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Human Capital Accumulation of Disabled Children : Does Disability Really Matter?

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Abstract: Although most of the world's people with disabilities live in the developing countries, little is known of the consequences of disability in that part of the world. This study uses the DHS-MICS 2011 data to assess the effect of child disability on education in Cameroon. This effect is also assessed both on school attendance and on school success, correlated with severity of disability. The research value added is that in the context of a lack of longitudinal data, the estimates of disability effects are corrected both for the endogeneity bias related to household and genetic unobservable variables by using a household and sibling fixed-effects model and for the simultaneity bias by including birth disability. The findings are that moderate and severe disabilities reduce by 9% and 42% the probability that a child attends school and by 8% and 55% respectively that he has ever attended school. Moderate disability and severe disability diminish school progress, showing that lower school attainment of children with disabilities is not only due to schooling access.

Key words: Disability, education, child, development, poverty, household fixed-effects model.

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Introduction

In both developed and developing countries, education is associated with a higher probability of gaining a decent and better paid job (Unicef, 2013). Any obstacle to education therefore reduces individuals' future productivity and incurs a future cost. This is why education for all, especially universal primary education, features high among all development strategies, and the elimination of inequalities in education is one way of achieving it (ONU, 2014).

There are various types of inequality in education: by gender, ethnicity, urban ratio, income, disability, etc. Even if the inequalities relating to disability are less frequently addressed in the literature, they have been shown to have greater impact than most other forms of inequality. Currie and Stabile (2007) show for two developed countries (Canada and US) that the education deficit due to disability is greater than that due to income or mother's education. Filmer (2008), working on thirteen developing countries, concludes that this deficit is often greater than that due to gender, urbanisation and economic status. The educational gap due to disability is therefore just as great as, if not greater than, all other forms of inequality.

And yet there are many policies and laws dealing with the education of people with disabilities. Internationally, as early as 1948, the Declaration of Human Rights recognised the right of education for all (ONU, 1948), the Convention on the Rights of the Child reiterated this right for children (ONU, 1989), and the Convention on the Rights of Persons with Disabilities promotes their right to education (ONU, 2006).

In Cameroon, the general legal framework for education is laid down by the 1998 Law on Educational Guidance, which is supposed to guarantee access to education without discrimination. In 2000, primary education was made free of charge for every children.[1] The education of people with disabilities is covered by the 2010 law, whose Article 29 states that the State contributes to the education and initial vocational training expenses of poor pupils and students with disabilities (Cameroun, 2010).

However, both global and national figures continue relentlessly to reveal the huge educational disadvantages suffered by people with disabilities. UNESCO, for example, estimates that in developing countries 98% of children with disabilities do not go to school (OIT, 2009). These differentials between those with and without disabilities are observed both at the entry to education and throughout it. Analysis of 51 countries shows that the primary completion rate of the 18-49 year age group is 53% for people with disabilities, compared with 67% for the rest. Similarly, the average number of years' schooling for those with and without disabilities is 6.23 and 7.86 respectively (OMS, 2011). The situation in Cameroon is hardly any better. The data from the 2005 Population and Housing Census show a net primary school enrolment rate of 75.5% for

[1] In practice, other expenses, such as uniform, transport, school exams and textbooks, and subscriptions to parent-teacher associations remain to be paid by parents.

children with no form of disability, compared with only 69.9% for those with disabilities (Mbouyap and Ahanda, 2010).[2] A differential also appears in level of instruction at all stages in the education system. So only 13.8% of people with disabilities of 6 years and over have completed 4/5 years of secondary school, compared with 18% for the population as a whole.

This implies that their disability would be the major determining factor in the deficit of human capital that children with disabilities face. However, matters are not that simple. Economic theory reveals much more complex relationships between child health and education. Some authors, reinterpreting life-cycle models, have concluded that disability has a possible influence on education (Case et al., 2005, Cutler and Lleras-Muney, 2012, Fletcher and Lehrer, 2009, Currie and Stabile, 2006, Jackson, 2009, Filmer, 2008).

Other research, based on Grossman's theory of non-market outcomes of education (2005), claims that education determines an individual's health status and not the opposite. Other authors mention observable and unobservable third factors that may influence both disability and level of educational attainment. Some empirical studies, controlling for some of these unobservables and inverse causality, have shown that disability has no effect on children's education (Oreopoulos et al., 2008, De Ridder et al., 2013, Filmer, 2008).

In the face of these theoretical and empirical disagreements and the virtual absence of robust evidence from developing countries, this study aims to assess the effect of a child's disability on their accumulation of human capital in Cameroon, using the 2011 Demographic and Health Survey and Multiple Indicator Cluster Survey (DHS-MICS) data. The measurement of the effect of a child's disability on their educational level would be of great importance for recommending economic policies. It would not only identify how endeavours targeting this social group should be directed in order to achieve better education, but not least so as to spare the individual and society the future costs of their exclusion from the labour market because of poor human capital.

The contribution of this study is of four kinds. First, a fairly recent database is used to provide an updated measurement of the effect of disability on children's education. Second, the virtual absence of information on this subject for developing countries is filled by using estimates corrected both for the endogeneity bias due to unobservables with a household and sibling fixed-effects model, and for the simultaneity bias by using disability at birth. This makes it possible to obtain a more robust effect despite the transversal structure of the database. Third, the effect of disability is evaluated on both school attendance and school achievement, giving a comprehensive vision; as the MDG Report 2014 puts it, "The achievement of universal primary education requires both enrolment in, and completion of, the full cycle of primary school education" (ONU, 2014, p. 18). Fourth, the estimates are made for various degrees of severity of disability,

[2] Except where otherwise stated, all the figures in this paragraph come from the same source.

giving great force and precision to the suggestions for economic policy that are made.

The rest of this chapter has three sections. Section 1 is a detailed review of the theoretical and empirical literature on the relationship between disability and education. Section 2 presents the methodology used in this study. Section 3 proposes an analysis of the statistical and econometric results obtained

1 Review of the literature

1.1 Theoretical links between child disability and education

In economic theory there are three possible links between health and education (Cutler and Lleras-Muney, 2008). Poor health may cause lower educational attainment. Education may affect an individual's health. And third factors may affect both the health and education of an individual.

1.1.1 Child's disability a determining factor in educational attainment

Poor health, particularly during an individual's first years of life, is likely to retard their accumulation of human capital. This conclusion is implied by certain life-cycle models (Case et al., 2005). Although these models reveal the effect of childhood health on adult health, they also show clearly that this is due, among other things, to an effect of health on educational attainment. How this operates in the case of a disability may be explained by two channels.

First, health may affect education via the illness it causes and/or the anticipations of lifespan it changes (Cutler and Lleras-Muney, 2012). A child's disability may reduce their physical and/or cognitive capabilities. The child may also have other satellite illnesses and thus attend school less, learn less when they are there, leading to poor school results and ultimately lower educational attainment.

