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Effect of El Niño induced drought on students' academic performance: a case study in Borena woreda of South Wollo Zone, Ethiopia

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It is unequivocal that the climate of our planet is changing and the impacts are being felt in most parts of the world-particularly in developing countries where their economies are highly dependent on weather sensitive primary sectors and their adaptive capacity is very low, among others. Though studies have been conducted to investigate the impacts of such changes on livelihoods and ecosystems, its effect on students' academic performance has been little researched. This study was conducted to examine the impact of climate change induced shocks on students' academic performance. Ex-post facto research design has been employed to investigate the impacts of 2015/16 El Niño on academic performance of 1210 students selected from junior secondary schools using multistage sampling technique. Data has been analyzed using independent sample t-test, Chi-square test and linear regression. The t-test result revealed that students from El Niñoprone schools have scored statistically lower mean result as compared with their counterparts (t (1208) =2.98, p= <0.05, two-tailed). The Chi-square test result (χ^2 (1) = 35.78, p<0.01) also evidenced that the observed proportion of students from victimized schools in the top achieving groups was statistically less than expected. Likewise, linear regression analysis result confirmed that being in El Niño prone schools was among the factors which determine students' academic performance. Based on these findings, we recommend that concerned government and non-governmental organizations have to give due attention for schools in drought prone areas in providing supports and building their resilience.

Key words: Academic performance, climate change, El Niño, independent-samples t-test

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INTRODUCTION

Climate change is one of the major development challenges of the 21thC and children are particularly more vulnerable as they are psychologically and physiologically less able than adults in adapting climate-related exposure (Doherty and Clayton, 2011; Oselumese *et al*., 2016). In this regard, ISCA (2008) had highlighted that, with increasing number of disasters being linked to changing climatic conditions, and the escalating frequency of

droughts, floods, water scarcity, malaria and vector–borne diseases, children are likely to be adversely affected both as children and in their adult lives. The types of climate risks confronting school aged children are diverse: ranging from direct physical impacts (such as cyclones, storm surges, flooding and extreme temperatures) to impacts on their education, psychological stress and nutritional challenges (UNICEF, 2011a). As underlined by UNICEF (2011b), children are disproportionately vulnerable to the impacts of climate change but remain invisible in climate change adaptation discourse; and as a result, climate change policies and program do not yet adequately recognize children's vulnerabilities. The specific nature of their vulnerability is multidimensional, shaped largely by the physical, social and emotional changes that take place over the course of childhood. Children are also more likely than adults to be killed or injured during disasters; they are particularly susceptible to air and water quality, temperature, humidity and vector-borne infections due to their less-developed physiology and immune system.

Bartlett (2008) and Oselumese *et al*. (2016) argued that there are links between climate change and education (refer Figure 1) particularly during and immediately after extreme events or environmental and climate-related disasters. For instance, during extreme events, school infrastructure or roads and bridges to schools can be destroyed, limiting children's possibilities of attendance; children may be removed from school to support the household; the added burden of disease in areas suffering food and water insecurity can render children too weak to attend school. It can also reduce the time available for education when the household division of labour is restructured to cope with illness. In any case, ill or malnourished children lack the energy to be active learners. Climate change is likely to exacerbate the risk of dropout, mainly through its economic impacts on households and children (UNICEF, 2011b). Mbah (2014) and Nkeiruka (2014) also underlined that climate change-related problems adversely affect teaching and learning by causing lateness and absenteeism to school among teachers and students; destruction of school buildings and learning materials, unconducive learning environment, destruction of means of livelihood; incompletion of curriculum content, ineffective instructional supervision, and poor performance in examinations. El Niño might cause shortages of water and food, leading to malnutrition and famine which would have impacts on school attendance and result in poor performance in academic work (Nkeiruka, 2014). Climate change induced scarcity of water in Vietnam, for instance, forced girls to miss classes frequently (Walker, 2012). Schools might be occupied as shelters for people displaced by climate change impacts, eventually forcing school children out of schools. Getting these children back to school once they drop out can be a serious challenge (UNICEF, 2015).

Some of the leading killers of children worldwide are highly sensitive to climate change. Higher temperature has been linked to increased rate of malnutrition, cholera, diarrhea disease and vector-borne diseases like dengue and malaria (UNICEF, 2011a). Danysh *et al*. (2014) disclosed that children born during and after 1997/98 El Niño in Peruwere on average shorter and had less lean mass for their age than expected. Changes in temperature or precipitation can cause changes in the seasonality of some allergenic species, changes in the distribution of some disease vectors and changes in the seasonal distribution of malaria, dengue, tick-borne diseases, cholera and other diarrhea diseases which would affect children. Climate change may also impact school attendance and educational attainment through its effects on children's health and nutritional status (UNICEF, 2008). Extreme weather events and changes in maximum temperature (heat waves) can increase the incidence of mortality and morbidity (UNICEF, 2011a; Nkeiruka, 2014 and Oselumese *et al*., 2016). On the other hand, climate change might force governments to squeeze their budget on education in dealing with climate change impacts such as disasters or droughts which have undesirable impact on enrolment and quality of education (UNICEF, 2008).

