



---

# OBESITY, HEALTH CARE EXPENDITURE AND EDUCATION IN BAMENDA MUNICIPALITY- CAMEROON: CONSIDERATIONS FOR CURRICULUM INNOVATION

**Nubonyin Hilda Fokong**

*Faculty of Education, The University of Bamenda, Cameroon*

**Kinga Bertila Mayin**

*Faculty of Business and Management Sciences, Catholic University of Cameroon  
(CATUC) Bamenda*

## **ABSTRACT**

*Obesity is a major risk factor to many non-communicable diseases leading to increase health care expenditures and concerns for curriculum innovations in many countries. Thus, the objectives of this study are: to determine the factors influencing health care expenditure, to investigate the effects of obesity on health care expenditure, to examine the relationship between obesity and education and to discuss implications for curriculum innovation on the basis of the findings. The study was conducted in the Bamenda Municipality of Mezam Division in the North West Region of Cameroon. The survey research design was employed. With the use of questionnaire, primary data was collected from 753 obese and non-obese individuals aged 20 and above. The multiple regression and multinomial logit results revealed that, level of monthly expenditure and education had statistically significant effect on health care expenditure in the Bamenda Municipality. There was insignificant effect of obesity on health care expenditures. Gender and age influenced health care expenditure and majority of those who had attained higher levels of education were non obese as opposed to their obese counterparts. The study argued that, curriculum innovation focusing on reducing obesity and health care expenditure via educational attainment remains a long term process. Therefore, educational stakeholders should sensitize the community on the basic rules on weight watching and the Bamenda City Council should create weight loss rehabilitation centers. The adoption of personalized and integrated approaches to innovative curriculum planning and design should be of utmost importance to the government of Cameroon.*

## **KEYWORDS**

*Obesity, health care, expenditure, education, curriculum innovation.*

## **1. INTRODUCTION**

Obesity, health care expenditure, education and innovations in curriculum have become a worrisome phenomenon for health and educational stakeholders in both developed and developing

---

countries. According to the World Health Organization (WHO, 2021) obesity is an abnormal or excessive fat accumulation that may impair health and have important consequences for morbidity, disability and quality of life. To this organization, obesity entails higher risk of developing type 2 diabetes, cardiovascular diseases, several common forms of cancer, osteoarthritis and other health problems. To corroborate this statement WHO (2014) states that in Cameroon, 44% of diabetes, 35.5% of hypertension, 24% of cancer and 60% of cardiovascular burden is caused by obesity. This implies that obesity is a major contributing factor to many health care problems affecting both men and women in Cameroon today.

To resolve this problem of obesity, the Cameroonian government has progressively embarked on curriculum innovations and increased her resources allocated for education and health care (Growth and Employment Strategy Paper (GESP), 2009). This solution for the most part remains questionable because it has been observed that, in the rank for the most obese countries, Cameroon ranked 135 with an average body mass index (BMI) of 11.4% in 2016 and 24.4% in 2019 (United Nations Statistics Division (UNSD), 2020). These trends in obesity in Cameroon bring to mind the question of whether obesity has a relationship with health care expenditure.

For a long time, unhealthy behaviour such as obesity as measured by BMI scale or a person's weight (in kilograms) divided by the square of his or her height (in meters) is increasing (WHO, 2021). This implies that, obesity is associated with increased demand for health care expenditure. It is highly documented that, health care expenditures are a combination of outpatient visit expenditures, prescription drug expenditures, and emergency room expenditures (Medical Expenditure Panel Survey, 2008). In 2014 it was observed that obesity was associated with 35% increase in inpatient and outpatient spending, as well as a 77% increase in related cases (Ayers, Alvin, Ian, Jaret., Anand, Sandeep, Amit, Darren, James and Aslan; 2014). While in 2016 the world health organization reported that, obesity resulted to both direct and indirect cost to an individual. Direct costs were those that result from outpatient and inpatient health services (including surgery), laboratory and radiological tests, and drug therapy; while indirect costs were the resources forgone as a result of a health condition such as absenteeism, reduced productivity and time wasted (WHO, 2016). From the WHO (2016) analysis understanding the factors influencing health care expenditure and the effects of obesity on health care expenditure in Cameroon are crucial.

