

## Education and Religious Beliefs: Supportive Determinants in the Understanding of Health Issues in Sub-Saharan Africa

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**ABSTRACT** In the aftermath of the 1978 WHO conference where the Alma Ata Declaration on *primary health care* was issued, the Cameroonian government was striving to guarantee equity in health care by developing a policy targeting social justice and assurance of “*health for all*” by 2000s. From this, a research programme based on health in the urban milieu was conceived in 2000 to address the population’s state of health. The epidemiological and transversal study was carried out in April-May 2005 on children aged between 6 and 59 months in Yaoundé (Cameroon). The objectives of this study were to identify risk factors predisposing people to diarrheas in the city, to measure their prevalence, and ascertain their spatial distribution, all in a bid to evaluate the progress made in infant health since 1978. The microbiological analyses carried out revealed an average diarrhea prevalence rate of 14.4% (437 cases of diarrhea on the 3034 infants tested). Amongst many other factors, the level of education and the religious belief of the household head were seen to be associated with the occurrence of infants’ diarrhea. In addition, it was acknowledged that the level of diarrhea infection in the city varies considerably from one household to another.

### INTRODUCTION

In the post independence period, the principal mission of the Cameroonian government was to develop the educational sector, in the belief that it will be the surety for a rapid and harmonious development of the country. That explains why the teachers’ training and creation of new schools were always prominent under its five year development plan. For example, from 1992 to 1998, the country’s educational statistics improved tremendously from 81.9% to 92.6% as far as school attendance is concerned. In Yaoundé in particular, the net school attendance was about 75% in 2000 (NIS 2007). This is quite high compared to other sub-Saharan African cities like Bamako or Ouagadougou which display less than 40% (World Bank 2005).

However, the economic crisis which was to overwhelm the country from the mid-1980s caused severe retrogression in the educational system resulting in a decrease in teaching quality, individual and public hygiene. In 2008 and according to WHO, results show an upsurge in infant and juvenile mortality caused notably by respiratory infections (20%), malaria (27.3%), diarrhea diseases (13.6%), malnutrition and intestinal parasites less than 10% (WHO 2008).

Traumatized by the economic crisis and the resultant unemployment, many households

sought solace in churches and other religious groups which preached a blissful life for those who will surrender all their material and earthly problems or burdens to God. Since it is generally accepted that the individual characteristics of a household are good indicators of the state of health of the population, this paper evaluates the state of health of children of age five and under relative to their mothers’ education and religious beliefs.

### CONCEPTUAL FRAMEWORK

The relationship between education and health has been studied widely by researchers in economics, social and health sciences (Baker 1999; Desjardins and Schuller 2006). Whilst there is general acceptance of a positive relationship between education and health, explanations of this relationship are still much debated. An extensive body of literature documents the strong and broad relationship between formal education and health (Barrera 1990; Hammond 2002; Groot and Maassen 2006), which forms the basis of the three broad models outlined below:

- The first technical efficiency comes out of Grossman’s model of health (human) capital in which individuals maximize their lifetime utility with respect to wealth, time, and technical constraints. In this model, health is

a capital stock that depreciates over time but can be increased through investment. In short, health improves education (Grossman and Kaestner 1997).

- The second model is time preference. It states that individuals who invest more in schooling will also invest more in health. There's no direct effect of education on health. Instead, there's a third variable to which both education and health are related (Fuchs 1996).
- The third model is allocative efficiency. It suggests that more highly educated individuals have better health knowledge and this leads them to choose better mixes of health inputs than less educated individuals, which results in better health for the more highly educated (Kenkel 1991).

Grossman and Kaestner (1997) note, "the three explanations are not mutually exclusive", and this makes it difficult to identify the most significant model. Thus, in this paper, we neither consider the first nor the second model. However, we do discuss the third model according to which, education improves health. While the association between education and health is well-established and is robust across health conditions and outcomes (Winkleby et al. 1992; Ross and Wu 1996; Smith 1999; Adler and Newman 2002), the paths by which education influences health require further elucidation. Looking at the different types of education that might affect health, Ross and Mirosky (1999) examine how three measures of education, i.e. quality (years of education), credentials (the qualification received), and selectivity (institution attended) are associated with health outcomes. In this context, the two first measures globally known as literacy may be particularly important. Literacy, notably health literacy is defined as a measure of an individuals' ability to perform basic reading and numerical tasks required to optimally function in the health care environment (American Medical Association 1999) and more broadly as the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions. While literacy may be an important explanatory variable in the relationship between education and health, this hypothesis has not been formally tested within developing societies. That is why we are primarily interested in discussing the efficiency of how literacy affects health and providing some preliminary empirical

evidence of their relative spatial importance. Particularly, we would like to measure level and quality of education and their possible impact on attitude towards health issues

Research on the relationship between religion and health dates to at least 1872, when Galton investigated the effects of intercessory prayer on mortality among English royalty, clergy, and missionaries (Garrison 2008). Since then, a surge in studies on religion, spirituality, and health has renewed debate about the appropriate role for religion and spirituality (Koenig et al. 1998). On one side of the debate, advocates for a partnership between religion and medicine cite a growing body of literature that suggests a link between religiosity and improved health (Benjamin et al. 2006; Cotton et al. 2006; Benjamin et al. 2008). On the other side of the debate, authors, notably physicians, claim that the extent of associations between religious practice and better health is actually quite weak and is based on data from methodologically flawed studies (Rippentrop et al. 2005).