Second, in addition to the morbidity effect of a child's disability on their school results which may be called "direct" an "indirect" effect may also be observed. The disability may alter the "subjective" or "objective" return expected from education. The "subjective" expected return is the internal or external return of education as modelled by their parents' beliefs about what a child with disabilities can accomplish at school or in the labour market. The "objective" expected return is the parents' objective reasoning about the profitability of their child's education, given the state of the labour market. If the labour market displays strong discrimination against people with disabilities (Baldwin and Choe, 2014) or if the type or severity of the child's disability is such that they are unlikely to obtain a job, the "objective" expected return will be low.[3] If, as Becker (1962) claims, the expected return on investment in human

[3] Note that the "subjective" and "objective" expected returns may be linked, since the state of the labour market may alter beliefs about the capabilities of children with disabilities.

capital is the main determining factor in the amount of that investment, then one would expect the parents of children with disabilities to reduce the investment made in their education, particularly if household resources are strained. Ultimately, the child's disability will lead to a reduction in educational attainment.

1.1.2 Is the child's education a possible determining factor in their disability?

An abundant literature has sought to explain why an individual's health status may be the result of their capital in knowledge or education (Cutler and Lleras-Muney, 2008, Grossman, 2005). It follows directly on from Grossman's (2005) study of the nonmarket outcomes of education. His theoretical model shows in particular how an individual's education is likely to affect certain nonmarket outcomes, such as their adult health. Although the model reveals a causal link between education and adult health, it may still be extended to child health. The reason is that certain school vaccination campaigns or school meals systems in developing countries can protect children against certain types of disability. Similarly, children enrolled in school may be exempted from street work. School thus shelters them from certain high-risk environments, a possible source of accidents and disabilities. A lack of education may also be an aggravating factor in certain cognitive problems (Jackson, 2009). This theoretical link between the accumulation of educational capital and disability deserves to be included in the analysis.

1.1.3 Third factors affecting both the education and the disability of the child

A set of third factors or family antecedents may also simultaneously affect a child's disability status and school attainment. These factors may be either observable or unobservable. The observable ones include household income, parents' educational attainment or social status. A rich parent can invest more in both the education and health of their child (Cutler and Lleras-Muney, 2008, Case et al., 2005). A poor parent is more likely to have children with disabilities, because they invest less in their offspring's health, and to have less-educated children, because they invest less in their education. The unobservable factors that may affect both health and educational attainment in a child include notably their genetic features or endowments (Cutler and Lleras-Muney, 2008). A child's genetic inheritance may thus be responsible for certain mental or physical illnesses and also poor school results. Other unobservable factors in the family environment may also affect both education and disability status. For example, a noisy, dangerous or unlit family environment may underlie certain forms of disability and also be unfavourable for accumulating educational capital.

1.2 Empirical literature linking child disability and educational capital

1.2.1 Evidence for correlation between child health and education in the empirical literature

Following the pioneering work of such researchers as Barker (1995), showing that weight at birth is one determining factor in certain chronic diseases, a number of authors have taken that indicator and related it to individual school results. Although it is not in itself a disability, low birth weight, like other health indicators at birth, is associated with a high rate of disability and may therefore be considered to be a condition marker (Stabile and Allin, 2012).

Authors such as Currie and Hyson (1999), Case et al. (2005) in the UK and Hack et al. (2002) in the US conclude that low birth weight correlates with poor educational attainment. They also analyse other chronic health problems including physical and mental disabilities, and show that the occurrence of a chronic illness is associated with 0.3 fewer Ordinary Level subject passes at 16.[4]

1.2.2 Demonstrations of causal effect in the empirical literature

Black et al. (2007) use a twin fixed-effects model to compare twins in the same family and thus allow for the unobservable heterogeneity between households. They find that in Norway a 10% increase in birth weight increases the probability of completing secondary school by just under 1%. However, their estimation technique requires them to confine themselves to twins, which raises the problem of the external validity of their results. The twin population differs in many ways from that of other children, throwing doubt on the generalisation of results to the population as a whole. Oreopoulos et al. (2008) in Canada use both a sibling fixed-effects model and a twin fixed-effects model to assess the effect of certain health indicators at birth such as weight, Apgar score and length of pregnancy.[5] They find that whereas most of these indicators have no effect on the scores obtained in language tests at Grade 12, they do have a significant negative effect on the probability of entering Grade 12 at age 17.

Fletcher and Lehrer (2009) combine a sibling fixed-effects model and a "genetic lottery". The idea is that a child's health until they become an adult is affected by the behaviour (choices) of their parents. It should therefore be treated endogenously. The authors use variations in genetic markers between children and their interactions as an instrument of health, due to the simple genetic lottery that occurs at a child's conception. They find that mental disorders have a negative effect on the number of years' schooling completed. However, even if this approach solves the endogeneity

[4] The Ordinary Level is an exam written by students at 16 years old in the UK

[5] The Apgar score is a summary of five vital signs noted by health staff at birth. They are heart rate, respiration, muscle tone, reflex and colour. Each is scored from 0 (poor) to 10 (excellent).

problem that remains after using family fixed effects (because even for children in the same family there are differing characteristics), the authors recognise that it is hard to capture the effect of a specific health problem because of the existence of co-morbidity. There are rarely if ever any genetic markers able to explain a specific health problem. As a result of this limitation and the lack of information about the genetic lottery in most databases, this method cannot easily be generalised.

Smith (2009) works on chronic diseases both severe (such as cancer, heart and lung disease and stroke) and moderate (high blood pressure, arthritis, diabetes). Although simple regression shows a significant negative effect of chronic disease, the inclusion of unobservables via family fixed effects causes the effect to disappear. De Ridder et al. (2013) analyse the risk of college dropout among adolescents presenting certain health problems. They use a sibling fixed-effects logistic model or conditional logistic to allow for unobservable heterogeneities at family level. They find a high risk of dropout for young people with high psychological distress and problems with concentration. However, once sibling fixed effects are controlled for, the effect is no longer significant for psychological distress. Their study may suffer from selection bias, since only young people attending school were included in the base sample, potentially excluding those who had already dropped out. Jackson (2009) uses the same model and a lagged health measurement in order to avoid simultaneity bias between health and education.

Alongside these studies of general health problems, others have been devoted to child deficiencies, by far the most on mental disability or behavioural disorders. Currie and Stabile (2006) examine the effects of Attention Deficit Hyperactivity Disorder (ADHD) on the level of children's human capital in Canada and the US, showing that the effects of this behavioural disorder are more marked than those of physical conditions. Currie and Stabile (2007) find a similar result including, in addition to ADHD, anxiety/depression, conduct disorder and other behaviour problems. Fletcher and Wolfe (2008) extend Currie and Stabile's (2006) study to older children so as to see the effect of these disorders on long-term educational results in the US. They find that, when they include family unobservables, ADHD has no effect on long-term education indicators such as the number of years' schooling or the probability of going on to higher education. To explain what is a counter-intuitive result, they show that living with a child suffering from this disorder negatively affects the other children, leading to a reduction in observed differences between children.