Importantly, the link between obesity and health care expenditure hinges on a good curriculum or curriculum innovation that supports learning about healthy living. Curriculum innovation in this context refers to cultivating learners' key competences such as healthy life, responsibility and practice (Li, Zhang, Dai, and Hu, 2021). In Cameroon, curriculum innovation has focus on learning about healthy living. This explains why educational stakeholders embarking on curriculum innovation have been confident that a well-designed curriculum on healthy living could have an impact on the citizen behaviour outside the school (Order No 419/14/MINESEC/IGE of 09 December 2014). This means that, curriculum innovation that handles issues related to economic life as the broad areas of living has influential parts on learning. The standard of living of the learners after the teaching and learning process are demonstrable proof. In this paper we need to be realistic about how long it will take for any curriculum innovation to have a positive influence on learning as evident by the health and wellbeing of the learners in the community. The above-mentioned discussions encourage the researchers to dig deeper, asking the question, in what ways

are curriculum innovations as measured by levels of educational attainment making a difference to obesity.

Aside from curriculum innovation, the human capital theory (Grossman, 1972) explains that individuals' lifestyle such as education, diet and physical exercises have a positive impact on their health and wellbeing. To reaffirm Grossman's theory, Fokong, Fonchamnyo and Njimanted (2019), suggest that, the level of educational attainment raises a person's knowledge about productivity relationship and therefore increases his or her ability to select healthy habits and to make efficient use of his or her time and earning. With regards to Fokong et al. (2019) proposition, this paper has questioned whether individuals in the Bamenda Municipality attain higher levels of education and invest in healthy lifestyle. This is because these individuals are compel to trade off time and resources devoted to health (such as: attaining a higher level of education, eating a balance meal and exercising at local gyms) against other goals.

Without doubt, obesity, health care expenditure, education and curriculum innovation is a permanent concern for the Cameroonian state and the Bamenda Municipality in particular, which is keen on achieving its emergence in 2035. Thus, this paper attempts to address the following objectives: to determine the factors influencing health care expenditure in the Bamenda Municipality; to determine the effects of obesity on health care expenditure in the Bamenda Municipality; to examine the relationship between obesity and education in the Bamenda Municipality and to discuss implications for curriculum innovation on the basis of the findings. Based on the objectives we hypothesized that: 1) There are no significant factors influencing health care expenditures in the Bamenda Municipality; 2) There are no significant effects of obesity on health care expenditure in the Bamenda Municipality and; 3) There is no significant relationship between obesity and education in the Bamenda Municipality.

## 2. REVIEW OF LITERATURE

Theoretically, this paper utilized Grossman's (1972) demand for health care theory and Campbell (2006) absolute model. Grossman (1972) states that, individuals invest in themselves through education, training and health to increase their earnings. In a nutshell the model states that the demand for health care is a derived demand from the demand for health. This implies that, in the Bamenda Municipality the demand for sport or diet to get a healthy weight is a derived demand for good health void for diseases (like diabetes, hypertension cardiovascular heart diseases, cancer and corona virus pandemic or COVID 19) which have obesity as their risk factors. The model assumes that individuals will seek to reduce their weights because it makes them feel better; it increases the number of healthy days available for them to work and to earn an income and it reduces their expenditures on potential illness like diabetes, hypertension, COVID 19, and so on. The theory further assumes that, the cost of any health intervention like obesity will be in terms of the time and resources forgone. The framework of the model is presented as follows:

$$I = I (M, TH) \dots \dots \dots i$$

Where: I is investment in obesity, M is market inputs in obesity treatment and TH is time used in the cutting down of excessive fat.

$$T = TH \text{ (improving obesity)} + TB \text{ (producing other goods)} + TL \text{ [lost to obesity]} + TW \text{ (working)} \dots \dots \dots ii$$

---

Where,  $T$  is the total time available to the individual. From this model, time is classified under four categories: When an individual is sick or obese, he or she actually uses up time like going to the gym and for treating obesity related illnesses. This time spent in cutting weight is called health-improvement time (TH). The leisure time is denoted as  $TB$ . The time lost to obesity is denoted as  $TL$  and  $TW$  is the time available for work. Grossman assumes that  $TH$  and  $TL$  are fixed time available for work or leisure= $365 - TH - TL = TB + TW$ . This implies that, the total time minus time lost to improving obesity plus time lost to obesity related sickness will sum up to the time available for an individual to work and produce other goods. Therefore, when an individual in the Bamenda Municipality is obese, the time taken to improve upon his or her weight and to treat obesity related illnesses reduces the total time available for him or her to work and vice versa.

In corroborating Grossman's view of the relationship between education and obesity, Campbell (2006) states that the probability that individuals will be obese depend on their level of education. The model assumes that education may reduce the probability that individuals will be obese by increasing the stock of information available to the individual concerning health risks associated with unhealthy life style. The model further assumes that education may reduce the probability that individuals will be obese by improving their ability to understand and handle information concerning health risks associated with unhealthy lifestyle. The framework of this model argues that, the absolute effect of education might be positive or negative. From a positive perspective, policies which promote education and learning and increase the average educational attainment of a population will have the effect of decreasing obesity rates. Whereas, from a negative viewpoint, education increases wages and hence increases the opportunity cost of leisure time. This implies that an educated individual's propensity to engage in leisure time, physical activity or home meal preparation will likely be reduced.