Despite burgeoning interest in the relationship between religion and health, few have analyzed this topic with a focus on communicable diseases like diarrhea and by assessing the relation through personal and communal behaviors such as solitary practices like attending religious services where Christians are encouraged to educate and to carefully take care of their body. We posited that some religious practices, whether 'traditional' or through biblical or Koran teaching may influence believers' health.

Diarrhea is generally characterized by the frequent occurrence of watery stools. Following clinical signs, we have considered diarrhea as the sudden and frequent occurrence of abundant and consistently abnormal watery or mucus stools more than three times a day and more than 300g per stool (Gascon et al. 2000). Stools should be either bloody or mixed with a phlegm-like substance. The most common causes of diarrhea are viral, bacterial, and parasitic infections as well as intestinal diseases, drug reactions, and food intolerance (Parashar et al. 2003; Schiller 2007). However, within the framework of our research, we are primarily interested in viral, bacterial and parasitic diarrheas for which it is estimated that 1.8 million people die worldwide every year; a high enough figure to justify our focus on them. Amongst this 1.8 million people, 90% are children under 5 mostly in developing societies. In

Cameroon, diarrheal diseases, though symptoms of other diseases are the leading cause of infant mortality as they account for 40% of the total mortality burden (77%). However, they are the second cause of infant morbidity (20%), just behind acute respiratory infections (28%). Infants between 12 and 23 months of age are the most vulnerable (36%) compared to infants between 6 and 11 months (21%) (NIS/CAVIE 2004). An estimated 88% of this morbidity burden is, like in many developing countries, attributed to unsafe drinking water supply, inadequate sanitation, poor hygiene and individual characteristics such as education, income, beliefs (Tumwine et al. 2002). Despite the many studies in existence, relatively little is known about the contribution of education and religiosity to diarrheal incidence in Sub-Saharan Africa.

### STUDY AREA

This study took place in Yaoundé, the capital of Cameroon, a country situated in Central Africa between latitudes 3° 47' and 3° 56' North and 11° 10' and 11° 45' East. Yaoundé was made known to the outside world in 1889 by two German explorers: Richard Kund and Hans Tappenbeck. Towards the end of the 19th century, the "Ewondo country" (henceforth known as Yaoundé) declined in favor of the German military station of "Yaunde Station". A plan was outlined for the city in 1891 by Von Zimmerer (Nsile 1998). Following hidden religious criteria, all the natives and other ethnic groups were scattered around the demarcated belt occupied by white peoples: the natives i.e. the Beti, Bulu, and Fang peoples who adopted Christianity were resettled in the Center and North of the city, whereas the Fulbe tribes coming from the Northern Islamized part of Cameroon were grouped together west of Yaoundé, and the Bamiléké tribes bound to their traditional beliefs were located north-west and south-west of the city. During the French colonial administration, the existing spatial segregation was reinforced as new migrants into the city were asked to settle within their respective communities (Mpouamze 1998; Njike 1998). During their reign, schools created by French colonial administration were all concentrated in the Native areas. Was this because French administrators were Christians? We cannot firmly assert it. But, what is true is that former European settlers (French and English) were all missionaries whose main goal was to

convert local population into Christianity. This politico-historical fact might be at the background of schooling in Yaoundé along with the health outcomes that are associated. Like many sub-Saharan African cities, Yaoundé is currently experiencing very rapid urbanization. In the first population census in 1926, Yaoundé had 100 000 inhabitants. With an estimated annual growth rate of 4.5 per cent since 1980, its population has grown from 812,000 inhabitants in 1987 to 1,500, 000 inhabitants in 2000, and to about 2, 100, 000 inhabitants in 2007 (CIA 2008). However, this population growth has not been monitored by the city planners and decision makers. Consequently local authorities have failed to provide neighborhoods with adequate utilities, services and infrastructure. Therefore, city dwellers are facing difficulties such as getting access to educational and health infrastructure and services. Relatively, 67.9% are literate (male: 77%, female: 59.8%), and many profess different religious faiths such as indigenous beliefs (40%), Christian (40%), and Muslim (20%).

### METHODOLOGY

**Target Population:** To minimize the risk of confusion between the infectious diarrhea and the soft feces normally observed in babies, the survey targeted only children from 6 to 59 months. Thus, the childless household and those with children outside the age group were eliminated from the sample. In the households with several children in the survey age bracket, a table of random numbers was used to select only one of them.

**Survey Frame and Type:** The survey covered neighborhoods and households in Yaoundé, and used a stratified random sampling procedure based on two stages to select targeted neighborhoods. First, 20 neighborhoods were selected out of the 105 that make up the city. These neighborhoods are representative of the six types that the city contains. Second, based on that procedure, 3, 500 households were therefore selected. Two types of survey methods were used: (a) the qualitative investigation through participant observation, and (b) the quantitative methods through structured questionnaires. For the first part, we perform the participant observation to allow for a thorough investigation, exploration and localization of educational and religious infrastructure and services. At the

second stage and under our coordination, structured questionnaires were administered by a team of ten students' doctors from the Faculty of Medicine and biomedical sciences of the University of Yaoundé I, as well as by eight qualified data collectors from the Demographic Training and Research Institute (IFORD, University of Yaoundé II). The questionnaires had two main components: (i) the socio-demographic component includes elements such as place of residence, religion, level of education and socio-professional activity; (ii) the medical dimension aiming to detect cases of diarrhea in children within the selected households. Thus, when a case of diarrhea was reported, a stool sample was taken and dispatched to the bacteriological, virological and parasitological laboratories of the Cameroon Pasteur Institute for analysis. Each positive sample was correlated with the socio-economic data pertaining to the household to which the infected child belonged to for example the level of education of the child's mother and her religion. These data files were thereafter inputted into a geographical information system for spatial analysis. Bivariate statistical analyses followed by tests of significance were carried out to verify the level of association between our two main variables (i.e. diarrhea disease and schooling/religion).