Research indicates that vulnerable households can withdraw children from school as part of their coping strategy to deal with shocks to income. A drop in income of households due to climate change impacts is more likely to cause cuts in food expenditure, substituting less nutritious food or consuming less, with profoundly detrimental effects on child development. Similarly, adjustments in consumption could result in a reduction in spending on health care and school related costs. As a result, a shock to incomes often means lower school attendance, performance or even dropout. With that, some children, particularly the older ones, would take up paid work to help support the household. UNICEF (2008) stated that when income of the family is deteriorated due to climate change, children are forced to incorporate paid or unpaid work into their routine whilst still attending school which adversely obstructed their academic performance by taking away their time and energy from school and school-related tasks. What makes things worse is that, the rate of dropout is high for children from poor families. In this regard, a study by Tassew and Adiam (2015) in Ethiopia revealed a unit increase in the wealth index was found to increase the child's chances of completing primary school by 37.6 percent. Domestic duties may be redistributed to children, generally girls, who will then offer less time to school and leisure (UNICEF, 2008/2011b andBartlett, 2008). Tassew and Adiam (2015) revealed that there is high probability of dropping out from schools and forced children to take part in domestic activities, unpaid activities and paid

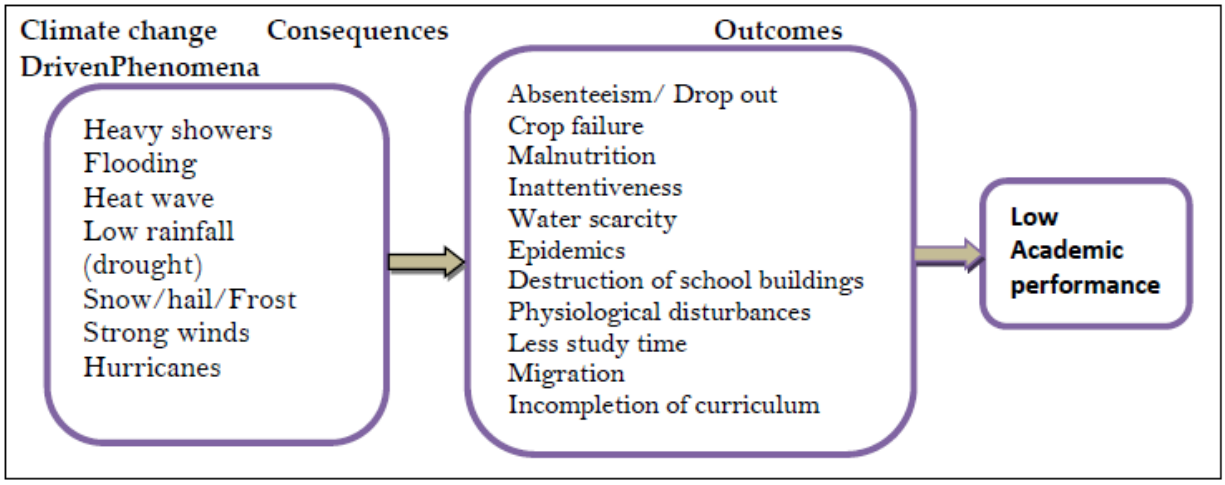

Figure 1: Conceptual framework- impacts of climate change on academic performance

labour due to shocks. As compared with boys, girls are often responsible for fetching the household supply of water and collecting firewood, and they are forced to travel greater distances as sources become scarcer. As a result, they have less time to spend on school-work and leisure, both of which are vital for children's social and intellectual development (Orazem and Gunnarsson, 2003; UNICEF, 2008/2011b; UNESCO, 2012; AKLDP, 2016).