In both developed and developing countries, a number of studies have investigated the factors influencing healthcare expenditure and the effect of obesity on health care expenditure. Amongst them are the works of Finkelstein et al. (2009); Buchmueker and Johar (2015) who found that obesity, gender and age influence health care expenditure. Specifically, they argued that, obesity related health expenditure is higher for obese men than women. Equally, they stated that obesity related health expenditure has the largest impact among older men aged 75 and women aged 60 to 74 years old. Interestingly, Buchmueker and Johar (2015) argued that, relative to the annual health expenditure of those with normal weight, the health expenditure of those with BMI 30 and 35 are 19% higher while the health expenditure of those with BMI 35 and 40 are 51% higher. This justifies the affirmation that unhealthy behaviour such as being overweight or obese increases the demand for medical care (Cawley, Meyerhoefer, Biener, Hammer and Wintfeid, 2015). To reaffirm Cawley, et al. (2015) findings, Huye and Marton (2018), Cecchini (2018) as well as Ward, Bleich, Long and Gortmaker (2021) discovered that in America the different class of obesity influence total health care expenditure. Remarkably, Cecchini (2018) results reveal that, class III obesity ( $BMI \geq 40kg/$ ) significantly affects the demand and expenditure for health care services. Whereas, Huye and Marton (2018) findings reveal that, a 5% weight reduction would reduce individuals with class III obesity annual medical cost by \$2.137 while individuals with class II and I obesity would save \$528 and \$69 respectively. In Cameroon, Kinga, Sunjo, Nfor and Njimanted (2020) collected data from 100 hypertensive and diabetes individuals aged 20 and above from the Bamenda Regional hospital and argued that the treatment of obesity annually cost 492000 FCFA.

To reaffirm Kinga et al. (2020) findings, Cawley, Biener, Meyerhoefer, Ding, Zvenyach, Smolarz and Ramasamy (2021) found that one additional unit of BMI raised the total annual medical expenditure by \$201 whereas Ward et al. (2021) found a j-shape curve of medical expenditure by obesity.

Worldwide, several studies have investigated the relationship between obesity and education. For instance, Cohen, Rai, Rehkopf and Abrams (2013) observed that, there exist an inverse association between educational attainment and obesity in high income countries and a positive association between educational attainment and obesity in lower income countries. The findings reiterate Bockerman, Viinikainen, Pulkki-Raback and Raitakan (2017) findings that education could be a protective factor against obesity in advanced countries. In a further twist, Murakami, Ohkubo and Hashimoto (2017) findings revealed that, the education of women was significantly associated with obesity among unmarried women than their married counterparts. To ascertain the above findings, Hsieh, Lee, Yu, Hu, Lin and Ho (2020) indicated that, the odd ratios increase as years of education decrease. Hsieh, et al. (2020) argued that, the trend is more pronounced among women. The above reviews of related literature were mostly carried out in developed country thus warranting a work of this nature in a developing country like Cameroon and Bamenda in particular.

### 3. METHODOLOGY

The study was conducted in the Bamenda Municipality of Mezam Division in the North West Region of Cameroon. The study adopted a survey research design. From a total population of 2500 individuals a sample of 753 was derived using Krejcie and Morgan (1970) table. A purposive sampling technique was used to select Mezam Division in the North West Region of Cameroon. A simple random sampling technique was used to select three sub-divisions in Mezam Division. From the sampling process Bamenda I, II and III Municipalities were selected.

Close ended questionnaire was utilized to collect data from a sample of 753 obese and non-obese individuals in the Bamenda Municipality. The questionnaire was subdivided into three sections. Each section was made up of items pertaining to a specified objective of the paper. Generally, the questionnaire covered items pertaining to age, gender, body weight, height, occupation, monthly income, monthly expenditure, monthly health expenditure and levels of educational attainment. Content validity of the questionnaire was measured when, twenty individuals in Bamenda were administered the questionnaire and after a forth night the same individuals were administered the questionnaire. The reliability of the questionnaire scale was established using the 'Cronbach Alpha ( $\alpha$ )' statistical method. The reliability coefficient of the questionnaire was .891. The researchers administered the questionnaire to the individuals in the month of August and September 2021. Before administering the questionnaire to the individuals, the researchers explained the purpose and nature of the study; sought their consent and assured them that the information collected would be treated confidentially.