**Level of Analysis:** Several factors explain diarrhea prevalence in Yaoundé (Nguendo Yongsy et al. 2007). In this paper, we will neither analyze nor correlate all those factors because they have been explored in previous studies (Nguendo Yongsy et al. 2008). Rather we focus on the ways in which households particularly mothers' educational level and religious tendency influence the prevalence of diarrhea. We have used bivariate statistical analysis (Chi square) to assess the level of association between our two variables of study.

## RESULTS AND DISCUSSION

### Global Portrait of Diarrheal Diseases in Yaoundé

Among the 3,034 children who were subjected to medical investigation, 437 were found to have been affected by diarrhea, i.e. a 14.4 percent prevalence rate. Boys were more vulnerable than girls (81.9% vs 18.1%); and independently of the gender, children between 12-23 months (40.7%) and between 24-35 months (27.4%) were the most

exposed. The 14.4 % prevalence rate covers the entire urban area and is the average for the twenty neighborhoods where this investigation was carried out. Figure 1 is the result of the modeling which displays the global spatial distribution of diarrhea in the city.

To understand incidence of these diarrheas, ten determinants or risks factors were tested and six were associated to diarrheas in the city. Using the regression logistic model, the weight or importance of each risk factor was assessed (Table 1). Close linkages between diarrheas and economic level/poor access to safe water/health care system/handling of waste water and refuse having been already widely studied (Huttly 2002; Pruss et al. 2002; Cairncross et al. 2003), we then focused on education and religion to understand how they can help understanding diarrheal prevalence

**Table 1: Weight of risks factors associated to diarrheas in Yaoundé**

<i>Risks factors</i>	<i>Odds ratio</i>
<b>1. Morphological Unit</b>	
Valleys i.e. marshy areas	(RM)
Slopes	0,81
Plateaus	0,67 ***
<b>2. Level of Education</b>	
Illiterate	(RM)
Primary level	0,77
Secondary – 1 <sup>st</sup> cycle	0,73 **
Secondary - 2 <sup>nd</sup> cycle	0,59 **
Higher level – College/University	0,37 **
<b>3. Waste Water Management</b>	
Discharge in the natural milieu	(RM)
Use of septic tanks	0,98
Discharge in the plots	1,25 *
Discharge in the rivers	1,10
<b>4. Source of Drinking Water</b>	
Springs	(RM)
Wells	0,97 **
Personal/Private Tap	0,76
Community Tap	0,86 *
<b>5. Religion</b>	
Muslim	(RM)
Traditional beliefs	0,73 ***
Catholics	0,51 **
Protestants	0,63
<b>6. Level of Income</b>	
Low	(RM)
Medium	0,65 **
High	0,66 *
<b>7. Household Refuse Handling</b>	
Discharge in the natural milieu	(RM)
Door-to-door collection system	0,96 *
Use of garbage bins	1,10 ***

† RM means Reference Modality i.e a modality assumed to be more risky than the others

