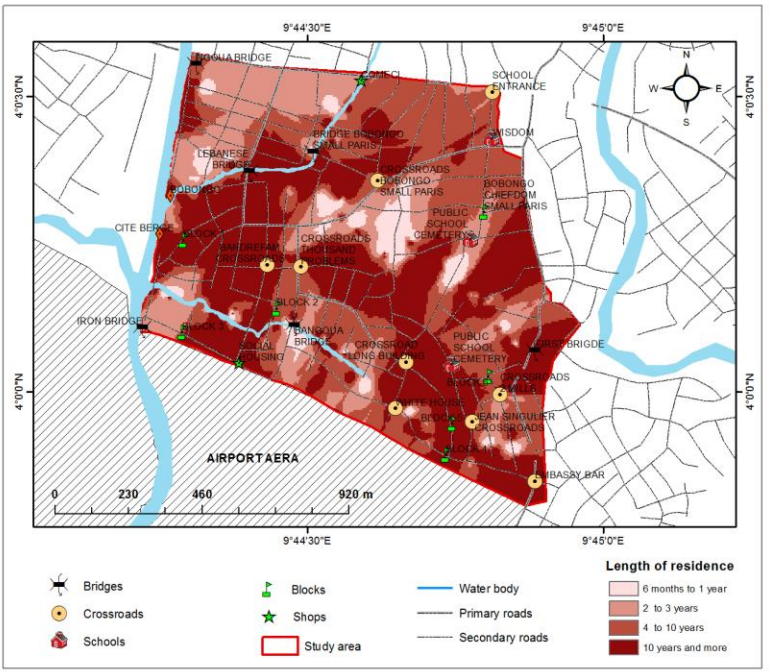

Figure 4. *Mental map of populations by length of residence*

The observation of the RASTER layers produced informs us about the duration of residence of the inhabitants in the study site. From this mental map it can be seen that in the place called Bangoua Bridge there are populations with a duration of residence of between 6 months and 1 year with degrees of vulnerability to low flood risk. Iron bridge sites, Bobongo bridge, small Paris II, public school cemetery, Bobongo chiefdom, small paris II are spaces where we find populations with a residence period between 2 years and 3 years with degrees of vulnerability to the risk of relatively low flood. The Jean singulier crossroads, Wisdom, school entrance, Ngoua Bridge, contain populations with a residence period of between 5 years to 10 years and high degrees of vulnerability to the risk of flooding. Those of the so-called block 6, block 2, although grouping the populations having a residence duration between 5 years and 10 years have relatively low degrees of vulnerability. The benchmarks cited-bank, block 1, social housing, Lebanese bridge, white house, crossroad long building,

crossroads thousand problems are spaces where one finds the populations having a duration of residence understood between 10 years and more and degrees of relatively high and high risk of flood risk. The general observation that can be made of this mental map is as follows, along the survey watercourses, there are populations with residence duration greater than or equal to 5 years and these areas constitute territories. Relatively vulnerable to floods risk. This situation is explained by the proximity of the spaces with the hydrographic network as well as a lack of information on the phenomenon at risk.

3. The mental map according to prior knowledge of the risk of flooding by the populations of the Bobongo watershed

Knowledge of the risk of flooding affects territorial vulnerabilities because knowledge of the natural phenomenon, its damaging effects, and adequate anticipation measures can reduce territorial vulnerabilities with, as a corollary, a more detailed representation of the phenomenon. Figure 5 highlights this representation of the flood risk according to the variableprior knowledge of the hazard in the sub-catchment area of Bobongo.

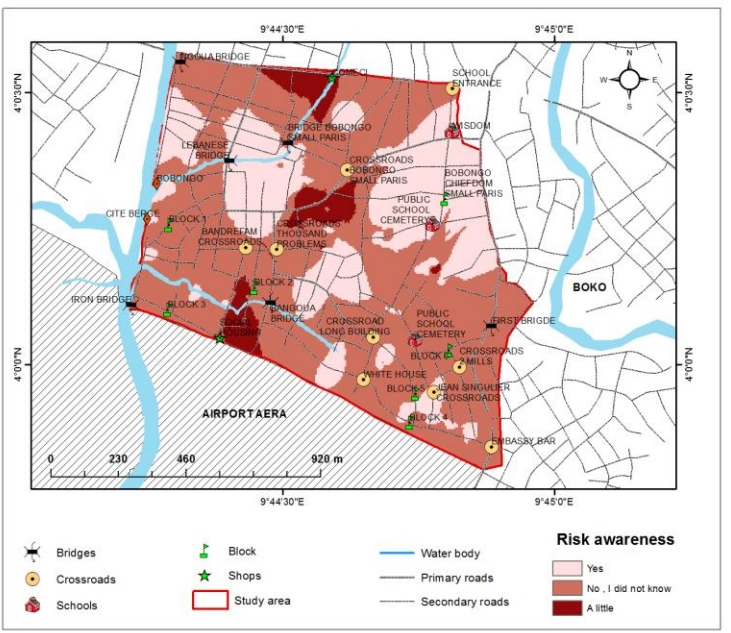

Figure 5. *Mental map according to prior knowledge*

This mental map shows that the populations of the study site did not have prior knowledge of the risk of flooding before settling in the Bobongo sub-catchment area. In principle, the populations living along the water supply lines did not have any knowledge of the risk of flooding before they settled on the study site. The observation of Figures 4 and 2 shows a close relationship between the different variables materialized on the mental maps of the populations of the Bobongo sub-watershed. The areas deemed never to have had prior knowledge of the risk of flooding by populations are areas where territorial vulnerabilities are significant.