The data collected was analyzed using descriptive and inferential statistics. Specifically, Chi square test was used to evaluate the factors determining health care expenditure and the relationship between obesity and educational attainment. The multiple regression and multinomial logistic regression techniques were used to evaluate the effect of obesity on health care expenditure. Health care expenditure was categorized as low, medium and high. The base group was low health care expenditure. The model was specified as follows:

**3.1. Multinomial Logit Regression Model**

$$f(y) = P_1^{y_1} x P_2^{y_2} x \dots P_7^{y_7} = \prod_{j=1}^7 P_j^{y_j} \dots \dots \dots (1)$$

Where j = choices of y and i = number of explanatory variables

The Multiple Regression Model is specified as:  $Y = (\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k) + \epsilon$

$$= \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k + \epsilon \dots \dots \dots (2)$$

Where y= dependent variable and xi = independent variables

Applying this model to our work, our model can be specified as

$$HCE = \beta_0 + \beta_1 BMI + \beta_2 Gen + \beta_3 Ag + \beta_4 EX + \beta_5 ED + u \dots \dots \dots (3)$$

**Table 1: Description of variables**

Description of variables	Measurement	Expected sign	Authors (Date of Publication)
Health Care Expenditure (HCE)	Yearly health care expenditure in thousands of FCFA. HEC is categorized as: low (HEC<50.000), medium (50.000<HEC<100.000) and high (HEC>100.000).		Finkelstein et al. (2009); Buchmueker and Johar (2015)
Body mass index (BMI)	Obesity (OBS) is measured using BMI. BMI is calculated as $kg/m^2$ BMI is categorized as Obese and non-obese Obese=Individuals with BMI from 30 to 35(class I), 35 to 40 (class II), above 40 (class III) Non-Obese= Individuals with BMI from 18.5 to 25(Normal or healthy weight).	+	WHO (2012); Cawley, et al. (2015), Huges and Marton (2018); Cecchini (2018)
Gender (Gen)	Male =1, Female = 2	+	Finkelstein et al. (2009); Buchmueker and Johar (2015)
Age (Ag)	Age of the individual in years	+	Finkelstein et al. (2009); Buchmueker and Johar (2015)

Expenditure (EX)	Monthly expenditure excluding health care expenditure	+	Grossman (1972); Cecchini (2018)
Education (ED)	Levels of education. It is categorized as no education, primary education (first school), secondary education(Ordinary level (O/L) and advance level (A/L)) and tertiary education (first degree and post graduate)	-	Cohen, et al. (2013); Hsieh et al. (2020)

*Source: Computed by authors*

An important strength of our methodology is to understand which practices contribute to curriculum innovation in the Bamenda Municipality. Thus, adapting OECD (2014) measurement, we measured curriculum innovation as individuals (learners) attending schools and application of their knowledge and skills of healthy living in their real lives or change in their health care practices.

#### 4. EMPIRICAL RESULTS

*Table 2: Summary descriptive statistics of variables used in the model*

	Mean	Std. Deviation	N
Body Mass Index	27.85	4.94	753
Health Care Expenditure	1.75	1.28	753
Sex	1.63	0.48	753
Age	1.63	0.76	753
Monthly Expenditure	2.01	1.30	753
Level of Education	3.97	1.41	753

*Computed by authors*

Table 2 presents the study variables and descriptive statistics for obesity, health care expenditure and education in Bamenda Municipality. Specifically, table 2, shows that from the sample of 753 observations, on the average the BMI for obese and non-obese individuals is 27.85 and the mean health care expenditure is 1.75. The mean age of the individuals is 1.63 years. On average individuals spent 2.01 on health care expenditure monthly. The summary statistics of educational attainment reveals that, the average number of years of schooling for obese and non-obese individuals is 3.97.

##### 4.1. Verification of Hypothesis I

Null Hypothesis (Ho): There are no significant factors influencing health care expenditure in the Bamenda Municipality.

Alternative Hypothesis (H1): There are significant factors influencing health care expenditure in the Bamenda Municipality.