† \* = p<0,05; \*\* = p<0,02, \*\*\* = p<0,001

Source: PERSAN Survey/Infant diarrhea in Yaoundé

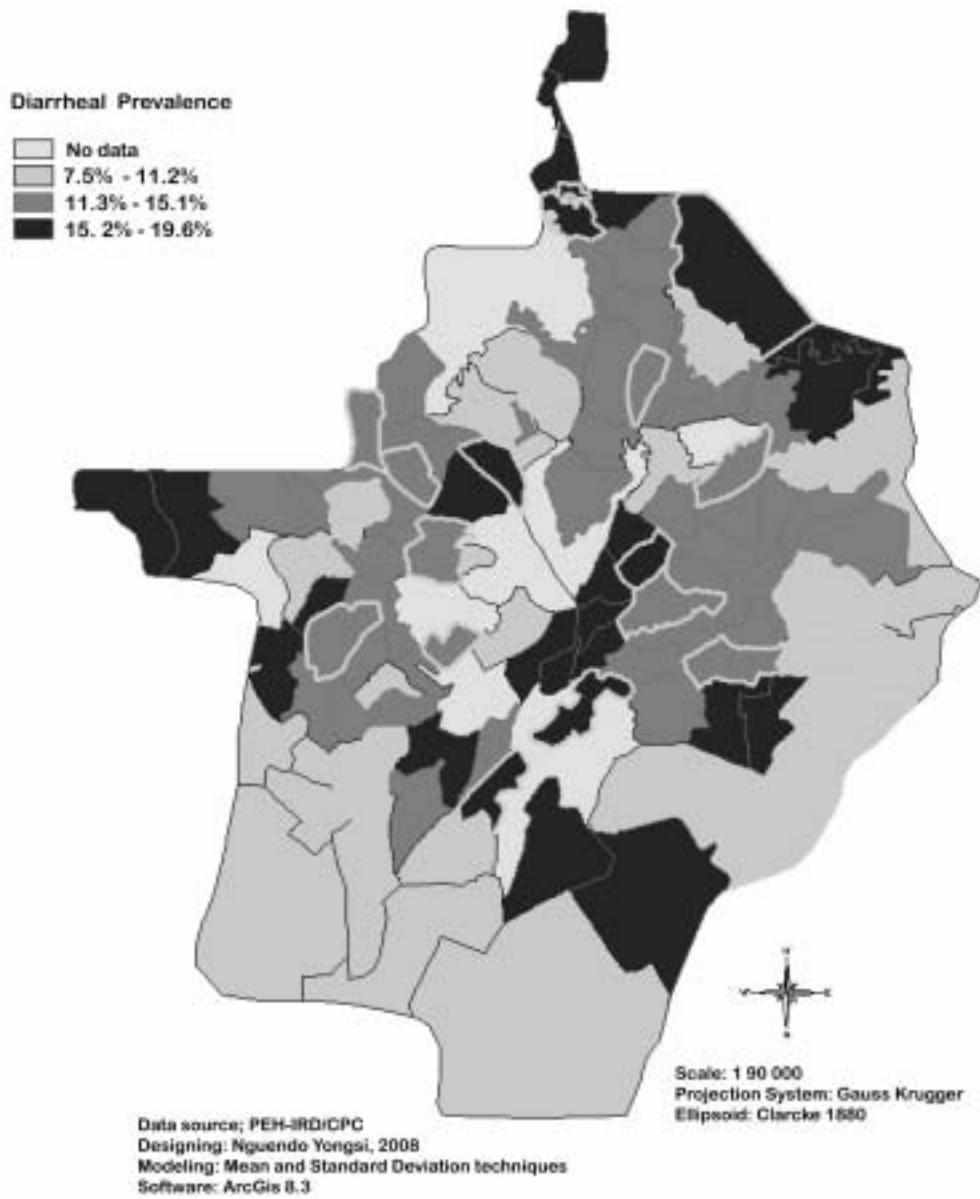


Fig. 1. Global spatial distribution of diarrheas in Yaoundé (a modelling)



in this tropical setting. That is why, analysis level is the contextual one as previously explained.

### Analysis of the Influence of the Mother's Level of Education

In many families, the mother is often responsible for the health of her children. Scholars describe this task as "motherhood", which includes disease prevention, treatment of child illnesses, and ensuring good nutrition, and hygiene in children (Maccomack 1998). These activities naturally fall within context of the domestic responsibilities in which women are fully involved. In Africa in particular, women, right from their childhood take an active role in the transmission of values, attitudes and habits which favor health and wellbeing. That is why mothers are often considered to be responsible for the caliber of children (Hobcraft 1993). For the fact that child health care is devolved to the woman, the analysis that follows will mainly center on the level of education of the women whose children were examined.

### The Significant Influence of Educational Attainment Level on the Occurrence of Diarrhea

There is evidence in the literature that education decisively influences behaviors in the face of illness: educated or the most educated people who are often more conscious of disease prevention often fall less sick, and more often seek medical care in times of need (Eisemon and Schuille 1990). A low level of education or its complete absence can at first consideration become a significant risk factor for ill health. This is demonstrated in table 2.

It has been observed that a significant proportion of diarrhea comes from children whose mothers are illiterate because of the following reasons: (a) If we do not consider factors such as medium and language for communication, it is difficult to sensitize them since their education and

know-how (beliefs and habits), are based on traditional and rural perspectives; (b) It is difficult for them to understand the rationale for certain elements of health education notably in the area of disease prevention, hygiene and nutrition for which they do not perceive the immediate benefits and are therefore unable to appreciate their efficiency as the results are indirect and long term. The perception of health risks to which children are exposed could be better envisioned if their mothers possessed basic school training that will cause them to become more receptive to preventive care and health promotion. This observation is justified by analysis of some variables drawn from the "domestic environment" (Table 3).

In general, uneducated mothers have less

**Table 3: Health behaviours of illiterate women in Yaoundé**

<i>I. Purification of Drinking Water</i>		
	<i>Number</i>	<i>Percentage</i>
Yes	17	18.8
No	73	81.2
<i>Coverage rate: 100,0 (90)</i>		
<i>Variables involved (3): boiling, chlorination, filtration</i>		
<i>II. Behaviour Regarding Children Cleansing</i>		
	<i>Number</i>	<i>Percentage</i>
Good *	12	13.6
Bad **	76	83.4
<i>Coverage rate: 97,77 (88)</i>		
*Women using diapers, pots, or the water closet to collect and dispose the child's faeces.		
**Women whose children defecate on the ground, or who dump the children's faeces on garbage heaps.		
<i>III. Food Preserving Measure</i>		
	<i>Number</i>	<i>Percentage</i>
Good *	23	25.5
Bad **	67	74.4
<i>Coverage rate: 100,0 (90)</i>		
* Keeping in a cool place, in covered plates, in a refrigerator, or in a cupboard		
** Preserving in uncovered plates, on the floor, or on a shelf		

*Source: PERSAN Survey/Infant diarrhea in Yaoundé*

**Table 2: Level of education of mothers and infant diarrhoeas.**

<i>Level of education</i>	<i>Households surveyed</i>		<i>Cases of diarrhoea</i>	
	<i>Number</i>	<i>Percentage</i>	<i>Number</i>	<i>Percentage</i>
Illiterate mothers	90	3.2	23	25.6
Literate mothers	2,753	96.8	390	14.1
Coverage rate: 93,70	-2843			

$P < 0,005$

*Source: PERSAN Survey/Infant diarrhea in Yaoundé*

have good health behaviors than their educated counterpart. Very few mothers (18.8%) provide their new born children with boiled or mineral water at birth. A majority of mothers (81.2%) give their children boiled water which is often stored in feeding bottles of doubtful hygienic quality only for a very limited period of time. A similar situation was observed with the hygienic conditions of toilets where over three-quarters of the mothers interviewed (74.8%) asserted that their children sometimes excrete on the floor, or that their excreta is disposed off in nearby cans.