1.2.3 Empirical literature in developing countries

Although there are many studies in the developing countries evaluating the effect of nutrition problems and tropical diseases (Bobonis et al., 2006, Field et al., 2009, Clarke et al., 2008), there are virtually none on the effect of disability. Even if the study population for Mitra et al. (2011) and Mitra et al. (2013) was adults in fifteen developing countries including seven in sub-Saharan Africa, they do show that disability is associated with a low number of years' schooling in these countries, except for Burkina Faso, Kenya and the Dominican Republic, and with a low probability of completing primary school in all except Burkina Faso. However, because of the format of the survey, designed to question only one person per household, the authors are not able to establish a causal link and this result can only be seen as a correlation.

Filmer (2008) analyses the interactions between children's physical and/or mental disability, education and poverty in twelve developing countries and one emerging one. He finds that, although in most of these countries children with disabilities do not always live in poor households, their education is negatively affected by their disability. He shows that, except for Chad, disability has a negative effect on the probability of actually attending or having attended school. Although he controls for family unobsevables (such as parents' preferences for investing in children's education and health, and family environment) through household fixed effects model, it could remain some unobservables heterogeneity in households especially in African context. In fact, many families in the developing countries include children who are not direct descendants.Comparing these children with biological HH's children could not allow to control for the genetic unobservables.

Our article is an extension of this article applied on more recent data and Cameroon context. We go further by using a sibling fixed-effects model to correct for unobservables. The estimates are also corrected for the potential endogeneity bias related to simultaneity using birth disability and control for the disability severity.

2 Study data and samples

The Demographic Health Survey National Multiple Indicators Cluster Survey (DHS-MICS) survey was used for the statistical and econometric processing. It was held from January to April 2011 by the INS with support from UNFP, Unicef, World Bank and USAID. It is representative of the entire Cameroon population and was intended to collect information on demographic and health indicators using three questionnaires: women, men, and household.

Within the household questionnaire, various modules were used with all or some households. The disability module was administered to a random sample of half the households. This is the sub-sample used for all the following analyses. In addition to demographic information such as age, gender and relationship with head of household, the DHS-MICS survey collected information on current and past school attendance and educational level for the current and previous school year for household children from 3 to 24.

Given that the survey is a transversal one and does not provide the exact date at which each disability began, the effect can only be measured for the population defined as children.[6]. Our child definition is from age 6 to age 17. Although information on school attendance was collected from the age of 3, before 6 most children are in pre-primary; their enrolment rate is relatively low. School attendance in Cameroon is only compulsory from primary school on.

The general sample used in this study thus comprises children aged 6 to 17 for whom the education information is not missing.[7] Since DHS-MICS collected information about all the children in each household, it is possible to produce analyses at household level. For these analyses via household fixed effects, only the sub-set of individuals living in household with at least two children of differing disability status (i.e. at least one child with a disability and one without) (Filmer, 2008) is used: the household sample. Analyses are also made with a restricted sample on only biological siblings. It means the head of household's biological children, where at least one has at least one disability and one has none: the Sibling sample.[8]

Although the DHS-MICS survey provides no precise information about the history of the disability, one of its advantages is that it records whether or not the disability dates from birth. For some of the household analyses in this study, only children with a disability from birth (38.90% of all those with a disability) and those with no disability are included in the sample: the household with birth disability sample. Here the age limit is extended to 24: we can be sure that the disability was present in childhood (because it was present at birth). This has the advantage of increasing the size of the sample. How the samples are put together is described in Figure 1.

The DHS-MICS survey makes it possible to identify deficiencies such as the lack of a body part or extremity, deformation of a limb, serious problems with sight, with hearing, with speech and behavioural disorders as described in Table 7.[9] The degree of severity of deficiency is then checked by a question about whether or not it is partial. This provided a disability categorical variable of value 1 if the child has no disability, 2 if their disability is not severe and 3 if the disability is severe.

There are a number of measurements of education used in the literature (Mani et al., 2013). Some measure access to schooling, others educational attainment. In order to capture access to schooling, this analysis uses the *attends school* and *ever attended*

[6]The 1989 Convention on the Rights of the Child defined a child as "every human being below the age of eighteen years unless under the law applicable to the child, majority is attained earlier" (ONU, 1989, p. 2056).

[7]The information on curent school attendance, ever school attendance and number of years' schooling is missing for only 0.34 %, 0.34 % and 0.35% of children respectively.

[8]The choice of grouping children by their descendance from the head of household rather than from father or mother was guided by the desire to keep as many children as possible in the sample. Generally speaking, 44.19% and 35.77% of children do not live in the same household as their father or mother respectively, and cannot be grouped as siblings on that basis. However, in all households there is a head of household (who may be a woman or a man) and this person is generally one of the children's parents.

[9]Although the questions used are not those of the Washington Group on Disability Statistics (WG), they produce overall results as to the prevalence of disability that are fairly close to those obtained with the WG questionnaire in Senegal in 2013.

school variables. This is a short-term measurement of education. the *attends school* has value 1 if the child currently attends (or is enrolled at) a school and otherwise 0, *ever attended school* takes the value 0 if the child has never attended school and 1 otherwise. Educational attainment is a long-term measurement because it is supposed to summarise the child's career from school entry to the survey date. To measure it, the number of completed years' schooling at the time of the survey could be used.

However, this variable is better suited to adult populations (Patrinos and Psacharopoulos, 1997). Since the sample used for this study comprises children of school age who have therefore not completed their educational careers, the measurement is right-censored (Mani et al., 2013), so another school attainment measurement is necessary.

Some authors consequently use the relative number of years' schooling or school progress (Mani et al., 2013). This is the ratio of number of completed years of education to the number of potential years of education. The latter figure is the number of years of education the person would have completed if they had started their schooling at the normal age and then completed one further year of education each year. In the literature, the variable is expressed as follows:

$$\textit{School progress} \ = \frac{\textit{Years' schooling}}{Age - E} \tag{1}$$

Where *Years' schooling* is the number of actually completed school years and E the usual school entry age in the country concerned. In Cameroon, E is 6 (Unesco-BIE, 2010). Equation (1) may pose a problem with very young children, namely those aged 6. For them the *School progress* variable is infinite since the denominator is zero. For that reason, we built another school progress variable which allows including children of 6 in this study, what the previous variable does not allow.

It is expressed as follow:

$$\textit{School progress} \ = \frac{\textit{Years' schooling+1}}{Age - E + 1} \tag{2}$$

School progress or the relative number of years' education provides information on both whether a child entered school late and if there have been results failures along the way. Where *School progress* < 1, the child has had a bad school progression meaning he has entered school late or has repeated at least one grade. If *School progress* $\geq> 1$, it means that the child has a normal or advantageous school progression meaning he entered school at the right time or earlier and had never repeated any class. It is important to notice this indicator values the years of education according to the child's age, for example one year of education for a child of 8 is better valued than for a child of 9.