**Table 3: The Factors Influencing Health Care Expenditure in Bamenda Municipality**

Variable	Yearly Health care expenditure			Totals
	Low (<50,000)	Average (50-100,000)	High( > 100000)	
Obesity				
Obese	129(17.1%)	47(6.2%)	46(6.1%)	222(29.5%)
Non obese	33.4(44.4%)	109(14.5%)	88(11.7%)	531(70.5%)
ProbX <sup>2</sup>				0.345
Gender				
Female	293(38.9%)	94(12.5%)	84(11.2%)	471(62.5)
Male	170(22.6%)	62(8.2%)	50(6.6%)	282(37.5)
ProbX <sup>2</sup>				0.785
Age				
20-35	266(35.3%)	76(10.1%)	48(6.4%)	390(51.8%)
36-50	148(19.7%)	58(7.7%)	65(8.6%)	271(36.0%)
51-65	44(5.8%)	18(2.4%)	13(1.7%)	75(10.0%)
>65	5(0.7%)	4(0.5%)	8(1.1%)	17(2.3%)
ProbX <sup>2</sup>				0.000
Level of education				
Primary	89(11.8%)	28(3.7%)	32(4.2%)	149(19.8%)
Secondary	184(24.4%)	61(8.1%)	49(6.5%)	294(39.0%)
Tertiary	190(25.2%)	67(8.9%)	53(7.0%)	310(41.2)
ProbX <sup>2</sup>				0.75
Monthly expenditure				
1	277(36.8%)	56(7.4%)	19(2.5%)	352(46.7%)
2	116(15.4%)	45(6.9%)	52(6.9%)	
3	44(5.8%)	30(4.0%)	25(3.3%)	
4	12(1.6%)	13(1.7%)	13(1.7%)	
5	4(0.5%)	4(0.5%)	12(1.6%)	
6	10(1.3%)	8(1.1%)	13(1.7%)	
ProbX <sup>2</sup>				0.000
total	463(61.5%)	156(20.7)	134(17.8%)	

*Source: computed by authors*



Table 3 shows that health care expenditure statistically depended on age ( $p$ -value=0.00) and monthly expenditure ( $p$ -value=0.00). It also reveals that, health care expenditures is statistically independent of obesity ( $p$ -value=0.35), gender ( $p$ -value=0.79), and level of education ( $p$ -value=0.75). Therefore, we reject the null hypothesis and conclude that, there are significant factors influencing health care expenditure in the Bamenda municipality. It is worthy to note that, the chi square result of 0.345 shows an insignificant influence of obesity on health care expenditure. However, the results indicate that, 44.4% of non-obese individuals have low health care expenditure while only 6.1% of the obese have high health care expenditure. This means that most of the non- obese individuals have low health care expenditure.

#### 4.2. Verification of Hypothesis II

Null Hypothesis (Ho): There are no significant effects of obesity on health care expenditure in the Bamenda Municipality

Alternative Hypothesis (H1): There are significant effects of obesity on health care expenditure in the Bamenda Municipality

**Table 4: The Effects of Obesity on Health Care Expenditure in Bamenda Municipality**

	Regression Results	Multinomial Logit Results			
		Medium		High	
Variable	Coefficient (Standard error)	Coefficient (Standard error)	Marginal effect	Coefficient (Standard error)	Marginal effect
BMI	0.0007 ( 0.903)	0.0033 (0.0199)	0.0005	0.0012 (0.0222)	0.0001
Gender	0.0419 (0.446)	-0.0088 (0.1978 )	-0.0084	0.2004 (0.2242)	0.0270
Age <sup>2</sup>	0.0681* ( 0.067)	0.0954 (0.1336)	0.0072	0.2641 (0.1401)	0.0318
Educational level	-0.0440** (0.027 )	-0.0718 (0.0720)	-0.0062	-0.1770** (0.0798)	-0.0210
Expenditure	0.2227*** (0.000)	0.4640*** (0.0851)	0.0538	0.7374*** (0 .0869)	0.0820
F( 26.5 1052) =	Prob.> F = 0.0000***				
Number of observations	753				
R-squared	0.089		LR Chi <sup>2</sup> (4) = 110.23 Prob. > Chi <sup>2</sup> = 0.000***		

Source: Computed by authors

\* indicates statistical significance at the 10% level, \*\* at the 5% level, and \*\*\* at the 1% level.

Table 4 presents the effects of obesity on health care expenditure from the multiple regression equation and multinomial logistic regression equation. The coefficient in column 4 compares medium health care expenditure to low health care expenditure (base group). The coefficient for obesity in column one of the multinomial logistic regressions is positive (0.0033). The marginal effect result is equally positive (0.0005). This means that with a 1kg/m<sup>2</sup> increase in body mass index, the likelihood that the respondents (individuals) will have medium health care expenditure compared to low health care expenditure will increase by 0.0005. This result is however insignificant. The coefficient for obesity (0.0007) in column 2 (multiple regression result) also confirms this insignificant result. Looking at the multinomial logit results, the coefficients for gender (-0.0088) and level of education (-0.0718) are negative. Similarly, the marginal effect results for gender (-0.0084) and level of education (-0.0062) are negative. These results reveal that, more men as compared to women will have medium health care expenditure compared to low health care expenditure. The results also show that, as the level of education increases by one unit, the likelihood of having medium health care expenditure compared to low health care expenditure will fall by -0.0062.