An equal level of education for an equal level of diarrhea prevalence: If many studies have established links between the level of education of the mother and the health of her children (Haggerty 1994; Al-Mazrou et al. 1995), it also holds true that differences in the levels of education of these mothers are evident in health inequalities. Figure 2 shows a progressive decline of diarrhea in Yaoundé as the level of education of women improves. Similar result has been reported by Kenkel's study on health effects of smoking among individuals of different educational grade.

The high prevalence of diarrhea in children

whose mothers have only primary education is explained by the fact that in Cameroon, the primary school curriculum revolves around activities that are intended to arouse the consciousness of pupils through singing, recitation and in learning the basic techniques of reading, writing, arithmetic, and the resolution of basic problems (Banque Mondiale 2003). The teaching of body hygiene is limited to the very basic elements. In short, there is no rigor in the teaching of the observation of the rules of hygiene. In the first five years of secondary school, teachings related to hygiene become more intensive especially with the introduction of students to human biology. However, just like in the case of the primary school, knowledge is still very theoretical. That is what emerged from the households surveyed. Revisiting the results of the relationship of the following variables; "level of education and purification of water", it was observed that out of the 757 women who had received primary education, only 34 (4.5%) boiled or filtrated their drinkable water. A higher majority (95.5%) did ignore the benefits of treating potable water by boiling, or disinfecting it before consumption (Table 4).

In addition to the flaccid nature of the

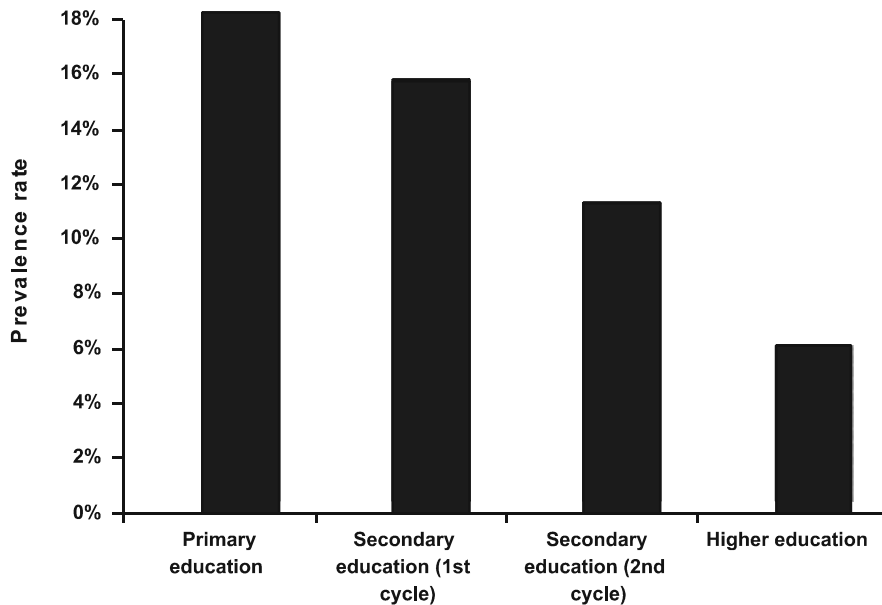


Fig. 2. Diarrheal prevalence in accordance with mother's education level in Yaoundé

**Table 4: Purification of potable water in accordance with the level of education of women in Yaoundé**

	<i>Water purification</i>	
	<i>Yes</i>	<i>No</i>
<i>Level of Education</i>		
Primary		
Number	34	723
%	4.5	95.5
Coverage rate	100,0 (757)	
Secondary 1		
Number	59	1064
%	5.3	94.7
Coverage rate	100,0 (1 123)	
Secondary 2		
Number	348	277
%	55.7	44.3
Coverage rate	100,0 (625)	
Higher education		
Number	111	137
%	44.7	55.3
Coverage rate	100,0 (248)	

Source: PERSAN Survey/Infant diarrhea in Yaoundé

educational policy, is the approximately abstract or theoretical character of teaching. At the first cycle of the secondary education for example, emphasis is laid on molding the person. At this level, women become more conscious of the advantages of individual and domestic hygiene. In Cameroonian high schools (secondary 2 and higher education), most students undertake subjects directly or indirectly related to health and physical education. For example, in most Yaoundé public schools, students are required to undertake 120 hours annually in "Social Behaviors, Health and Physical Education". And according to the 2005 curriculum, "courses are concerned with developing the knowledge and skills and fostering behaviors that will empower students to adopt healthy lifestyles" (Ministry of National Education 2003). Thus, it comes out that more highly educated individuals (mothers) have a better knowledge (health literacy) and this leads them to choose better mixes of health inputs (use of safe water, resort to formal medicine, regular hand-washing, well-dressed and vaccinated children etc.) than less educated mothers. As we have seen when using intermediate variables (water treatment), not only are more educated mother healthier with their kids, but they also consistently choose better health behaviors which minimize their children's diarrheal attacks. Our study and that conducted by Wim and Van den Brink (2002) not only confirm the significant effect of education on health (i.e. a given level of education/health literacy is more productive in

improving health), they also show that education improves the allocative efficiency with which individuals use inputs to improve health i.e. a more educated mother is more likely to select more efficient inputs with which to improve the health of her family (Weiss et al. 1992). In other words, education may lead to better health outcomes through increasing a person's health-related knowledge and information (Sur et al 2004). For educated mothers, it is the most influential factor in improving child health and reducing infant mortality.