Climate change induced disasters could also trigger displacement of people which has serious consequences for children. It fragments families and disrupt social networks; interrupts children's education and may result in leaving the school system altogether (UNICEF, 2008).Climate shocks affect human capital accumulation (among the key capitals which enable to improve resilience of people to climate shocks as well as priority development goals) and it will seriously fall as the risk of disaster increases. Muthaa *et al*. (2013) and UNCED (1992) underscored that education is critical for promoting sustainable development and improving the capacity of people to address environment and development issues. However, additional stress from global warming will make it more difficult to achieve existing development targets for education (UNCED, 1992; UNDP, 2007 and Crespo, 2009). A study by World Bank (2010), confirmed that a one standard deviation increase in the coefficient of variation of rainfall could reduce grade attainment by 0.2 grades. Similarly, Jensen (2000) found that enrolment rates declined by 20% in climate change exposed regions; and Alderman *et al*. (2006) reported that drought-affected households delayed starting school of children on average by 3.7 months. Tassew and Adiam (2015) in Ethiopia disclosed statistically significant effect of shocks on students' dropout rate in primary schools; a child from a household that had experienced shocks was found to be less likely to complete primary education by 32.2 per cent compared with a child whose household had not experienced any such shocks. A recent study by AKLDP (2016) in the aftermath of El Niño-driven drought in Gonder zone (Ethiopia) disclosed a steep surge in the drop-out rate of students to help their families in collecting water and firewood and to do other household and farming chores, or that their parents were not able to afford the cost of school logistics.Mbah (2014) revealed that flooding in Nigeria had caused the loss of homes of many people which led to mass movement of people which in turn adversely affected the education of many children. School buildings and learning materials were swept off thereby disrupting the education of the children. Walker (2012) on the other hand stressed that climate change would particularly affect the struggle to achieve access to education particularly in developing countries where their human capital accumulation is very low. As emphasized by World Bank (2010), children may be affected by school withdrawal in response to climatic shocks, with long-run and irreversible impacts on human capital and, subsequently, lifetime earnings. Higher levels of risk should result in a greater incentive to increase the number of hours worked by children and reduce investments in education. Such interruption and/or impediment to access of education have a detrimental impact on learning outcomes (UNDP, 2007).

STATEMENT OF THE PROBLEM

The 2015/2016 El Niño-driven weather condition caused one of the worst droughts in decades across Ethiopia. The incident had caused havoc on Ethiopia's summer rains. This comes on the heels of failed spring rains, and has driven food insecurity, malnutrition, disease outbreaks and water shortages in affected areas of the

country. Abay-Beshilo livelihood zone of South Wollo (in north central Ethiopia) is among the drought prone areas of the zone and that was heavily stricken by the impacts of El Niño Phenomena. In these areas, the less than usual rain had caused drought which in turn triggered severe food insecurity. The severity was the result of a combination of factors that includes pre-El Niño failure of the spring rains and El Niño induced late onset, erratic and early cessation of the main summer rains. As a result, smallholder farmers had encountered total failure of both *belg* (small rain season which lasts from February to April) and *Kiremt* (large rain season which lasts from June to September) of 2015/2016 harvesting year. Due to this, a significant number of household heads were in need of emergency food aid for their sustenance. Such circumstances had adversely affected the educational system and students were forced to drop out or frequent absenteeism from schools due to shortage of food; and involved in supporting their families in finding food and/or engaging in household chores. Furthermore, students who came to school with inadequate food or empty stomach would not be attentive (lacks concentration) and has negative implication in their performance. It is believed that children who are hungry or chronically malnourished are less likely to learn attentively. Families which were under the siege of drough and consistent food aid had no option than withdrawing their children from schools. When the worst comes, such families, together with their school aged children, might be forced to migrate into another area which makes their life more complicated. Despite the particular vulnerability of children, few studies have investigated how climate change would affect child development and well-being (Orazem and Gunnarsson, 2003; UNICEF, 2011b); and the impact of climate change on education (which is the bedrock and the wheel on which other developmental effort revolves) has got little attention (Mbah, 2014). In this regard, Doherty and Clayton (2011) urged that the psychological and social impact of climate change should be addressed adequately as of biodiversity and economic impacts. UNICEF (2008) also underlined that the potential impact of climate change on children has been a critical missing element from the climate change discourse. The report further argued that '…*whilst there is a growing body of literature on the links between climate change and vulnerability, particularly in relation to the impact of natural disasters, research and advocacy activity on climate change and children specifically is less developed'.* UNDP (2007) and ISCA (2008) asserted that the cumulative effects of extreme weather events on both initial enrolment and longer-term educational performance are not well studied. Most studies at global level in general and in developing countries like Ethiopian particular (see for example Woldeamlak, 2007; Workneh *et al*., 2011; Cunha *et al*.,2012; Gutu *et al*., 2012; Nkondze *et al*., 2014; Oyekale, 2014) gave due emphasis on the impacts of climate change on livelihoods and ecosystems. Its adverse impact on students' academic performance has been little researched. As a result, this study opts to investigate the impacts of climate change induced shocks on the academic performance of grade eight students in their regional examination. The output of the research would enable to shed light there by contribute to reduce the adverse impact of climate change induced challenges on academic performance of students. By doing so, it enriches the existing literature on the nexus between climate change and human capital formation. Furthermore, it would provide important recommendations which the policy planners may adopt for future intervention.