The multinomial logit coefficient of age (0.0954) and monthly expenditures (0.4640) are both positive. Similarly, the marginal effect for age (0.0072) and monthly expenditures (0.0538) are positive. The marginal effects results for age and monthly expenditure are reaffirmed by the positive multiple regression results for age (0.0681) and health care expenditure (0.2227). This means that, with a 1% increase in age and monthly expenditure, the probability of having an average health care expenditure as compared to low health care expenditure will increase by 0.0072 and 0.0538 respectively. A critical look at the multinomial logit results in column 1 indicate that, only monthly expenditure(0.4640) has a statistical significant effect on health care expenditures while for the regression results, both monthly expenditure(0.2227) and level of education (-0.0440) have statistically significant effect on health care expenditure in the Bamenda municipality.

The coefficients in column 5 of table 4 compare medium health care expenditure to high health care expenditure. For instance, the obesity coefficient (0.0012) and marginal effect (0.0001) are positive. This means that, with a 1% increase in obesity level, the probability that people will have medium health care expenditure as compared to high will increase by 0.0001. This result is however statistically insignificant. Moreover, the marginal effect result for gender (0.0270), age (0.0318) and monthly expenditure (0.0820) are positive while that of level of education is negative (-0.0210). The results reveal that a 1% increase in gender, age and monthly expenditure the probability that individuals will have medium health care expenditure as opposed to high health care expenditure will increase. The coefficients in column 5 further indicate that, in these municipalities coefficient of the level of education (-0.1770) is significant. From the multiple regression and multinomial logit results, it is evident that, obesity has a statistically insignificant effect on health care expenditure. Thus, we retain the null hypothesis. However, the results show that, the level of monthly expenditure and level of education have statistically significant effect on health care expenditure in these municipalities.

### 4.3. Verification of Hypothesis III

Null Hypothesis (Ho): There is no significant relationship between obesity and education in the Bamenda Municipality.

Alternative Hypothesis (H1): There is a significant relationship between obesity and education in the Bamenda Municipality.

**Table 5: Relationship between Obesity and Educational Level**

Level of education	Non-obese	Obese	Total
No education	20(2.7%)	9(1.2%)	29(3.9%)
First school	75(10.0%)	45(6.0%)	120(16.0%)
Ordinary level	82(10.9%)	33 (4.4%)	115(15.3%)
Advance level	139(18.5%)	40(5.3%)	179(23.8%)
First degree	139(18.5%)	65(8.6%)	204(21.1%)
Post graduate	76(10.1%)	29(3.9%)	105(14.0%)
Total	531(70.6)	221(29.4)	752
P- $\chi^2$	0.113		

From table 5, we observed that, 221 (29.4%) of the total respondents indicated that, they were obese and the highest percentage of obese individuals were those with first degree (8.6%), followed by first school (6.0%), advance level (5.3%), ordinary level (4.4%), post graduate (3.9%) and those with no education (1.2%). The calculated value (0.113) is positive but insignificant. We retain the null hypothesis. Thus, we conclude that, there is no significant relationship between obesity and education in the Bamenda Municipality.

Table 5, further revealed that, among the 531 (70.6%) of the total respondents who indicated that they were not obese; 139 (18.5%) were holders of the first degree and advance level certificate. Among those who apply the knowledge and skills acquired about healthy living, 82(10.9%) were holders of ordinary level certificate, 76(10.1%) had a post graduate certificate and 75(10.0%) were holders of first school leaving certificate. Interestingly, we observed that, 29 (3.9%) of the total respondents had no education and 20 (2.7%) of them were non obese whereas 9 (1.2%) were obese. Moreover, 120 (16.0%) of the total respondents indicated that, they had acquired knowledge and skills of healthy living at primary level of education. Indeed majority 75 (10.0%) of them were non obese while 45(6.0%) were obese. 115 (15.3%) of the total respondents indicated that, they had attained the ordinary level of education and majority 82 (10.9%) of them were non obese while 33(4.4%) were obese. 179 (23.8%) of the total respondents indicated that, they had attained the advance level of education and majority 139 (18.5%) of them were non obese as opposed to 40 (5.3%) who were obese. 204 (21.1%) of the total respondents indicated that, they had reached the first degree level of education and majority 139 (18.5%) of them were non obese as compared to 65 (8.6%) who were obese. Furthermore, 105 (14.0%) of the total respondents indicated that, they had gotten to the postgraduate level of education and majority 76 (10.1%) of them were non obese while 29 (3.9%) were obese. In a nutshell, these findings reveal that, among the total respondents who indicated that, they had attained school majority were not obese as opposed to their obese counterparts. This implies that a handful of the respondents never or could not appropriately apply the knowledge and skills acquired about healthy living. These findings highlight the importance of curriculum innovation in healthy living in promoting a healthy weight for the entire population.