4. The mental map according to the experience of the risk of flooding by the populations of the Bobongo sub-watershed

Figure 6 highlights the representation of areas considered to be at risk of flooding in the study site according to the flood experience in the Bobongo sub-watershed.

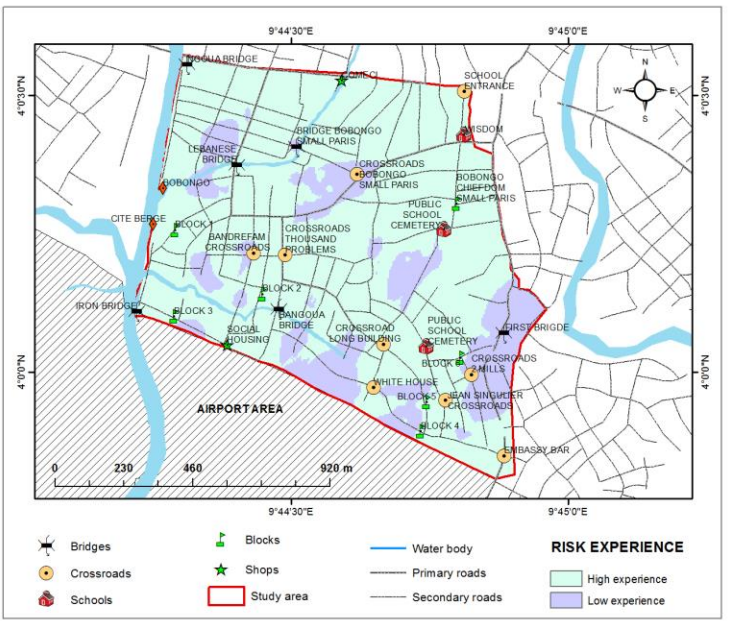

Figure 6. *Mental map of the populations according to the experience of the hazard*

The observation of the RASTER layers produced tells us about the flood risk experience of the inhabitants in the study site. With regard to this mental map, we find that the populations of our study areas have a strong experience of flood risk in the study site. This strong experience is identified at the areas so-called Lebanese Bridge, public school cemetery, Jean Singulier crossroads, Block 4, Ngoua bridge, crossroads thousand white house problems, Bandrefam crossroads... This strong experience is one of the proofs that the populations of more than 80% of the sample has already experienced past or present flooding in the Bobongo sub-watershed. This figure has an important spatial peculiarity; the areas judged to have high flooding experience by the populations of the sample are likewise the spaces where the knowledge of the risk was non-existent by the populations before the installation.

Conclusion

The objective of this paper is to demonstrate that the study of spatial representations via the "mental maps" of the inhabitants of the Bobongo sub-basin can help to understand and analyze vulnerable territories. Floods are one of the common and challenging problems of urbanization in Cameroonian cities and especially that of Douala. The State of Cameroon to deal with floods has set up sectoral policies for natural risk management. The magnitude of the damage caused by the June-July-August 2016 floods in the city of Douala in Cameroon was beyond scientific explanation. The consideration of subjective space therefore imposes on geographers a complete paradigm shift, a new method, a new tool, a new perspective. The use of GIS via Arc Gis 10.2.1 software approach was adopted in this study whose challenge lies to provide an alternative vision in the process of analysis of areas at risk of flooding in the Bobongo sub-watershed. From this findings, the following results were obtained: It was identified that in the areas so-called Lebanese Bridge, public school cemetery, Jean Singulier crossroads, Block 4, Ngoua bridge, white house, Bandrefam crossroads... more than 80% of the sample population has already experienced past or present flooding in the Bobongo sub-watershed. This figure has an important spatial peculiarity; the areas judged to have high flooding experience by

the populations of the sample are likewise the spaces where the knowledge of the risk was non-existent by the populations before the installation. Further observation with the RASTER layers, shows the degree of vulnerability to flood risk by the inhabitants of the study site. The variables of degree of vulnerability relatively high to the risk of flood are observed at the places known as: block 1, crossroads thousand problems, Lebanese bridge, white house... It is also evident at: social housing, block 3, COMECI, crossroad long building, Carrefour jean singulier. The tide phenomenon with average altitudes less than 5m; a soil constantly waterlogged or hydromorphic, and the relatively low degree of vulnerability is located in the landmarks: embassy bar, iron bridge, Cité-Berge, public school cemetery, bridge Bobongo small paris... This space reality is explained by the fact that these spaces are places of transition between swampy lowlands and high terrain with average altitudes between 5 to 9m. However, it is important to note that there are some distortions between the mental representations of the populations and the objective view of the flood risk specialist in the study site. The second variable emitted in this article is the duration of residence that results in the time spent in the study site by the populations of the Bobongo sub-watershed. This variable is divided into: the length of residence between 6 months to 1 year, the duration of residence between 2 years to 3 years, the duration of residence between 5 years to 10 years and the duration of residence between 10 years old and more. It was noticed that duration of residence of between 6 months and 1 year, degrees of flood risk vulnerability is low. This is the case of Iron bridge sites, Bobongo bridge, small Paris II, public school cemetery, Bobongo chiefdom, small paris II and are spaces where we find populations with a residence duration between 2 years and 3 years. This distortion between experts 'and inhabitants' knowledge will be developed in future research.

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