Table 2 describes in detail the study samples. Column 1 describes the general sample of children for whom human capital variables are not missing. Columns 2, 3 and 4 describe the samples in which there are at least two children with differing disability status. The samples are used for the fixed-effects models. Overall, disability affects some 3.1% of children aged 7-17 in Cameroon (non-severe and severe disabilities affect 2.6% and 0.5% respectively). This prevalence is identical to that found by Filmer (2008) in Mongolia but slightly above that obtained in other African countries such as Burundi, Zambia and South Africa (approximately 1.3%) from 1995 to 2003. This probably reflects the ability of the 2011 DHS-MICS to record certain types of disability. The disability prevalence figures obtained for the other three samples are much higher, which is quite understandable because these samples only include children in households with a child with a disability. Table 2 shows that overall the samples selected for fixed effects are fairly close to the general sample and may thus be used with no risk of selection bias. There are however slight differences in the samples with birth disability concerning some control variables.

Since this study uses birth disability to control for simultaneity bias, it is important for the external validity of the results obtained to verify that this population is relatively similar to the general set of people with disabilities. To that end, mean difference tests are shown in Table ‘8. Column 1 presents the difference test for the 6-17 age group and Column 2 for the 6-24 group. For the 6-17-year-olds, except for living environment (place of residence), the two populations do not differ. For the 6-24-year-olds, in addition to place of residence, the age and the illness status of the two populations differ slightly but the distribution of all the human capital variables are the same across the two groups. Overall, therefore, the two populations with disabilities are fairly similar, showing that the results obtained from the birth disability sample can be generalised to the rest of the disability population.

Table 3 shows the means of human capital variables by child's disability status. Whatever the educational variable, there is a considerable differential in human capital between children with and without disabilities. The more severe the disability the wider the gap. For example, the school attendance rate is 82% for children with no disability, 77% for those with a non-severe disability and 28% for those with a severe disability. Similarly, the school progression of children with a severe disability is only 0.47 compared with 0.75 of those with a non-severe disability and 0.84 of those with none. These descriptive findings imply that there would be a causal relationship between having a disability and having poor educational capital. This hypothesis requires, however, more detailed econometric investigation.

Table 1: Disability status in study samples

	General	Household	Siblings	Household With Birth dis.	Sibling With Birth dis.
	N	N	N	N	N
No dis.	10758	698	415	529	260
Non-sev. dis.	290	252	169	143	86
Sev. dis.	57	45	27	30	15
Total	11105	995	611	702	361

Note: Author from 2011DHS-MICS data. N: sample size.

Table 2: Variables means and Standard errors

	General		Household		Sibling		Household Birth dis		Sibling Birth dis	
	Mean	Standard errors	Mean	Standard errors	Mean	Standard errors	Mean	Standard errors	Mean	Standard errors
Attends school	0.820	0.384	0.803	0.398	0.804	0.397	0.770	0.421	0.828	0.378
Ever attended school	0.867	0.339	0.853	0.354	0.848	0.360	0.889	0.314	0.895	0.307
School progress	0.838	0.460	0.791	0.473	0.796	0.478	0.798	0.473	0.813	0.439
Child disability										
None	0.969	0.174	0.702	0.458	0.679	0.467	0.754	0.431	0.720	0.450
Non-sev. dis.	0.026	0.159	0.253	0.435	0.277	0.448	0.204	0.403	0.238	0.427
Sev. dis.	0.005	0.071	0.045	0.208	0.044	0.206	0.043	0.202	0.042	0.200
Child illness										
None	0.942	0.234	0.927	0.261	0.918	0.274	0.926	0.262	0.922	0.268
Slight illness	0.020	0.139	0.020	0.140	0.026	0.160	0.021	0.145	0.017	0.128
Moderate illness	0.024	0.152	0.027	0.163	0.026	0.160	0.031	0.174	0.030	0.172
Serious illness	0.015	0.121	0.026	0.160	0.029	0.169	0.021	0.145	0.030	0.172
Age	10.858	3.401	10.970	3.343	10.725	3.292	13.175	5.211	12.598	4.859
Age2	129.464	77.318	131.503	76.236	125.845	74.254	200.699	150.596	182.260	136.972
Boy	0.502	0.500	0.535	0.499	0.552	0.498	0.528	0.500	0.571	0.496
Biological child HH	0.648	0.478	0.693	0.461			0.647	0.478		
Education HH										
None	0.274	0.446	0.221	0.415	0.223	0.416	0.140	0.347	0.150	0.357
Primary education	0.390	0.488	0.433	0.496	0.439	0.497	0.494	0.500	0.496	0.501
Secondary or higher ed.	0.336	0.472	0.346	0.476	0.339	0.474	0.366	0.482	0.355	0.479
Age HH	48.603	14.018	49.177	12.357	47.655	10.480	51.148	13.398	50.568	10.955
Disability HH	0.108	0.310	0.188	0.391	0.177	0.382	0.172	0.378	0.169	0.375
Domicile										
Provincial capital	0.189	0.391	0.161	0.368	0.165	0.372	0.264	0.441	0.205	0.404
Other town	0.241	0.428	0.223	0.417	0.198	0.399	0.255	0.436	0.249	0.433
Rural area	0.570	0.495	0.616	0.487	0.637	0.481	0.481	0.500	0.546	0.499
Household size	8.201	4.564	9.102	3.832	8.895	3.598	9.745	5.163	9.468	4.157
Econ. well-being										
Poorest	0.203	0.402	0.220	0.415	0.270	0.444	0.134	0.341	0.175	0.380
Second quintile	0.233	0.422	0.262	0.440	0.247	0.432	0.214	0.410	0.180	0.385
Middle	0.216	0.412	0.220	0.415	0.200	0.400	0.234	0.423	0.252	0.435
Fourth	0.187	0.390	0.165	0.371	0.180	0.385	0.214	0.410	0.249	0.433
Richest	0.161	0.368	0.133	0.339	0.103	0.304	0.205	0.404	0.144	0.352
Constant										
Observations	11105		995		611		702		361	

Note: Author from 2011DHS-MICS data. +School attendance figures are 11106, 995, 613, 700 and 361 respectively. ++Ever attended school figures are 11106, 995, 611, 702 and 361 respectively.

Table 3: Level of human capital by disability status

	No dis.	Non-sev. dis	Sev. dis.	Total
Attends school	0.825	0.772	0.281	0.820
	(0.380)	(0.421)	(0.453)	(0.384)
Ever attended school	0.870	0.834	0.474	0.867
	(0.336)	(0.372)	(0.504)	(0.339)
School progress	0.842	0.752	0.474	0.838
	(0.459)	(0.465)	(0.339)	(0.460)
Observations			11105	

Note: Author from 2011DHS-MICS data. Standard errors in parentheses.

3 Method

In order to evaluate the effect of a child's disability on their school results, the estimated equation will first be of the following form:

$$Y_i = \alpha + \beta D_i + \lambda X_i + \epsilon_i \tag{3}$$

Where Y_i is the human capital of individual i, D their disability status and X_i all their individual and family control variables. β and λ are the parameters to be estimated. As in many studies (Currie and Stabile, 2006; Fletcher and Wolfe, 2008; Oreopoulos et al., 2008; Black et al., 2007; Filmer, 2008), Equation (2) is estimated with a linear model both for the continuous variables (Ordinary Least Squares [OLS]) and the binary variables (via a linear probability model). This is used to calculate cluster-robust variances and directly interpret the results.