MATERIALS AND METHODS

Description of Study Area

South Wollo administrative zone (in North central part of Ethiopia), is found between $10^0$10'-$11^0$41'N and $38^0$25'-$40^0$05'E. The zone consists 25*woredas* and bounded from the south by north Shewa zone and Oromia National Regional State, from the west by east Gojjam zone, from the northwest by south Gonder zone, from the north by north Wollo zone and on the east by Oromia special zone and Afar national regional state. The total number of people lived in rural and urban areas of the zone is 88% and 12% respectively, of which the urban dwellers are lower than the national average (BoFED, 2009).

The main economy of the zone is crop production supported by rearing of livestock. Agriculture is constrained by poor soil fertility, soil degradation and erratic rainfall. As a result, most parts of south Wollo are chronically food insecure. Crop production follows a bimodal rainfall regime (short *belg* and longer *Kiremt* rains) leading to two harvesting periods. As evidenced by zonal economic and finance development bureau, most *woredas* in zone are drought prone and were critically affected by the El Niño induced drought of 2015/2016. Borena *woreda* (*woreda* is an administrative unit equivalent with district) is found in Southwestern part of South Wollo zone between $10^0$30'30"-$10^0$50'55" N and $38^0$25'35"- $38^0$55'20" E (Lakew *et al.*, 2007) (Figure 2). It is bordered on the South and Southeast by Wegede *woreda*, on the West by East Gojjam zone (separated by Abay River) and Mehal Saint *Woreda*, on the North by Saint *Woreda* and on the Northeast by Legambo wereda (BoFED, 2009). The *woreda* comprises 35rural and 2 urban kebelles; of which 16kebelles were severely affected by the 2015/16 El Niño induced drought (either partially or totally). According to the *woreda* finance and economic development office estimation, the total population of the *woreda* (as of 2016 estimate) was 169, 869 (of which 50.7% were males and 49.3% females.

