

Using Logistic Regression to Model Factors Associated With Basic School Drop-Out in Kassala State, Sudan

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Abstract

Background: Basic education is a crucial element for socio economic development, it is both a human and value in itself. One of the sustainable development goals SDGs is ensuring inclusive and quality education for all and promote lifelong learning one of the target linked this goal by 2030. It has been approved observed that Kassala does poorly in terms of educational indicators. For instance, The Sudan Household Health Survey 2010 (SHHS) findings showed that the net attendance rate in primary education in the State was only 55.7%, implying that 44.3% of the children at school age are dropped out from primary schools.

Objective: This study aimed at examining from an empirical point of view the association between socio economic and demographic factors and basic school attendance in Kassala State, Sudan.

Methods and Data: Cross-sectional community based study using descriptive and analytical approach. A stratified cluster sampling was utilized with sample size of 600 households, 259 from urban while 341 from rural areas. All children in household age 6 – 13 years, which an age of basic school in Sudan, were included.

Results: Only 7.2% of the household were headed by females, this result is not surprising as the situation in many areas in Sudan. The mean monthly expenditure was 715 SDG with standard deviation of 481 SDG.

Out of the 739 children aged 6-13 years in the sample, 566 (76.6%) of them were currently enrolling at the time of the field survey 2011. 73.8% out of females were currently enrolling and 79.6% of males were currently enrolling implying that 26.2% and 20.4% were school dropped-out for females and males, respectively.

The logistic regression estimates showed that age, monthly expenditure, distance to school, availability of public net electricity, urban area, and availability of basic school in a cluster were positively significant associated with school attendance. While own of TV was negatively associated with school attendance.

INTRODUCTION:

Education is both a human and value in itself and strong component for achieving human development. Primary education develops the capacity to learn, to read and use math, to acquire information, and to think critically about that information. Primary education is also the gateway to all higher levels of education that train the scientists, teachers, doctors, and other highly skilled professionals that every country, no matter how small or poor, requires.

The second goal of the Millennium Development Goals (MDGs), agreed on September 2000, is the achievement of universal primary education, The target linked up this goal is ensuring that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling.

One of the overarching Sustainable Developed Goals SDGs that to be achieved by 2030 is ensuring inclusive and quality education for all and promote lifelong learning one of the target linked this goal By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and Goal-2 effective learning outcomes.

In another direction, the dropout from basic education is considered a major problem and is one of the most series pest confronting the educational process and future generations in many communities for being the educational growl not only impact on the students, but goes beyond that to all aspects of community leading to increase the rates of illiteracy, unemployment and weaken economic structure and productivity of society and the individual and increase the dependency. It also produces dangerous phenomena of the society of children, like child laborers and the phenomenon of early marriage which leads to increase the size of social problems as juvenile delinquency and the spread of robberies and attacks on property of others, which leads to the weakness of society and spread corruption in it.

In Kassala State, it has been observed that it does poorly in terms of educational indicators. For instance, The Sudan Household Health Survey 2010 (SHHS) findings showed that the net attendance rate in primary education in the State was only 55.7%, implying that less half of the children at school age are dropped out from primary schools. Besides, the SHHS results also indicated that primary school completion rate was only 28.7%. Conventionally, these low rates of attendance are associated with various socio economic and demographic factors. In addition, there are no enough recent researches in Sudan go deeply in analyzing the factors affecting basic school attendance with focus on MDG-2 indicators.

Therefore, the paper considers the following questions:

- What is the size of drop-out problem in Kassala State?
- To what extent do children's attendances vary within communities (Urban – rural)?
- What are the main socio economic factors affecting the attendance of basic school through fitted logistic regression model.

This research aimed at building logistic model to examine the socio economic and demographic factors affecting basic school drop-out in Kassala State which one of the area suffering from high rate of drop-out.

METHODOLOGY:

Cross-sectional community based study using descriptive and analytical approach. This paper uses primary data collected via sample survey in the State in 2011. The sample size consisted of 600 households wherein 259 from urban areas and 341 from rural areas. The target number of children age 6- 13 years was 739.

The paper uses descriptive statistics in terms of frequency distribution, cross tabulation, means and standard deviation and Logistic Regression model.