However, as pointed out above, the child's disability status and school results may be influenced by third factors such as family environment, parents' preferences for investing in human capital and certain genetic traits. As a result of these unobservable elements, coefficient β obtained in Equation 3 is tainted by endogeneity bias.

To correct for this bias, one may compare children living in the same household. This may be done by using, like Filmer (2008), a household fixed-effects model. The household fixed-effects model corrects the estimates for the unobservables shared by children in the same household independently of their biological relationship with the head of household. It supposes that there is no parents' preferences difference between their own child and a foster child, which is not always true as shown by Bledsoe et al. (1988) and Case et al. (2004). Moreover, there may be genetic unobservables that affect both education and a child's disability status. An attempt to control for these unobservables is made by considering only children who have the same parents through a sibling fixed-effects model (Fletcher and Wolfe, 2008, Currie and Stabile, 2006, De Ridder et al., 2013). By comparing the biological children of the head of household rather than all the children in the database irrespective of origin, the sibling fixed-effects model controls for all the observable, and not least unobservable, elements shared by siblings.

So the equation is:

$$Y_{is} = \alpha + \beta D_{is} + \lambda Z_{is} + \mu_s + \epsilon_{is} \tag{4}$$

With Z identical to X, except that it excludes the control variables shared by siblings. Subscript s represents the Sibling. So Y_{is} is the school attainment of individual i in Sibling s. μ_s represents the sibling fixed-effects; it relates to the family-specific unobservables. And ϵ_{is} is the error term.

However, there may still be a simultaneity bias. As shown above in the theory section, health and education may affect each other. The effect of disability on education may be isolated and any inverse effect eliminated by using a lagged child disability variable (Jackson, 2009), by only including disabilities occurring before school age. Since the data used show whether a child's disability dates from birth, in some of the estimates presented here, the population of children with disabilities will consist solely of those with disabilities from birth.

4 Results

4.1 Evidence of correlation between disability and education

Table 4 shows the OLS estimated regression of education on disability for all children (i.e. children living alone in families, living in families with more than one child with identical disability status, and living in families with children with varying disability status). It suggests that children with disabilities have lower school attendance than others. Compared with a child with no disability, a child with a moderate disability has a risk of attending school that is 7 percentage points lower. The difference is even more marked for children with severe disabilities where the difference may reach 56 points. Similarly, moderate disability is associated to a lower risk (by roughly 6 percentage points(pp)) of attending school and a lower child's school progress. Severe disability is associated with a reduction of 42 points in ever attended school risk and in even lower school progress. The table 9 presents this correlation by types of disability. It shows that compared to children who don't carry such condition, the deformation, speech deficiency and mental deficiency are associated with a lower risk of attend or ever attended school. All the others form of deficiency except visual deficiency and the missing limb or extremity are associated with a lower school progress.[10]

To have a clearer idea of the extent of these variations due to disability, it is of interest to compare them with those arising from other common sources of differences in human capital. In order to do so, we run the sheaf coefficient post-estimations presented in the table 10. The sheaf coefficient post-estimations help comparing the relative strength of the influence of several blocks of variables or categorical variables (Buis, 2010). On contrary of Filmer (2008) and Currie and Stabile (2007), this shows that the gaps due to disability are not much greater than those due to gender or parent's educational attainment and econnomic well-being, which are more extensively addressed in the literature.

However, overall, the results for the probability that a person has ever attended school suggest that the lower current school attendance of disabled children could be due to their barrier at the entrance as shown by Filmer (2008). But school progress

[10]However due to the sample reduction when using household fixed models, the analyses by type of deficiency are made only in term of correlations.

informations show that they are also disadvantage once at school. However, because of the risks of endogeneity, the above results can only be interpreted as correlations. More robust estimation is essential to determine any causal effect.

Table 4: Correlation between disability and education: OLS for all children

	Attends school		Ever attended school		School progress	
	Coef.	SE	Coef.	SE	Coef.	SE
Child disability (None)						
Non-sev. dis.	-0.070**	(0.022)	-0.064**	(0.020)	-0.063**	(0.023)
Sev. dis.	-0.557***	(0.059)	-0.426***	(0.063)	-0.335***	(0.044)
Child illness (None)						
Slight illness	0.024	(0.023)	0.035*	(0.018)	0.002	(0.024)
Moderate illness	0.020	(0.020)	0.027	(0.017)	0.017	(0.020)
Serious illness	-0.035	(0.028)	0.003	(0.025)	-0.019	(0.038)
Age	0.142***	(0.008)	0.132***	(0.007)	-0.260***	(0.010)
Age2	-0.007***	(0.000)	-0.005***	(0.000)	0.009***	(0.000)
Boy	0.061***	(0.007)	0.042***	(0.006)	0.009	(0.007)
Biological child HH	0.011	(0.008)	-0.011	(0.007)	0.000	(0.009)
Education HH (None)						
Primary education	0.177***	(0.015)	0.159***	(0.013)	0.130***	(0.012)
Secondary or higher ed.	0.227***	(0.015)	0.182***	(0.014)	0.213***	(0.014)
Age HH	0.003***	(0.000)	0.002***	(0.000)	0.003***	(0.000)
Disability HH	0.011	(0.014)	0.012	(0.014)	0.000	(0.014)
Domicile (Rural area)						
Provincial capital	-0.043**	(0.014)	-0.010	(0.012)	-0.027	(0.016)
Other town	-0.013	(0.011)	-0.010	(0.010)	-0.029*	(0.014)
Household size	-0.005***	(0.001)	-0.003***	(0.001)	-0.007***	(0.001)
Econ. well-being (Poorest)						
Second quintile	0.165***	(0.018)	0.148***	(0.017)	0.142***	(0.014)
Middle	0.214***	(0.018)	0.175***	(0.016)	0.232***	(0.016)
Fourth	0.259***	(0.019)	0.205***	(0.017)	0.345***	(0.018)
Richest	0.286***	(0.020)	0.214***	(0.018)	0.451***	(0.021)
Constant	-0.299***	(0.048)	-0.233***	(0.045)	2.048***	(0.057)
R2	0.206		0.211		0.351	
Observations	11106		11106		11105	

Note: Author from 2011DHS-MICS data. Coef.: coefficient, SE: standard errors clustered at the household level. * significant at p<0.05 ** significant at p<0.01, *** significant at p<0.001. Variables in parentheses are reference categories.

4.2 Correcting biases and proving causal effect of disability on education

Table 5 gives the results of the OLS estimates (applied on the household sample) and the household fixed-effects model. Overall, the OLS estimates are fairly close to those obtained in Table 4 for the wider sample. So the results remain robust after reducing the size of sample.

In terms of school attendance, the disability coefficients obtained from the household fixed-effects model are fairly close to those obtained by OLS and are still just as significant. This suggests that the school attendance differential obtained previously was not due to unobservable factors common to households but indeed to the disability. Non-severe and severe disabilities reduce children's school attendance by 9% and 57% respectively.

The household fixed-effects models show that a child with a moderate disability and a child with a severe disability have a probability of ever attended school of 8 pp and 45 pp respectively less than a child with none. Having a non-severe disability or a severe disability reduces a child's school progress compared with no disability.