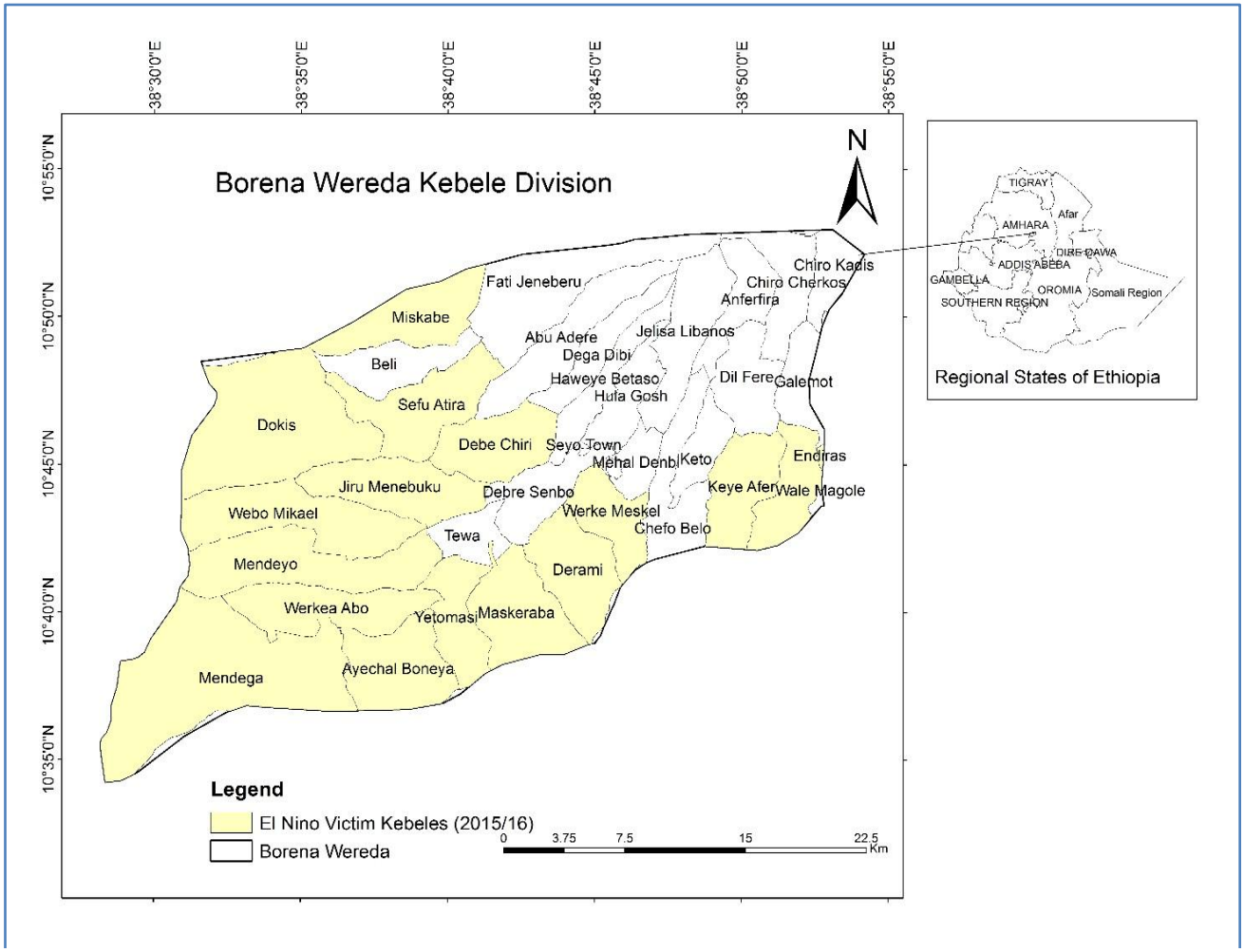

Figure 2: Relative location of the study area

The urban dwellers constituted around 7percent-which is much lower than the average of the zone (12%), region (12.6%) and country (16.1%).

With a total area of 1000.78km^2, the population density of the *woreda* is around 169.7 persons/km^2 which is higher than the average population density of the zone (148.6 persons /km^2), Amhara National Regional State (ANRS) (101.2persons /km^2) and the country as a whole (98.5 persons /km^2). The elevation of Borena *woreda* ranges from 1100 meters to more than 3700 meters which enables the *woreda* to have *kola* (32%), *woina dega* (47%), *dega* (20%) and *wurch* (1%) agroecologies. The annual mean temperature and precipitation are 18^{o}c and 1200 mm respectively (BoFED, 2009). Mixed farming is the dominant economic activity of the *woreda* which includes crop production and rearing of livestock (Woldegabreil, 2003).

Design of the study and source of data

Ex-post facto research design (using existing demographic characteristics and academic achievement result of students for2016 academic year in regional examination-which was obtained from *woreda* educational office) has been employed in this research. Regional results are preferred than the school based examination results because standardized admissions tests are good predictors of students' achievement (Lauzon, 2001) and can measure performance more consistently than examinations prepared at school level. Since it was difficult to know the result of the same student had El Niño phenomena were not occurred, comparison was carried out between the performances of students from El Niñostricken and relatively free junior secondary school students. The presumption made under such scenario is possibility of little disparity between students from El Niño prone and free schools in terms of other attributes (like age and family socio-economic status) which could have impact on performance. To substantiate the results obtained from quantitative analysis, key informant interview was carried out with expertise from *woreda* educational department and

informal interview with teachers, students and parents form victim schools were also undertaken.

Target Population, Sampling methods and Samples

Multistage sampling technique has been employed for this study. First, schools were categorized into two based on their extent of exposure to 2015/2016 El Niño-driven drought as victim and free schools. From each category, representative schools were selected randomly. Based on this, 11 victim junior secondary schools and 8 non-affected schools were selected (the decision on the number of schools from each scenario was done based on personal judgment by taking their representativeness). Once the schools were selected, the result of all grade eight students from the selected schools has been included in the study. Based on this, 1210 students (599 from El Niño stricken and 611 from non-victim schools) were taken as a sample. In this study, since their parents are less likely to engage in agricultural activities, schools from urban and sub urban areas were not included as target population. As a result, Borena, Legamara, Soye and Tewajunior secondary schools were excluded from the very beginning.

Data Analysis and Interpretation

The disparity of academic performances between students from El Niño victim and free schools has been analysed using independent-sample t-test (separate comparison was also computed by taking gender into account). Moreover, Chi-square test was used to examine the presence of difference in proportion between victims and El Niño free schools among the top and bottom achieving groups. To make the analysis more attractive, histograms and population pyramids were used. Linear regression analysis was computed to estimate the impact of different explanatory variables on the effect of overall result including effect of El Niño. The statistical analysis has been triangulated with qualitative data obtained from interview. The linear regression was modeled as:

$$Y=\beta_0 +\beta_1X_1+\beta_2 X_2 +\beta_3X_3+\beta_4X_4+\beta_5X_5+\varepsilon$$

Where: Y is the dependent variable (regional total result); X_1 is sex of the students (1= male; 0=female), X_2 is age of the student in years; X_3 is being El Niño victim of 2015/2016 or not (1=affected; 2=not affected); X_4 is Mathematics result; X_5 is English result; while β_0, $\beta_{1\text{-}5}$and $\varepsilon$are the constant, coefficients of explanatory variables and error term respectively

RESULTS AND DISCUSSION

As depicted in Table 1, regional examination result of 1210 students (49.5% from El Niño victim schools and the remaining 50.5% from El Niño free junior secondary schools) was analysed. Around 53.9percent of the samples were male and females comprised 46.1percent. The mean age and average result were found 14.97 years and 53.2points respectively. During 2015/16 academic year, 12055 students (from junior and elementary schools) and 4761students (from pre-primary levels) were exposed to El Niño impacts. School feeding was launched and a total of 16,816students had received the service for about 6-8 months.