---

## 5. DISCUSSION OF RESULTS

Obesity has a positive but insignificant influence and effect on health care expenditures. Some of the possible reasons for this insignificant influence and effect of obesity on health care expenditure in Bamenda municipalities are the multiple factors (such as occupation, attitude towards physical exercise, commuting patterns, food availability and sedentary lifestyles) responsible for the increase in obesity. However, the results reiterate Cecchini (2018) and Cawley, et al. (2015) predictions that obesity influence health care expenditures. Similarly, the findings corroborate earlier claims that obesity has a substantial effect on health care expenditure and vary according to gender and age (Kinga et al, 2020; Hüge and Marton, 2018). Other factors like age and gender equally influence health care expenditure in Bamenda municipalities. These results are in line with the findings of Finkelstein et al. (2009), Buchmücker and Johar (2015) as well as Ward, et al. (2021) that obesity, gender and age influence health care expenditure.

Remarkably, we observed that, the monthly expenditure and level of education have statistically significant effect on health care expenditure. Another remarkable relation is that between obesity and level of education in these municipalities. These results are consistent with Grossman (1972) and Campbell (2006) models. In connection to this, Grossman and Campbell described two path ways in which level of education is related to health care expenditure or obesity. First, when individuals invest in education and health, it causes a decrease in obesity, illnesses, monthly health care expenditure and leads to an increase in their earnings hence, increase their opportunity cost for leisure. Second, when individuals have little or no investment in education and health, it causes an increase in obesity, illness, monthly expenditure and thus, increases health care expenditure. Based on the above discussions, addressing innovation in the curriculum is likely to yield high human development and economic benefits and speed up reduction in obesity and health care expenditure in the Bamenda municipality.

### 5.1. Implications for Curriculum Innovation

It is well known that curriculum innovation in Cameroon has focus on learning about healthy living. However, the findings reveal that curriculum innovation focusing on reducing obesity and health care expenditure via educational attainment is a long term process. This is because the individuals in the Bamenda municipality do not express in action that, they have acquired knowledge, skills and attitudes in broad areas of living. Therefore, managing curriculum innovation in health living involve identifying the ways knowledge is transferred and developing strategies for evaluating the implementation. Some curriculum innovation policies to tackle this problem of individuals' in the Bamenda Municipality becoming obese and as a consequence increasing their monthly expenditure or health care expenditure include:

-Adopting personalized approaches to innovative curriculum planning and design: This implies providing a more flexible and less prescriptive curriculum which enable teachers in the different levels of education to teach knowledge and skills on obesity and health care expenditure directly, and develop individual learner's understanding of physical health and wellbeing. This innovation will be successful when learner's increase their participation in learning, share their experiences and perceptions of obesity and health care expenditure in particular and education in general.

-Adopting an integrated approach to innovative curriculum planning and design: This means, expanding initial teacher training to include training on incorporating issues on success criteria in healthy living, responsibility and practice in other subjects. This innovation will ensure that teachers tailor pedagogies that are appropriate to learner's wellbeing.

-Evaluating the acquisition of competences in health living curriculum by providing ample opportunities for student to apply and use the competences acquired in cross-curricular studies. This innovation will ensure an increase in learner's understanding and capability about healthy life.

## 6. CONCLUSIONS

It is well known that education focus on individuals' learning. Education leads to an improvement in individuals' health and earnings. It involves individuals practicing the competences acquired. Obesity and health care expenditure are based on this. Hence, obesity, health care expenditure and education are closely related. From our findings, it can be said that, the level of education and monthly expenditure have a statistically significantly influence on health care expenditure in the Bamenda Municipality. This implies that, an individual learning is the center of education, curriculum innovation is the key to education and healthy living is the supporter. A reduction in obesity and health care expenditure in the Bamenda Municipality cannot be effective without any of these (education, curriculum innovation and healthy living).

## 7. RECOMMENDATIONS

From the findings the following solutions were prescribed: The sensitization of people with high level of education on the negative financial and health consequences of obesity and basic rules on weight watching. In addition, people with high monthly expenditures (or the rich) should be more actively involved in checking their weights. Obese and non-obese individuals should listen, read and watch programmes focusing on obesity. The Bamenda city council should partner with pacourvita in Bamenda, in creating weight loss rehabilitation center. To target the entire population, the government should adopt personalized and integrated approaches to innovative curriculum planning and design. Educational stakeholders should incorporate obesity education in the school curriculum.