Less apparent evidence at area level: It might be tendentious to advance that some neighborhoods are more vulnerable to diarrheas than others according to households' educational attainment levels. Nevertheless, figure 3 shows that the five household categories (educated and uneducated, primary school, secondary school, and university graduates) are not equally distributed within given neighborhoods. Some contain all the five households' categories and others do not. In general, not only does diarrheal incidence vary among mothers of a given neighborhood, but it also varies among neighborhoods such as Briquetterie, Emana and Messa Carrière (see Figure 3) which have noticeable differences in the distribution of illiterate mothers. These areas also show the need to revise the standard definition of neighborhoods - as parts of a city displaying similar human and physical characteristics (Paulet 2006) in cities like Yaoundé which has cosmopolitan neighborhoods.

#### **Is the Religious Element Evident in the Incidence of Diarrhea in Yaoundé?**

It has been observed that the highest incidence was recorded in children whose mothers professed the Islamic faith (21.92%), followed by children whose mothers were animists or practiced traditional religion (20.40%). However, the bi-variate analyses we carried out didn't show a positive correlation between religion and diarrhea (P value <0.09). Therefore, we can not claim that professing a religion or another lead to ill-health. Religion appears here as a confusing variable. This means that considering religion generically might lead to misunderstandings. According to Koenig (2008), some mediates are to be taken into consideration for a better understanding of religious aspects on health outcomes. Within the Cameroonian context, the suitable



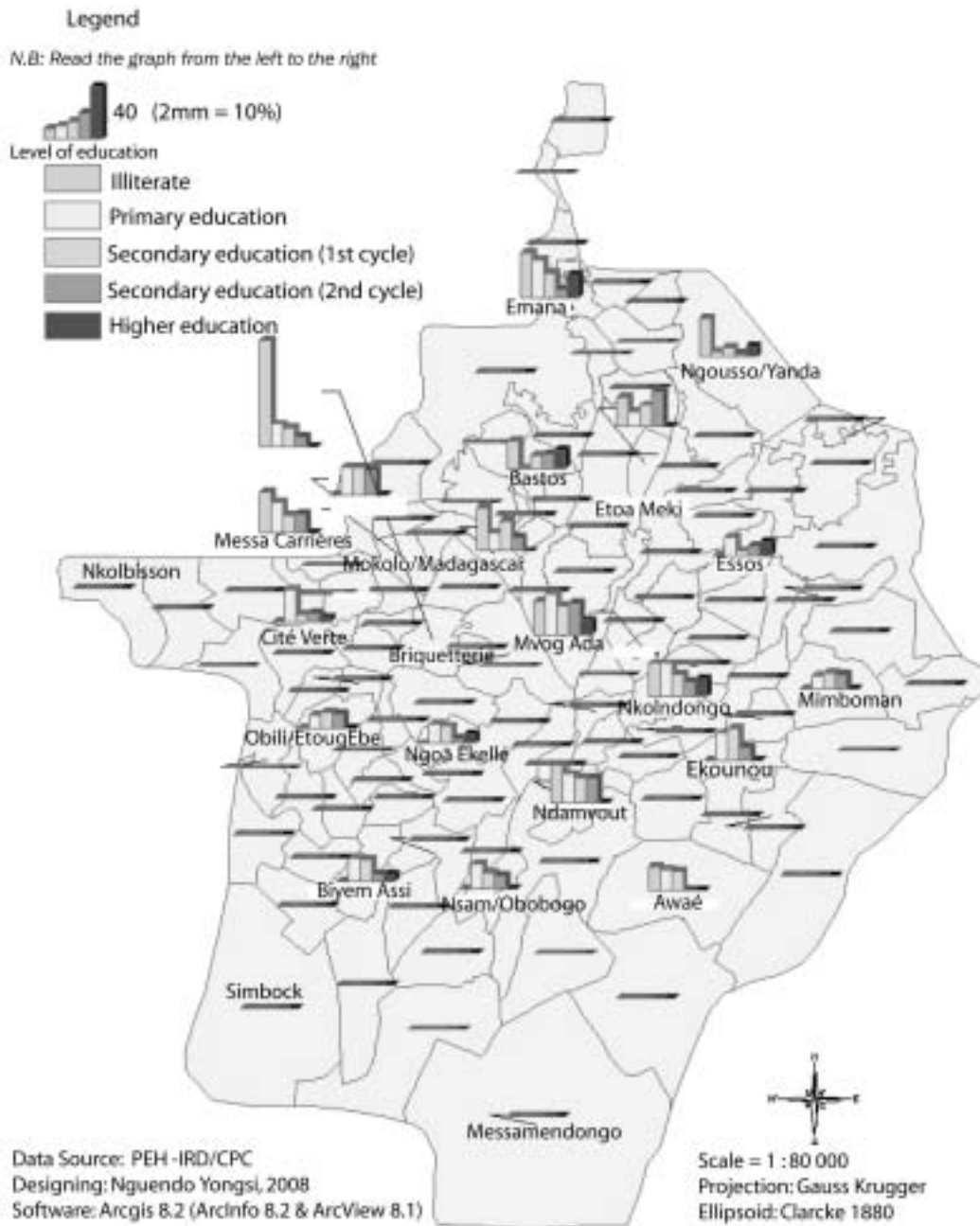


Fig. 3. Situation of diarrheal diseases in some Yaoundé neighborhoods according to mothers' level of education.

intermediary variable is education. By integrating the level of education into the analyses, diverse situations are observable (Table 5).