Binary logistic regression is the method of choice if the dependent variable is binary (dichotomous) and we wish to explore the relative influence of continuous and/or categorical independent variables on the dependent variable. Spicer's (2004)

The general form of the logistic regression model is:

$$\text{Logit}(P_i) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots \dots \beta_k X_k + e_i$$

Where :

P_i is the probability that $Y_i = 1$

X_i is are explanatory variable.

e_i = random term

LITERATURE REVIEW

According to Todaro (1977), most economists would probably agree that it is the human resources of a nation, not its capital nor its material resources that ultimately determine the character and pace of its economic and social development. Along similar lines, Harbison (1973) argued that "human resources constitute the ultimate basis for the wealth of nations. Capital and natural resources are passive factors of production; human beings are the active agents who accumulate capital, exploit natural resources, build social, economic and political organizations, and carry forward national development. Clearly, a country which is unable to develop the skills and knowledge of its people and to utilize them effectively in the national economy will be unable to

develop anything else”.

Todaro argued that the principal institutional mechanism for developing human skills and knowledge is the formal educational system. Most developing nations have been led to believe that it is the rapid quantitative expansion of educational opportunities which hold the basic key to national development, so that the more education, the more rapid the anticipated development.

Concerning the proportion of children of primary school age attending school, Todaro mentioned that vast differentials has been observed between the developed and less developed regions and among developing regions themselves. Africa lag behind with only 40 percent of its primary school age children enrolled in primary school.

Sema Tanguiane (1990) argued that the right to education as a fundamental human right was proclaimed a long time ago in the constitution of a number of countries. One of the objectives set out in the Constitution of UNESCO, adopted in 1945, was 'to advance the ideal of equality of education opportunity without regard to race, sex, or any distinctions, economic or social'. Three years later, the United Nations General Assembly adopted the Universal Declaration of Human Rights, which in its Article 26 proclaimed that: "Every one has the right to education. Education shall be free, at least in the elementary and fundamental stages. Elementary education shall be compulsory. Education shall be directed to the full development of the human personality and to strengthening of respect to the full development for the human rights and fundamental freedoms". The report showed that in half of the sub-Saharan African countries with available data, at least one in four children of primary school age were out of school (dropped out) in 2008. Though enrolment in sub-Saharan Africa remains the lowest of all regions, it still increased by 18 percentage points from 58 per cent to 76 per cent between 1999 and 2008. Progress was also made in Southern Asia and Northern Africa, where enrolment increased by 11 and 8 percentage points, respectively, over the last decade.

Colin Brock & Nadine Cammish (1997), examined the social, economic, religious and other factors influencing the degree of female participation in formal education institutions in six carefully selected developing countries which were: Bangladesh, India, Cameroon, Jamaica, Sierra Leone, and Vanuatu. A number of broad criteria were employed, notably: that the project should include examples from sub-Saharan Africa, from South and/or South-East Asia, and from the tropical island zones; that within the group of six nations a significant range of profiles existed in respect of the incidence of female participation in education. Various sample sizes were drawn from these countries as well as different locations selected. In all, the sample consists of 606 boys (50.8%) and 587 girls (49.2%).

The main results showed that geographical factors have strong effect on the outcome variable. Regarding health, however, because of their more favoured status, boys often tend to be better nourished and to receive treatment more quickly when they are ill.

The economic factor, especially in terms of poverty and hunger was found to be the major underlying influence acting against the participation of girls in formal education,

in both direct and indirect ways. Concerning religion, the researchers outlined that access to formal schooling for both boys and girls then has been influenced in many developing countries, both historically and geographically by the spread of religious movements and missions. Other factors that were significantly influencing access to education include: legal, political administrative, and educational factors.

According to the MDGs report 2010, enrolment in primary education has continued to rise, reaching 89 per cent in the developing world. The report outlined that household data from 42 countries show that rural children are twice as likely to be out of school as children living in urban areas.

The Millennium Development Goals MDGs report 2015 shows that net enrollment in primary education in developing world has reached 91% in 2015 compared to 83% in 2000. The number of children at school were out of school as to say dropped-out worldwide has fallen by almost half, to an estimated 57 million in 2015 down from 100 million in 2000. It is reported that number of children enrolled in primary education more than doubled between 1990 and 2012, from 62 to 149 million . The report revealed that in the developing regions, children in the poorest households are four times more likely to be out of school than those in the richest households.

An important study carried out by El Daw A. Suliman and Safaa E. El-Kogali (2002) with objective of identifying the factors affecting children's education in Egypt in terms of access and completion at the basic education level. who did attend, what are the reasons for dropping out before completing the basic level?. The researchers used of Egypt Demographic and Health Survey (DHS) 1995 and 2000 rounds. To reflect the most recent picture on children's education the Egypt DHS 2000 primarily used. The study found that 84% of children ages 6 to 15 are in school leaving 16% of the age group out of school.