The effect of severe and non-severe disability on school participation and progress slightly increases when unobservables are included and remains highly significant. This means that household-specific unobservables tend to under-estimate the effect of disability. A largely similar result is obtained from the estimates using sibling fixed-effects given in Table 11.

As discussed above, a further possible source of endogeneity bias is the inverse relationship there may be between disability and education. In order to reduce this simultaneity bias, the estimates in Table 6 include in the sample only those children with no disability and with a birth disability. The estimates of household fixed-effects (FE) are corrected both for unobservables-related bias and inverse causality (household fixed-effects).

The effects estimated from these OLS are fairly close to those obtained for the general sample showing the samples are comparable. However, controlling for inverse causality and unobservables at household level, if the effect of non-severe disability on human capital accumulation does not change, the magnitude of the effect severe disability change slightly. In fact, concerning the probability of attending school, compared to reduction by 60% obtained by controlling only for unobservables, this reduction is by 42% where the two sources of endogeneity are taken in account. Inversely, the control for the two bias makes the effects of severe disability on the probability of ever attended school and school progress much more greater. This points out the importance of the reverse causality.

The results of the sibling fixed-effects model are also shown in table 12. [11] Overall,

[11] However these results should be interpreted carefully due to the small number of severely disabled

where we reduce the estimation to the HH's biological children, the magnitude of effects remain stable even if the sample is reduced. This shown that disability does really have an effect on human capital accumulation of children.

children with a birth disability in the sibling sample.

Table 5: OLS and household fixed-effects model

	Attends school				Ever attended school				School progress			
	OLS		FE		OLS		FE		OLS		FE	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Child disability (None)												
Non-sev. dis.	-0.090***	(0.025)	-0.091***	(0.024)	-0.080***	(0.022)	-0.082***	(0.022)	-0.074*	(0.030)	-0.073**	(0.027)
Sev. dis.	-0.573***	(0.067)	-0.600***	(0.068)	-0.410***	(0.075)	-0.452***	(0.082)	-0.345***	(0.054)	-0.365***	(0.069)
Child illness (None)												
Slight illness	-0.024	(0.112)	0.116	(0.069)	0.003	(0.068)	0.077	(0.061)	0.013	(0.085)	0.017	(0.094)
Moderate illness	0.104	(0.053)	0.024	(0.049)	0.080	(0.044)	0.018	(0.050)	0.123	(0.066)	0.022	(0.067)
Serious illness	0.059	(0.051)	-0.024	(0.067)	0.097*	(0.041)	0.043	(0.047)	0.095	(0.163)	-0.009	(0.074)
Age	0.120***	(0.025)	0.133***	(0.024)	0.100***	(0.023)	0.118***	(0.022)	-0.300***	(0.033)	-0.276***	(0.031)
Age2	-0.005***	(0.001)	-0.006***	(0.001)	-0.004***	(0.001)	-0.005***	(0.001)	0.011***	(0.001)	0.010***	(0.001)
Boy	0.097***	(0.021)	0.081***	(0.023)	0.064**	(0.019)	0.045*	(0.020)	0.092***	(0.023)	0.072**	(0.025)
Biological child HH	0.022	(0.029)	0.082*	(0.038)	0.020	(0.025)	0.047	(0.032)	0.043	(0.029)	0.078*	(0.036)
Education HH (None)												
Primary education	0.136*	(0.053)			0.099*	(0.048)			0.084*	(0.038)		
Secondary or higher ed.	0.225***	(0.050)			0.173***	(0.047)			0.260***	(0.045)		
Age HH	0.001	(0.001)			0.001	(0.001)			0.004**	(0.001)		
Disability HH	0.024	(0.037)			0.054	(0.034)			-0.004	(0.036)		
Domicile (Rural area)												
Provincial capital	-0.053	(0.055)			-0.034	(0.045)			-0.058	(0.052)		
Other town	-0.020	(0.039)			-0.021	(0.034)			-0.035	(0.052)		
Household size	-0.004	(0.004)			-0.002	(0.004)			-0.006	(0.004)		
Econ. well-being (Poorest)												
Second quintile	0.199***	(0.056)			0.196***	(0.054)			0.156***	(0.035)		
Middle	0.220***	(0.060)			0.218***	(0.055)			0.236***	(0.047)		
Fourth	0.234***	(0.062)			0.229***	(0.059)			0.322***	(0.059)		
Richest	0.269***	(0.068)			0.251***	(0.063)			0.436***	(0.078)		
Constant	-0.123	(0.177)	0.097	(0.135)	-0.090	(0.157)	0.143	(0.124)	2.129***	(0.198)	2.462***	(0.180)
R2	0.244		0.220		0.228		0.183		0.424		0.343	
Observations	995		995		995		995		995		995	

Note: Author from 2011DHS-MICS data. Coef.: coefficient, SE: standard errors clustered at the household level. * significant at p<0.05 ** significant at p<0.01, *** significant at p<0.001. Variables in parentheses are reference categories.

Table 6: OLS and households fixed effects with birth disabilities

	Attends school				Ever attended school				School progress			
	OLS		FE		OLS		FE		OLS		FE	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Child disability (None)												
Non-sev. dis.	-0.127***	(0.034)	-0.091**	(0.034)	-0.113***	(0.031)	-0.084**	(0.030)	-0.088*	(0.039)	-0.078*	(0.038)
Sev. dis.	-0.435***	(0.088)	-0.423***	(0.095)	-0.543***	(0.083)	-0.546***	(0.089)	-0.437***	(0.063)	-0.493***	(0.085)
Child illness (None)												
Slight illness	-0.020	(0.079)	0.079	(0.112)	-0.040	(0.080)	-0.081	(0.101)	0.023	(0.099)	0.078	(0.116)
Moderate illness	0.018	(0.068)	0.015	(0.064)	0.038	(0.037)	0.079	(0.050)	0.022	(0.081)	0.073	(0.074)
Serious illness	0.068	(0.074)	0.042	(0.093)	0.116**	(0.039)	0.072	(0.039)	-0.042	(0.103)	0.054	(0.105)
Age	0.054**	(0.016)	0.036*	(0.016)	0.044***	(0.012)	0.042***	(0.011)	-0.133***	(0.023)	-0.135***	(0.024)
Age2	-0.003***	(0.001)	-0.002***	(0.001)	-0.002***	(0.000)	-0.001***	(0.000)	0.003***	(0.001)	0.003***	(0.001)
Boy	0.089**	(0.028)	0.074*	(0.030)	0.055**	(0.021)	0.053*	(0.022)	0.091**	(0.029)	0.072*	(0.030)
Biological child HH	0.130***	(0.032)	0.149**	(0.045)	0.047	(0.026)	0.070	(0.038)	0.034	(0.033)	0.037	(0.042)
Education HH (None)												
Primary education	0.046	(0.066)			0.005	(0.055)			0.005	(0.056)		
Secondary or higher ed.	0.093	(0.069)			0.102	(0.054)			0.116	(0.066)		
Age HH	0.001	(0.001)			0.002	(0.001)			0.005**	(0.002)		
Disability HH	0.035	(0.040)			0.005	(0.033)			-0.030	(0.042)		
Domicile (Rural area)												
Provincial capital	0.031	(0.038)			0.066*	(0.028)			-0.064	(0.057)		
Other town	-0.030	(0.034)			0.031	(0.029)			-0.082	(0.054)		
Household size	0.002	(0.003)			0.000	(0.003)			-0.001	(0.004)		
Econ. well-being (Poorest)												
Second quintile	0.248**	(0.085)			0.246**	(0.080)			0.232***	(0.052)		
Middle	0.313***	(0.088)			0.255**	(0.080)			0.298***	(0.066)		
Fourth	0.316***	(0.088)			0.230**	(0.082)			0.445***	(0.076)		
Richest	0.330***	(0.091)			0.229**	(0.081)			0.521***	(0.091)		
Constant	0.145	(0.154)	0.641***	(0.108)	0.230	(0.135)	0.595***	(0.083)	1.304***	(0.174)	1.886***	(0.163)
R2	0.325		0.265		0.299		0.221		0.423		0.373	
Observations	700		700		702		702		702		702	