Diarrhea prevalence in children of these religious communities can be primarily explained by local historical and political facts. As the Beti-Bulu-Fang was the first and the most prominent ethnic group, it is in their community that schools were created along with churches (Medou 1973). Besides, on Sundays, activities and services were performed in French and the priests were more kind and grateful only towards those who were attending classes during the week. Dah (1983) notes that "...at the end of mass rituals, priests always emphasized on the fact that only a healthy body can bear a healthy soul... and invited believers to avoid alcohol and to follow cleanness and personal hygiene rules that their teacher admits". According to Madiba Essiben (1980), the curriculum was focused on three main subjects: French learning, well-being and health promotion, and mathematics. As being a real individual by that period meant being Christian and also literate, Beti-Bulu-Fang individuals seized the opportunity as they were designated to take over the colonial

administration (Elango 1985; Lekunze 1987). From Cameroon independence in 1960 until the 1970s, this hidden "policy" has remained unchanged and Christian's individuals took advantage to strengthen their education whose benefits on health are outlined by many researchers (Gilleskie and Harrison 1998; Biddle 2006). On the other part, the urban area occupied by Fulbe individuals† who are mostly Muslims was not really provided with education infrastructure. Furthermore, they were treated like second class citizens. Following public opinion of southern people, since these Muslims who originated from the Northern part and whose main activities are trade retail and traditional farming, it was not necessary to encourage them having confidence in school. Out of the education plan, they had no access to health literacy. It is also believed that, early marriages practices prevalent amongst this Fulbe community deprive their female children of education. Even within the dominantly Christian communities in towns, this practice has just recently phased out amongst the new Fulbe migrants.

Regarding mothers who maintain traditional

**Table 5: Religion of mother, level of education and infant diarrhoeas in Yaoundé**

<i>Religion</i>	<i>Number surveyed</i>	<i>Percentage</i>	<i>Cases of diarrhoea</i>
<i>1. Catholic</i>			
- uneducated	35	2.1	8 (22.8%)
- primary education	402	23.9	64 (15.9%)
- secondary education (first cycle)	716	42.6	97 (13.5%)
- secondary education (second cycle)	387	23	37 (09.5%)
- Higher education	140	8.3	7 (05%)
<i>Coverage rate: 94,11 (1 680)</i>			
<i>2. Protestant</i>			
- uneducated	22	2.5	6 (02.7%)
- primary education	244	27.7	46 (18.8%)
- secondary education (first cycle)	326	36.1	54 (16.5%)
- secondary education (second cycle)	200	22.7	25 (12.5%)
- Higher education	90	10.2	6 (06.7%)
<i>Coverage rate: 96,60 (882)</i>			
<i>3. Muslim</i>			
- uneducated	29	19.8	9 (31.1%)
- primary education	63	43.1	13 (20.7%)
- secondary education (first cycle)	36	24.6	11 (30.6%)
- secondary education (second cycle)	10	6.8	3 (30%)
- Higher education	8	5.4	1 (12.5%)
<i>Coverage rate: 78,07 (146)</i>			
<i>4. Traditional Beliefs</i>			
- uneducated	4	3.3	0 (0%)
- primary education	43	36.1	9 (20.8%)
- secondary education (first cycle)	39	32.8	9 (23%)
- secondary education (second cycle)	23	19.3	3 (13%)
- Higher education	10	8.4	0 (0%)
<i>Coverage rate: 93,7</i>			
<i>P &lt; 0,005</i>			