For mothers' reported reasons for school never attendance and dropout, the study showed that, the direct cost of education is perceived as the number one reason for not sending children to school. Traditions and customs are obvious obstacles to girls enrollment, and the indirect costs (child need for labor), and the children disinterest in education are perceived barriers to both girls and boys enrollment.

The multivariate models results indicated that the household level of wealth showed a significantly negative association with the odds of a girl never attendance, thus reflecting significant vulnerability to exclusion from the education system among the girls of the poor. The mother's autonomy index showed significantly negative associations with school never attendance only for girls but not for boys. As expected, parental years of schooling significantly reduce the odds of a girl not to attend a school. Any additional year of schooling in parent's education contributes a round 25% reduction in the odds of a girl being never attending school.

With respect to previous work in Sudan, Adam Ishak (1989) attempted to study the drop-out phenomena and its related schooling factors in Khartoum Locality. The study focused on governmental school only followed the descriptive approach. The study sample included 15 primary schools wherein 597 pupils, boys and girls, have been

selected and further 205 teachers were targeted to point out their opinions on the phenomena. The sample also included 52 school directors. The researcher used several tools for data collection which were: form to determine the size of drop-out of a cohort from examinations lists and questionnaire to identify the causes of the problem. The most important result was that wrong dealing with pupils and use of more punishments by many teachers plays major role in increasing the rate of drop-out. In contrast, good relations with the pupils attract pupils to school and then decrease the drop-out.

Fadi Edward (1998), studied the determinants of school drop-out rate in basic education in Sheikan Province. He argued that drop-out is one of the main problems that constrain planning of education system. The study based on multi-stage cluster sampling. Firstly, 3 councils were selected at random, secondly from these councils 16 villages were selected and finally 142 households were selected. Linear regression analysis was applied to identify the factors associated with drop-out rates.

The results found that magnitude of school drop-out rate of boys was higher than girls by 6.4%. Family income and demand for girl's labor cost of education the main significant determining factors of the girls' drop-out rate.

The rest of the variables used in the model (distance to school, attitudes of parents and society towards boys and girls education) have insignificantly affect drop-out rate. All selected variables were insignificantly related to drop-out rates for boys. The overall drop-out model showed that all variables have insignificant effect on drop-out for boys and girls together. The most recommendations: reduce the cost of education and designing education system that accommodate the needs of family labour. Introduction of agriculture in basic education especially in rural areas.

Omer Siddig (1999) attempted to identify the facts about basic school drop-out

and related causes in Albutana Province. He used samples of teachers, parents and students, so teachers' sample consisted of 340 (240 females and 100 were males) the students' sample was 100 students whereas the parents' sample was 150.

The researcher applied t-test in analyzing the questionnaires data, since he classified the factors affecting school drop-out into four categories: economical, social, psychological and school factors.

Concerning the economical factors, the analysis showed that exposure of household to economic shock, student working, household income and transportation all these factors have significant effect on school drop-out. The social factors that significantly contributed to the problem were: rigid dealing with a child, conflicts inside family, low interest to follow student, early marriage, disability and orphanhood. The main psychological factors affecting drop-out were: hate of many teachers or subjects like math, student being sick with psychological state, no desire to education, low ability to understand and low academic performance. The study also found that disability and injury have significant influence on school drop-out.

The main recommendation of the study was for both State and Federal Ministries of education doing in limit the phenomena of drop-out according to their mandate and enlighten families to not allow early marriage for girls.

Kamal Eldein Elamin (2002) attempted to identify the factors affecting pupils drop-out from school in Umbadda province and suggest suitable solutions.

The study sample consisted of two groups: school headmasters who were 188 and pupils' parents 160. The tool used was questionnaires administered to each group. The research results showed that the drop-out rate was higher in rural areas, low income was one of causes, and also drop-out rate was higher in co-education school. The study recommended for identifying family status for each pupil and increase awareness of parents with importance of education.

Mohamed A. Alamiri (2004), studied the most important economic, social and school factors that causes the students' education in rural and pastoral society in Kadugli locality. The focus was on the parents factors abstain from sending their daughters to school. The sample of study was consisted of two samples, 1) 60 female teachers working in rural and nomadic schools and 2) 42 females' fathers selected from 3 villages.

The study showed that females out of school were 67%. The most important factors that affects drop-out were: No school in village or nearby areas, weak infrastructure of school and bad school environment, shortage of number of teachers, low income and large family size, the need for females either for the care for children or engage in marriage, illiteracy and low education of patients and the academic fees.