As dipicted in Table 2, independent samples *t*-test was applied to invetigate whether mean result of students from El Niño prone and free schools differ significantlyor not. The result showed that students from El Niño free schools had relatively scored (53.92$\pm$9.8) better than students from victim schools (52.46$\pm$7.1) and the mean difference was statistically significant (t (1208) =2.98, p= <0.05, two-tailed). The population pyramid in Figure 3 also illustrated the presence of difference in performance between the two groups. Gender wise comparison was also carried out to detect whether there is difference in impact based on the sex of students. In most literatures, girls are expected to be affected by climate change than boys. But in our study, statistically significant mean difference was found between boys (t (650) =2.75, p=< 0.05, two-tailed) where the mean result of boys from El Niño free schools was higher (54.61$\pm$9.9) than students form victim schools (52.75$\pm$7.2). A study by AKLDP (2016) in northwestern Ethiopia revealed that, during drought periods, more school aged boys (14-16years old) were likely to dropout and migrates to nearby towns in search of casual wage labor than girls. Teshome and Gamachu (2016) on their part reported that the rate of school dropout in pastoral communities of Southern Ethiopia was found to be higher for boys than girls. Similar result was reported by Muthaa *et al*. (2013**)** inIgembe District of Kenya where the rate of dropout of male pupils mainly for child labor was a serious problem which eventually affects their performance. Relatively higher disparities between boys in our study might be due to their frequent absenteeism to support their families. Though the mean result of girls was higher by 1.08points, on average, for those from El Niño free schools, the difference was not found to be statistically significant. The population pyramid figure also depicts the presence of difference particularly for high points between El Niñovictims and free schools (both in overall, male and female groups). Supporting the statistical test result, an informant from Dokis (one of the most affected kebelles in the *woreda*) shared his experience regarding the challenge while he was at grade 8 during El Niño period (he joined grade 9 during the time of interview-

Table 1: Demographic characteristics of respondents

El Niño affected or not				Sex			Age
Option	N	%		N	%		Mean=14.97(±1.12)
Yes	599	49.5	Male	652	53.9		
No	611	50.5	Female	558	46.1		Average result
Total	1210	100	Total	1210	100		53.2(±8.6)

Table 2: Independent samples t-test result based on average result

Category	Affected by El Niño?	N	Mean	SD	MD	t-test	p-value
Over all	Yes	599	52.46	7.120	1.47	2.98 (1208)	0.003
	No	611	53.92	9.793			
Male	Yes	334	52.75	7.195	1.86	2.75 (650)	0.006
	No	318	54.61	9.913			
Female	Yes	265	52.09	7.021	1.08	1.51 (556)	0.131
	No	293	53.17	9.622			