## REFERENCES

1. Ayers CR., Alvin C., Ian JN., Jarett DB., Anand R., Sandeep RD., Amit K., Darren KM., James A. and Aslan TT. (2014). The Relationship of Body Mass and Fat Distribution With Incident Hypertension. Observations from the Dallas Heart Study. *Journal of the American College of Cardiology*.64 (10). DOI: 10.1016/j.jacc.2014.05.057.
2. Buchmueller T.C. and Johar M. (2015). Obesity and Health Expenditures: Evidence from Australia, *Economics and Human Biology*, 17(C), 42-58. Doi: 10.1016/j.ehb.2015.01.001.
3. Campbell, D.E. (2006). 'What is education's impact on civic and social engagement?' R. Desjardins and T. Schuller (eds), *Measuring the effects of education on health and civic/social engagement*, OECD/CERI, Paris, pp. 25-126.

4. Cawley J., Biener A., Meyerhoefer C., Ding Y., Zvenyach T., Smolarz B.G. and Abhilasha Ramasamy A. (2021). Direct medical costs of obesity in the United States and the most populous states. *J Manag Care Spec Pharm.* 27(3):354-66.
5. Cawley J, Meyerhoefer C, Biener A, Hammer M and Wintfeld N (2015) Saving in Medical Expenditures Associated with Reductions in Body Mass Index Among US Adults with Obesity, by Diabetes Status. *Pharmacoeconomics.*33 (7) 707-722. Doi:10.1007/s40273-014-0230-2.
6. Cecchini M. (2018). Use of health care services and expenditure in the US in 2025: The effect of obesity and moebid obesity. *PLoS ONE* 13(11):e0206703. Doi: 10.1371/journal.pone.0206703.
7. Cohen AK., Rai M., Rehkopf D.H. Abrams B. (2013). Educational attainment and obesity: A systematic review. *Obes Rev.* 14(12), 989-1005. Doi: 10.1111/obr.12062.
8. Finkelstein EA., Trogon JG., Cohen JW. and Dietz W. (2009). Annual Medical Spending Attributable to Obesity. Payer- and Service-specific Estimates. *Health Affairs (Millwood).* 28.(5); 822-831.
9. Fokong H.F., Fonchamnyo C.D. and Njimanted G. F. (2019), Modelling the effects of maternal fertility on mother educational attainment in Cameroon, *Journal of Economics and Management Sciences (JEMS)*, 1 (2), 6 -26.
10. GESP (2009). *Growth and Employment Strategy Paper: Reference Framework for Government Action over the Period 2010-2020.* Washington DC: International Monetary Fund
11. Grossman M. (1972). The Concept of Health Capital and the Demand for Health. *Journal of Political Economy.* 80 (2); 223–255, doi:10.1086/259880.
12. Hsieh TH., Lee JJ., Yu EW., Hu HY., Lin SY. and Ho CY. (2020). Association between obesity and education level among the elderly in Taipei, Taiwan between 2013 and 2015: a cross-sectional study. *Sci Rep.* 10(1).20285. Doi: 10.1038/s41598-020-77306-5.
13. Huye W. and Marlon G. (2018). America's obesity crisis: The health and economic costs of excess weight. Milken Institute <https://tinyurl.com/y9hl84p7>.
14. Kinga B.M, Sundjo F., Nfor O.N. and Njimanted G.F. (2020). An evaluation of the financial cost-benefit analysis and Acbr of obesity treatment in the Bamenda Municipality. *Central African Journal of Public Health.* 6(4). 180-191. Doi:10,11648/j.cajph.2020604.11
15. Medical Expenditure Panel Survey (2008). Agency of Healthcare Research and quality [www.ahrq.gov](http://www.ahrq.gov).
16. Murakami K., Ohkubo T., and Hashimoto H.(2017). Distinct association between educational attainment and overweight/obesity in unmarried and married women: evidence from a population-based study in Japan. *BMC Public Health.* 17, 903. Doi: 10.1186/s12889-017-4912-5.

17. OECD (2014), *Measuring Innovation in Education: A New Perspective*, OECD Publishing, Paris, <http://dx.doi.org/10.1787/9789264215696-en>.
18. Order No 419/14/MINESEC/IGE 9 DEC 2014 (2014). To outline the syllabus for form III, IV and V of secondary general education. Social science form 3.4 and 5 classes.
19. UNSD. (2020). United Nations Statistics Division data base
20. Ward ZJ, Bleich SN., Long MW. and Gortmaker SL.(2021). Association of body mass index with health care expenditures in the United States by age and sex. PLoS ONE 16(3):e0247307. Doi:10.1371/journal.pone.0247307.
21. WHO. (2014). Obesity facts and figures. [www.who.int](http://www.who.int) , 311.
22. WHO (2016). Global Report on Diabetes. World Health Organisation.
23. WHO (2021). Obesity and overweight. <https://www.who.int/news-room/factsheets/detail/obesity-and-overweight>



© 2017 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).