Report of State of Children in Sudan 2011 prepared by National Council for Child Welfare in collaboration with UNICEF, showed that education in Sudan faces two challenges late enrollment and school drop-out, so the data showed that 57% of children age 6-16 years are enrolled in school. The enrollment reaches its peak for the age 11-13 years and declined gradually. The report showed that 3.3 million children at school age out of education system whether working or females helping their families in home duties so the mode of living (urban –rural) is a basic indicator. The lowest school dropout rates were in States in boarders (Red Sea, Gedarif, Kassala, B. Nile, S. Kordofan, S. Darfur and W. Darfur), however, Khartoum and Gezira States registered the highest rates over 90%.

EMPIRICAL RESULTS

Table (1)

Gender of the head of the household

	Frequency	Percent
Male	557	92.8
Female	43	7.2
Total	600	100.0

Source: Field survey, 2011

Only 7.2% of the household were headed by females, this result is not surprising as the situation in many areas in Sudan.

Table (2)
Monthly expenditure and income

		Total Expenditure	Monthly	Average Monthly Income
N	Valid	598		522
	Not reported	2		78
Mean		715.2		731.5
Median		650.0		550.0
Std. Deviation		480.9		585.5
Quartiles	25	395.0		350.0
	50	650.0		550.0
	75	900.0		901.0

Source: Field survey, 2011

Table (2) shows information about economic status of the households. We focus here on average monthly expenditure and income. The household monthly expenditure mean is estimated as 715 SDG with standard deviation of 481 SDG, the median is 650 SDG, hence we can say that median is better measure to present this data than mean. The mean of the household monthly income is estimated as 731 SDG with standard deviation of 585 which higher, the median is less than expenditure 650 SDG which means that whole income is spent for consumption.

Fourth of the households spent less than 395 for monthly consumption and less than 350 their income.

The high value of standard deviation indicates large variations in expenditure and income.

Table (3)
Enrolment of school or education institution

	Frequency	Percent
Currently enrolling	1037	33.0
Ever enrolled	1172	37.3
Never enrolled	822	26.2
Not reported	109	3.5
Total	3140	100.0

Source: Field survey, 2011

One third of household members age 5 years and above are currently enrolling in school or other education institution, 37.3% of them have ever enrolled in school but at the time of the survey were not enrolling. However, more than fourth of individuals age 5 years and over have never enrolled in any education institution.

Table (4)

The percentage distribution of school enrolment for children aged 6-13 years by background characteristics

Background characteristics		Ever attended school or educational institutions					
		currently enrolling		Ever enrolled		Never enrolled	
		Count	%	Count	%	Count	%
Sex	Female	270	73.8%	19	5.2%	77	21.0%
	Male	296	79.6%	20	5.4%	56	15.1%
Area	Urban	293	95.8%	3	1.0%	10	3.3%
	Rural	273	63.2%	36	8.3%	123	28.5%
Education of the head of the household	Primary/Basic	140	82.4%	7	4.1%	23	13.5%
	Intermediate	15	88.2%	1	5.9%	1	5.9%
	Secondary	99	96.1%	0	.0%	4	3.9%
	Post secondary diploma	1	50.0%	0	.0%	1	50.0%
	University	22	95.7%	0	.0%	1	4.3%
	Khalwa	64	76.2%	5	6.0%	15	17.9%
	Adult education	7	77.8%	1	11.1%	1	11.1%
Wealth Index Quintiles	Poorest	109	66.1%	17	10.3%	39	23.6%
	Second	86	60.6%	6	4.2%	50	35.2%
	Middle	109	69.9%	14	9.0%	33	21.2%
	Fourth	119	93.0%	2	1.6%	7	5.5%
	Richest	143	97.3%	0	.0%	4	2.7%
Total		566	76.7%	39	5.3%	133	18.0%

Source: Field survey, 2011

Out of the 739 children aged 6-13 years in the sample, 566 (76.6%) of them were currently enrolling at the time of the field survey 2011, only 39 (5.3%) have ever enrolled but at that time were not enrolling which is so called drop-out rate, whereas

133 (18%) of them have never enter school or education institutions. These results imply that 23.3% of the children are out of school.

It seen that there is the slight difference between males and females. There is a large difference between urban and rural area in enrolment; 95.8% for urban compared to 63.2% for rural areas. This can be attributed to that children in rural areas always help their families by working in agriculture or pastoral, also there is the lack of education services in rural areas. The education of the head of the household seems to have strong associations with attendance rate, those their head of the household with primary education attending school by 82% compared to 96.1% and 95.7% for secondary and university education level , respectively. The attendance rate is increasing with economic status of the households, ranging from 66% for the poorest households to 97.3% for the richest households.