*Source: PERSAN Survey/Infant diarrhea in Yaoundé*

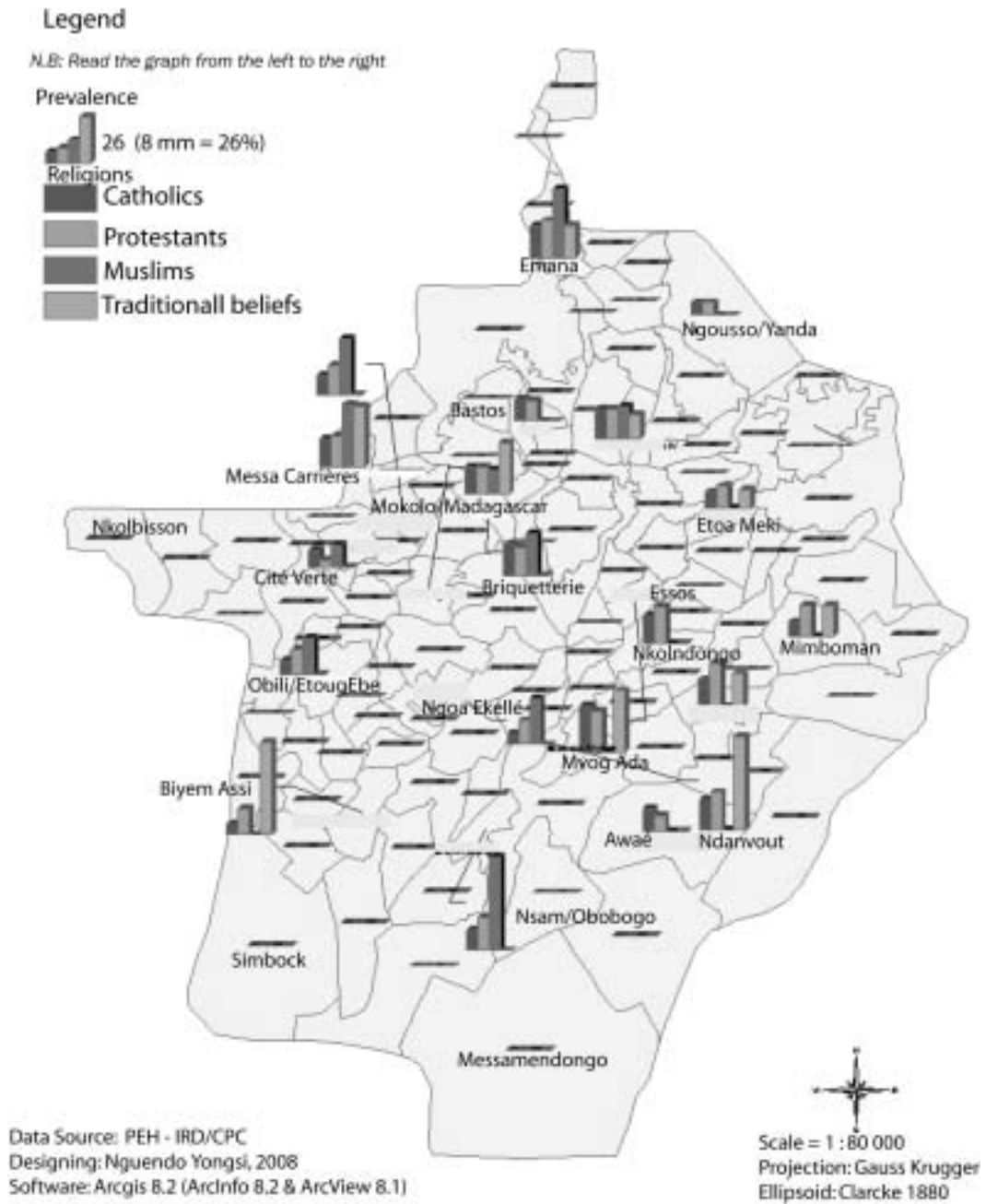


Fig. 4. Situation of diarrhoeal diseases in some Yaoundé neighbourhoods according to mothers' religions and beliefs

beliefs, they are made up of two main ethnic groups: the Bassa/Bakoko and the Bamiléké. According to Tiokou Ndonko (1989), though most of them are Christians and educated, they have remained strongly bound to their ancestors' beliefs i.e. totems and polytheism. Thus, despite their early exposure to Western civilization, the Bassa/Bakoko have two etiologies for diarrheal diseases which pathogenically and traditionally induced diarrhea. As far as the Bamiléké mothers are concerned, notwithstanding their level of education (52.1% have attained the secondary level), their behavioral patterns are dominated by what they consider in the vein of traditional values like (i) non resort to modern health care systems (because they believe that ancestors and gods they idolize will heal every sick individual), (ii) pre-mature and inappropriate feeding, and (iii) by tradition fluid foods. It has been reported that such behavioral patterns contribute to the weak immune status of their children and to their vulnerability to infectious diseases among which secretory diarrheas were ranked second (Mendoza and Piechulek 1992). However, since 1990 with the event of democracy, there have been many changes: city dwellers whether new or old settle independently of their community, individuals who were professing traditional beliefs because they feared to be reprimanded by their social group nowadays freely adopt behaviors they feel good for their blooming, girls are not more under the authoritarian influence of their parents and customs i.e. they can decide about their education and future. Because of those changes in the urban landscape, Yaoundé neighborhoods are not more homogenous as Figure 4 illustrates.

### CONCLUSION

To our knowledge, this study is the first to examine the extent to which literacy and religious connection may be mediators in the relationship between education/religion and health outcomes in Cameroon. Similar to others (Schlinger et al. 2002), we found that better educational attainment was associated with low diarrhea prevalence, the difference observed being statistically significant. We also demonstrated that the inclusion of health behavior (water treatment) has a link with the level of education attained. This result suggests that, literacy at least partially mediates the observed relationship between education and diarrhea

incidence. Literacy could mediate the effect of diarrhea through at least one mechanism: illiterate mothers have been shown to have inadequate health behaviors both purification of drinking water, children cleansing and food preserving measure. Besides, though not statistically proved, there's evidence that religious connection may have effect on diarrhea occurrence in the understanding that (i) us and customs bound to ethno-religious constitute a significant part of individuals' identities and influence their attitudes of coping with disease; (ii) different Yaoundé religious groups have been diversely considered as far as educational policy is concerned. As former public authorities were the missionaries, they favor Christian's believers by setting up educational infrastructure in their urban area and by services such as frequent pleas to attend school where health education is taught, and also such as scholarships that were granted to some to conclude their education overseas.

There are two main limitations of this study. First, the cross-sectional design does not allow us to infer that any associations were causal. Second, we only modeled the relationships between education, religious connection and diarrheas-an intermediate health outcome. While we were underpowered to address more distal outcomes, diarrheas are closely linked to unsafe drinking water, contaminated foods, mismanagement of household refuse and waste water and poor access to primary health care. In other words, even though the analytical method chosen (bivariate analysis) for interpretation (contextual level) falls in line with the recommended eco-epidemiological approach for this type of work, it appears difficult to link the existence of diarrhea diseases in Yaoundé only to the two variables or determinants: education and religion. Other risk factors also exist and contribute to occurrence of diarrhea (Woldemicael 2004; Sur et al. 2004). Thus, if our results were to be replicated with other populations in different settings and across health conditions and outcomes, use of a multi-level design with all known diarrhea determinants would be great.

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### NOTES

- 1 These populations originated mainly from the northern section of the country. They arrived in Yaoundé during the period of German colonization to pursue commercial goals at the appeal of Major Hans Dominik who needed them to develop trade in the new "station".
- 2 In Cameroon, the Bamiléké are a Bantu people settled on the Western Highlands of the country. They are an industrious people whose propensity to trade is rivaled only by that of the Muslims of North Cameroon. The first Bamiléké people arrived in Yaounde in 1918. They first settled at the race course site (hippodrome) before being transferred to Mokolo in the West, where they associated with other migrants like the Bamvelle, Baboute and Yambassa.

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