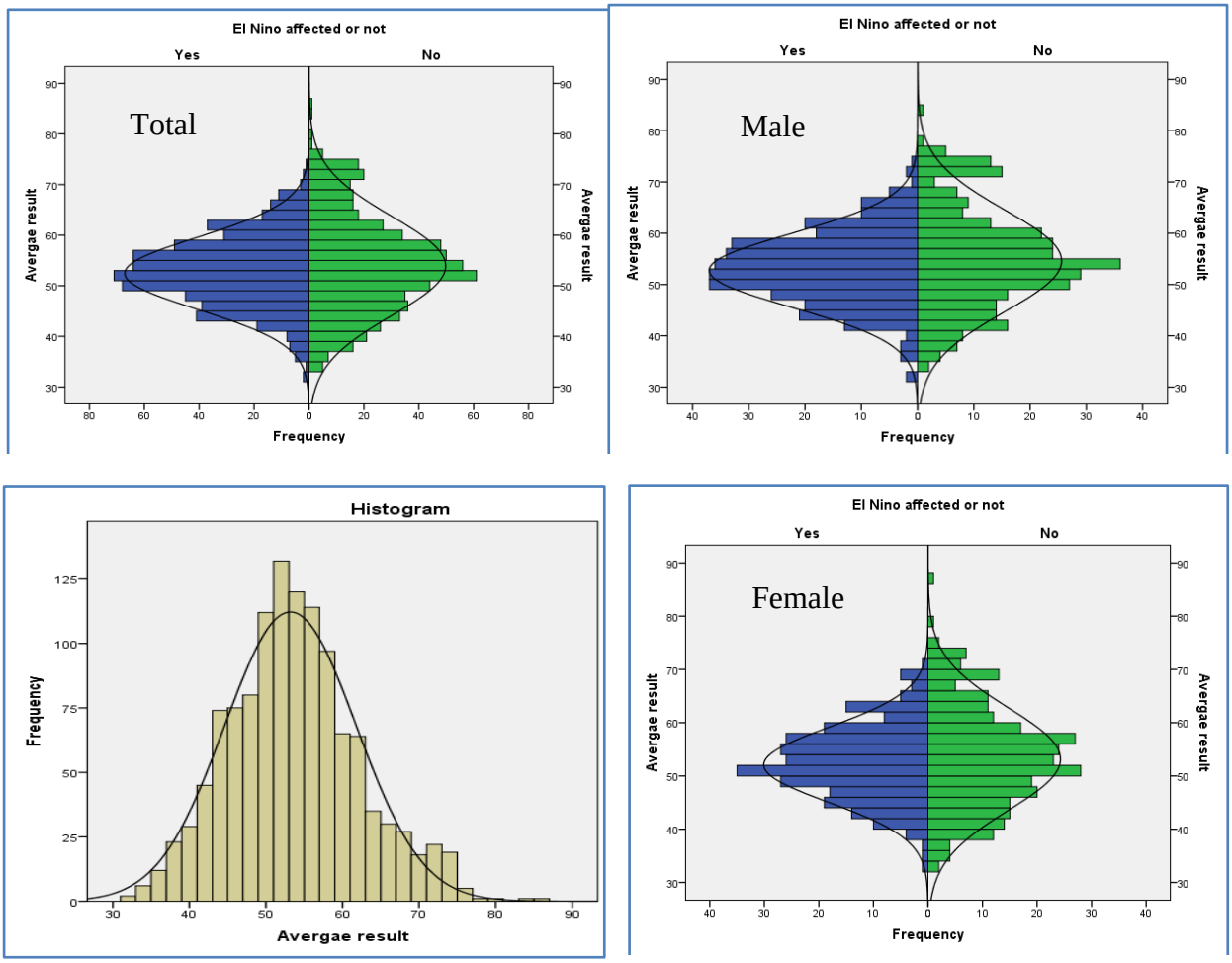

Figure 3: Poulation pyramid and histogram (based on average result)

26/01/2017) as: '*failure of rainfall hampered not only crop production but also availability of pasture and water for domestic animals. It was the tasks of school aged boys to follow livestock; and search pasture areas and water.*

Being absent from schools at least two days a week was mandatory for boys which adversely affected our result in regional examination'. This testimony is clear evidence that boys in rural areas are forced to miss classes to support their families mainly in field works. A parent from another victim kebele also confirmed that boys were obliged to engage in outdoor activities like farming and keeping animals while girls relied on domestic chores. According to this informant, herding is time intensive and incompatible with regular school attendance of boys particularly during the dry season. At times of disasters, animals have to be taken out for many weeks for search of feed and water. In this case, it is the boys who are dropping out of school and responsible to follow herds. A 17 years old girl (attending grade 9 during the time of interview) from one of the El Niño victim kebelles has shared her experience of the 2015/16 El Niño phenomena that:

> …availability of water for domestic purpose had been increasingly becoming scarce. It took more than two hours to get water and since its volume decreased especially during dry seasons we were forced to wait a long. Girls were responsible to fetch water and have to go to the water sources as early as possible not only to queue first but also to return back to school on time. Unfortunately, it was rear to reach school on time; late comers in most cases were female students. The El Niño incidence had made the situation much worse; we have forced to walk long distances in search of water daily which negatively affected our school attendance.

In line with this report, a study by Ashton *et al*. (2016) found that the most common reason for student's absenteeism or dropout in southern part of Ethiopia was to assist with chores in the home or farm. A 17 years old boy from Menedega kebelle (among the severely affected kebelles) narrated the situation of the 2015/16 El Niño phenomena with regret. He reported that, after the failure of main rainfall, it became challenging to get water and forage for livestock. As a result, he was forced to drop out his education in November to follow the herds of the family soon after registering for school in September.

A teacher from El Niño victim school explained that teaching-learning process in *kolla* agroecology in general is challenging due to the high temperature and critical scarcity of drinking water mainly after March. But what makes the 2015/16 academic year special was the failure of crop production and critical shortage of water. Students were inattentive in the class room due to the cumulative effect of shortage of food and water, extremely high temperature, being tired due to domestic chores and psychological disturbance. Absenteeism and being late into class were serious problems; no matter how the school feeding intervention had reduced the phenomena. Besides, one key informant from the educational office mentioned that, the 2015/16 El Niño was one of the worst ever drought which severely affected most kolla kebelles of Borena Woreda. Had it not been with the commencement of the school feeding program, which was initiated by the regional education bureau, the management of school dropouts in these El Nino prone schools was practically difficult. Thus, no matter how the school feeding program was started lately, it had played a pivotal role in reducing the occurrence of dropouts.