Table (5)
Logistic Regression Estimates

	B	S.E.	Wald	Df	P-value	OR (Exp(B))	95% C.I.for EXP(B)	
							Lower	Upper
Gender	.090	.270	.111	1	.739	1.094	.645	1.856
Age	.141	.063	4.972	1	.026	1.151	1.017	1.302
Mother alive	.095	1.204	.006	1	.937	1.100	.104	11.656
Father alive	-.875	.795	1.212	1	.271	.417	.088	1.980
Monthly Expenditure	.001	.000	6.043	1	.014	1.001	1.000	1.002
Own Radio	.495	.295	2.821	1	.093	1.641	.921	2.924
Own TV	-1.603	.691	5.387	1	.020	.201	.052	.779
Edu. Of HH			3.080	6	.799			
Edu. Of HH (Primary)	-.241	.336	.513	1	.474	.786	.407	1.519
Edu. Of HH (Intermediate)	-.782	.929	.709	1	.400	.457	.074	2.825
Edu. Of HH (Secondary)	.641	.659	.945	1	.331	1.898	.521	6.912
Edu. Of HH (Post secondary Diploma)	-.829	1.597	.270	1	.604	.436	.019	9.983
Edu. Of HH (University+)	19.071	7385.236	.000	1	.998	191529501.1	0.000	
Edu. Of HH (Khalwa/adult)	.188	.457	.170	1	.680	1.207	.493	2.954
Distance	.426	.119	12.718	1	.000	1.531	1.211	1.934
Water source	.819	.419	3.826	1	.050	2.268	.998	5.155
Electricity source			6.858	3	.077			
Electricity source (public net)	1.688	.645	6.858	1	.009	5.410	1.529	19.142
Electricity source (Generator)	20.585	10002.232	.000	1	.998	870683572.6	0.000	
Electricity source (other)	19.575	28404.958	.000	1	.999	317234377.9	0.000	
Area	1.705	.594	8.251	1	.004	5.504	1.719	17.622
Availability of basic school	2.158	.387	31.117	1	.000	8.655	4.055	18.476
Constant	-3.208	1.721	3.476	1	.062	.040		

Chi Square for model fit = 116.813 with p-value of 0.000 indicating that overall model is significant.

The classification percentage = 88.7% which means that fitted model can predict categories of dependent variable correctly with 88.7% while 11.3% of cases are incorrectly classified.

The Hosmer and Lemeshow test for comparing expected and observed frequencies of categories of dependent variable shows p-value of 0.365 which is greater than 0.05 indicating no significant difference between observed and expected frequencies so the model produce reliable predictions.

The logistic regression estimates show that age is positively significant associated with school attendance a child with one year older is 1.15 times more likely to attend basic school than that younger one year.

Monthly expenditure is positively significant associated with school attendance an increase of monthly expenditure by one make child 1.001 times more likely to attend basic school than that with monthly income less by one unit.

Own of TV is negatively significant associated with school attendance, a child from household own TV is 0.201 times less likely to attend school. In other words, a child from household not own TV is 4.98 (1/0.201) times more likely to attend school.

Distance from cluster centre to the nearest school is positively significant associated with school attendance. An increase in distance by KM will increase the Ln odd by 0.426.

Availability of electricity in public net has positive significant association with school attendance. A child from house wherein public net electricity is available is 5.41 times more likely to attend basic school than others.

The urban area is positively significant associated with school attendance, those from urban area are 5.5 times more likely to attend school than those from rural area.

There is positive significant association between school attendance and availability of basic school in a cluster. A child living in an area wherein basic school available is 8.66 times as likely as child from area wherein basic school not found.

It is observed that all other variables do not show significant association with school attendance.

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APPENDIX: 1

Variable coding

		Frequency	Parameter coding					
			(1)	(2)	(3)	(4)	(5)	(6)
Highest level of education attended head of HH	None	241	0.000	0.000	0.000	0.000	0.000	0.000
	Primary/Basic	153	1.000	0.000	0.000	0.000	0.000	0.000
	Intermediate	16	0.000	1.000	0.000	0.000	0.000	0.000
	Secondary	99	0.000	0.000	1.000	0.000	0.000	0.000
	Post secondary diploma	2	0.000	0.000	0.000	1.000	0.000	0.000
	University	21	0.000	0.000	0.000	0.000	1.000	0.000
	Khalwa/adult education	77	0.000	0.000	0.000	0.000	0.000	1.000
Main source of electricity	Not available	280	0.000	0.000	0.000			
	Public net	314	1.000	0.000	0.000			
	Generator	13	0.000	1.000	0.000			
	other	2	0.000	0.000	1.000			
Area	Urban	274	1.000					
	Rural	335	0.000					