Note: Author from 2011DHS-MICS data. Coef.: coefficient, SE: standard errors clustered at the household level. * significant at p<0.05 ** significant at p<0.01, *** significant at p<0.001. Variables in parentheses are reference categories.

Conclusion

The aim of this study was to evaluate the effect of child disability on the accumulation of human capital in Cameroon. The effect was measured taking into account the possibility of family-specific unobservables likely to affect both education and disability status, such as heredity, family environment and parents' preferences concerning human capital, and allowing for an inverse causality between education and handicap, since education and certain school-based programmes (vaccination, meals) may affect disability status. To that end, a household fixed-effects model and consideration of birth disabilities were used.

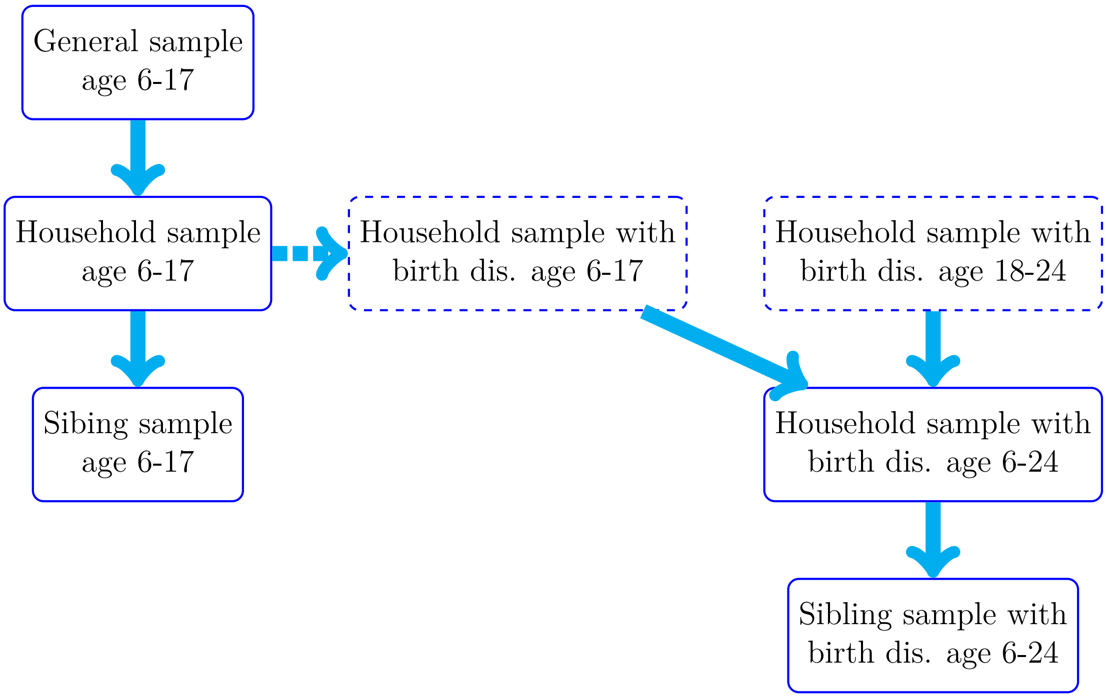
The findings are that a moderate disability reduces by 9% a child's probability of attending school and for a severe disability this figure may be as high as 42%. Moderate and severe disabilities reduce by 8% and 55% respectively the probability that a child has ever attended school. Most of the difficulty for children with disabilities is rather access to schooling. However, both the non-severe and severe disabilities reduce a child's school progress . This suggests that disability creates a major future indirect cost, by impairing children's accumulation of human capital, and making it harder for them to integrate into the labour market and/or reducing their adult earnings.

These findings provide matter for a number of recommendations for economic policy. First, they show that the educational differential between people with and without disabilities is not due to third factors or to an effect of education on disability, as suggested by economic theory, but is indeed due to the disability. Adopting policies to reduce childhood disabilities is therefore also a way of eliminating an obstacle to universal education.

Second, improvements need to be made both to the supply of education, by guaranteeing access to schools and specialist schools, and to the demand, by informing parents about the opportunities that education offers a child with a disability, so as to raise the level of school attendance. As Unicef puts it, the fact that parents believe that a child with a disability is unable to study at school is probably the main reason for their lower school enrolment (Unicef-Armenia, 2012). Third, the public authorities should improve and ensure the adequacy of education provided so that children with disabilities can achieve better school results.

This study does, however, have limitations. First, We have control for the surrounding and genetic unobservables in the household but we can not exclude unobservable factors specific to each child. Second, birth disability was used to control for simultaneity bias. Although it was verified that the populations of children with birth disabilities and those with other disabilities are fairly similar, the disability effect obtained may well be broader than for disabilities that develop later in a child's life. Longitudinal data on disability in developing countries need to be collected in order to achieve a more accurate analysis of the effects of child disability on school attainment.

Figure 1: Composition of study samples



Source: Author

This study contributes to the existing literature in three main ways. First, it reduces the lack of information about the effect of disability on education in developing countries. Thereby, unlike the small number of studies on developing countries, it corrects the estimates for the endogeneity bias due both to genitics unobservables and simultaneity. The effect obtained may therefore be rigorously interpreted as a causal effect of disability on education, even though the data used are transversal.

Second, the disability effect is evaluated both on access to education and school attainment, making it possible to throw more light on these two major aspects of a person's education. Third, the effect is addressed according to the degree of severity of disability, providing more detail for analysis and ensuring greater effectiveness for any policies that may be adopted as a consequence.