A chi-square test of independence was carried out (Table 3) comparing the proportion of students from El Niño victimized and relatively free schools in the top ten and bottom ten achieving groups. A significant interaction was found (χ^2 (1) = 35.78, p<0.01) for top achievers and (χ^2 (1) =10.59, p<0.01) for the bottom achieving groups. More students from El Niño free schools were represented in the top achieving groups than expected as compared with the proportion from victimized schools. Though the opposite was found in bottom achieving groups, the proportion of students in the top achieving category (10percent from the top achieving groups was taken) from victimized schools was very low (only 27 students as compared with 94 students from El Niño free schools). The implication here is that climate change induced shocks do have adverse impact on academic performance of students. On the other hand, the proportion of students in the low achieving groups was found to be less in El Nino prone schools as compared with their counterparts.

Linear regression was employed (Table 4) to estimate the overall result of students in regional examination based on different explanatory variables (including the effect of El Niño phenomena). The covariates used in the model were being in El Niño prone area (1=yes; 2=no), sex of the student (1=male and 0=female), age of the student in years, English and Mathematics results in regional examination. The ANOVA result was found to be statistically significant which implies that variables included in the model determines the average result of students. The R-squared result of 0.564 proved that, 56.4percent of the variation in average result was attributed due to the cumulative effect of the covariates. Multicollinearity problem was tested using VIF which granted absence of such problem. As depicted in Table 4, all variables except age of students were found to be statistically significant (p<0.05) in affecting students' result in regional examination. Being male and from El Niño free schools would increase the average result by 0.88 and 2.85pointsholding other variables at their constant. In this model, English and Mathematics results were found to be best predictors (see standardized beta values for their specific contribution)of average result which implies the need to give due attention for these

Table 3: Chi-square test based on top and bottom achievers (10%)

Category	El Niño Victim	N	Observed	Expected	χ^2	p-value
Top	Yes	599	27	59.9	35.78	.000
	No	611	94	61.1		
	Total	1210	121	121		
Bottom	Yes	599	42	59.9	10.59	.001
	No	611	79	61.1		
	Total	1210	121	121		

Table 4: Linear regression result

ANOVA result	Sum of Squares	df	Mean Square	F	Sig.
Regression	50462.902	5	10092.580	311.553	.000
Residual	39002.890	1204	32.394		
Total	89465.793	1209			
Dependent Variable: Average result($R = 0.751$ and $R^2 = 0.564$)					

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	22.834	2.467		9.256	.000		
El Niño affected or not	2.851	.334	.166	8.526	.000	.958	1.044
Sex of the student	.875	.335	.051	2.615	.009	.962	1.039
Age of the student	-.050	.154	-.006	-.322	.748	.901	1.110
English result	.544	.022	.469	24.495	.000	.988	1.012
Maths result	.735	.026	.547	28.060	.000	.954	1.048

subjects so as to achieve better performance.

CONCLUSION AND RECOMMENDATION

Climate change induced shocks could have adverse impact on academic performance of students in different ways. It causes scarcity of water in schools for safe drinking and sanitation; children tend to miss classes to help their families searching for water; hunger and malnutrition results in inattentiveness in the class; leads for displacement of families and school dropout; loss of assets and livelihoods has compromised the capacity of parents and caregivers to send their children to school as covering costs of uniforms, school materials and food is becoming difficult; heat waves make difficult to cover curriculum properly; drought-affected children might exhibit behavioural changes such as uncertainty, disturbance, hopelessness, fear and anxiety due to prevailing shortage of food and water as well as lack of rest; it intensifies the prevalence of water/air borne diseases;

In this study, we tried to examine the impact of climate change, particularly, the 2015/16 El Niñoincidence on the academic performance of students in Borena *woreda* of south Wollo zone in north central Ethiopian highlands. It was found that, El Niño induced drough had impact not only on agricultural production but also on academic performance of students. Students from relatively El Niño free schools have scored better result than their colleagues. In terms of gender, male students were more affected by El Niño where their mean result was found to be less than their counterparts. Besides, the proportion of students from victimized schools in top achieving group were found less than expected as compared with students from free schools. The result of our study provided a clue for the presence of impact attributed by climate change induced shocks. Based on these findings, we recommended that the concerned governmental and non-governmental bodies should give due attention regarding the impact of climate change on academic performance in their programs and interventions. Moreover, availing water at school compounds could help to minimize the impact. School feeding and any form of intervention should be undertaken ahead of time or immediately after the occurrence of the drought to overcome the problems related to school dropout, class room absenteeism, and poor academic performance. Special tutorial programs should be arranged for those students who have forced to miss classes due to shocks before seating for final examination. Schools can also be used as role models to climate change programs and

dissemination of information about climate change impacts and adaptation strategies.

LIMITATION

Variables for linear regression were used only the available ones in student's master list and it did not include all possible factors which would probably affect students' performance. Moreover, this research did not attempt to investigate the difference in performance of students from selected schools during non-ElNiño years.

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