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Appendix

Table 7: Types of disability

	Effectif	Frequence
Missing limb or extremity	Is there a person in your household who is missing a body part, for example, a hand, arm, foot or leg? Is there a person in your household who is missing an extremity, such as a fingertip, toe, nose or ear? Does [NAME] have bodily extremities that are numb?	0.081
Deformation	Is there a person in your household who has a deformed upper or lower limb and cannot, or only with difficulty, walk and/or use their arms or hands?	0.259
Visual deficiency	Is there a person in your household who can hardly see or is blind?	0.173
Hearing deficiency	Is there a person in your household who can hardly hear or is deaf?	0.329
Speech deficiency	Is there a person in your household who finds it very hard to speak or is dumb?	0.199
Mental deficiency	Is there a person in your household who has problems of behaviour?	0.127
Observations	347	

Note: Author from DHS-MICS 2011 data.

Table 8: Mean difference test between children with other disabilities and children with a birth disability

	Age 6-17		Age 6-24	
	Δ Mean	SE	Δ Mean	SE
Attends school	-0.082	0.050	-0.051	0.045
Ever attended school	0.008	0.046	0.057	0.039
School progress	-0.072	0.053	-0.046	0.042
Illness	0.055	0.035	0.092**	0.029
Age	0.683	0.361	1.181*	0.484
Boy	-0.047	0.055	-0.064	0.045
Biological child HH	-0.002	0.052	-0.053	0.044
Secondary or higher ed.	-0.075	0.054	-0.036	0.045
Age HH	-0.089	1.469	-1.710	1.265
Disability HH	0.051	0.043	0.063	0.036
Rural area	0.149**	0.054	0.100*	0.045
Household size	0.062	0.397	-0.101	0.371
Richest	-0.093	0.055	-0.074	0.045
Observations	347		519	

Note: Author from DHS-MICS 2011 data. Δ Mean is the difference between means or proportions for children with other disabilities and children with a birth disability, SE:Standard errors of difference. * Significant at p<0.05 ** significant at p<0.01, *** significant at p<0.001.

Table 9: Correlation between type of disability and education: OLS for all children

	Attends school		Ever attended school		School progress	
	Coef.	SE	Coef.	SE	Coef.	SE
Deformation	-0.142**	(0.044)	-0.138**	(0.043)	-0.101*	(0.046)
Visual deficiency	-0.026	(0.045)	-0.007	(0.034)	0.031	(0.053)
Hearing deficiency	-0.060	(0.036)	-0.056	(0.032)	-0.061*	(0.029)
Speech deficiency	-0.189***	(0.052)	-0.216***	(0.053)	-0.191***	(0.041)
Mental deficiency	-0.453***	(0.070)	-0.286***	(0.070)	-0.266***	(0.052)
Missing limb or extremity	-0.042	(0.079)	-0.034	(0.065)	-0.075	(0.057)
Child illness (None)						
Slight illness	0.021	(0.023)	0.032	(0.018)	-0.001	(0.024)
Moderate illness	0.019	(0.020)	0.027	(0.017)	0.016	(0.019)
Serious illness	-0.034	(0.028)	0.005	(0.025)	-0.017	(0.038)
Age	0.142***	(0.008)	0.132***	(0.007)	-0.261***	(0.010)
Age2	-0.007***	(0.000)	-0.005***	(0.000)	0.009***	(0.000)
Boy	0.061***	(0.007)	0.042***	(0.006)	0.009	(0.007)
Biological child HH	0.011	(0.008)	-0.010	(0.007)	0.000	(0.009)
Education HH (None)						
Primary education	0.176***	(0.015)	0.158***	(0.013)	0.130***	(0.012)
Secondary or higher ed.	0.226***	(0.015)	0.182***	(0.013)	0.213***	(0.014)
Age HH	0.003***	(0.000)	0.002***	(0.000)	0.003***	(0.000)
Disability HH	0.013	(0.014)	0.013	(0.014)	0.001	(0.014)
Domicile (Rural area)						
Provincial capital	-0.043**	(0.014)	-0.009	(0.012)	-0.027	(0.016)
Other town	-0.015	(0.011)	-0.010	(0.010)	-0.029*	(0.014)
Household size	-0.005***	(0.001)	-0.003***	(0.001)	-0.007***	(0.001)
Econ. well-being (Poorest)						
Second quintile	0.163***	(0.018)	0.146***	(0.017)	0.140***	(0.014)
Middle	0.214***	(0.018)	0.175***	(0.016)	0.232***	(0.016)
Fourth	0.259***	(0.019)	0.205***	(0.017)	0.345***	(0.018)
Richest	0.286***	(0.020)	0.214***	(0.018)	0.450***	(0.021)
Constant	-0.296***	(0.048)	-0.232***	(0.045)	2.049***	(0.057)
R2	0.205		0.211		0.352	
Observations	11106		11106		11105	

Note: Author from 2011DHS-MICS data. Coef.: coefficient, SE: standard errors clustered at the household level. * significant at p<0.05 ** significant at p<0.01, *** significant at p<0.001. Variables in parentheses are reference categories.

Table 10: Correlation between disability and education: sheaf coefficients post estimation

	Attends school		Ever attended school		School progress	
Main						
Child disability	0.041***	(0.004)	0.032***	(0.004)	0.026***	(0.003)
Child illness	0.006	(0.003)	0.006*	(0.002)	0.003	(0.004)
Education HH	0.092***	(0.006)	0.076***	(0.006)	0.083***	(0.005)
Residence	0.016**	(0.005)	0.005	(0.005)	0.014*	(0.006)
Econ. well-being	0.099***	(0.007)	0.077***	(0.006)	0.151***	(0.007)
Age	0.142***	(0.008)	0.132***	(0.007)	-0.260***	(0.009)
Age2	-0.007***	(0.000)	-0.005***	(0.000)	0.009***	(0.000)
Boy	0.061***	(0.007)	0.042***	(0.006)	0.009	(0.007)
Biological child HH	0.011	(0.008)	-0.011	(0.007)	0.000	(0.008)
Age HH	0.002***	(0.000)	0.001***	(0.000)	0.003***	(0.000)
Disability HH	0.011	(0.014)	0.012	(0.014)	0.000	(0.014)
Household size	-0.004***	(0.001)	-0.003**	(0.001)	-0.007***	(0.001)
Constant	-0.298***	(0.048)	-0.233***	(0.045)	2.048***	(0.057)
Observations	11106		11106		11105	

Table 11: OLS and sibling fixed-effects model

	Attends school				Ever attended school				School progress			
	OLS		FE		OLS		FE		OLS		FE	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Child disability (None)												
Non-sev. dis.	-0.104***	(0.030)	-0.120***	(0.029)	-0.078**	(0.027)	-0.084**	(0.027)	-0.068	(0.037)	-0.070*	(0.031)
Sev. dis.	-0.506***	(0.089)	-0.523***	(0.104)	-0.382***	(0.088)	-0.440***	(0.099)	-0.334***	(0.068)	-0.368***	(0.094)
Child illness (None)												
Slight illness	-0.079	(0.127)	0.092	(0.069)	-0.040	(0.079)	0.028	(0.060)	0.012	(0.103)	0.042	(0.131)
Moderate illness	0.134***	(0.038)	0.136**	(0.048)	0.104**	(0.032)	0.092*	(0.038)	0.168	(0.087)	0.093	(0.095)
Serious illness	0.025	(0.068)	-0.085	(0.081)	0.103*	(0.051)	0.066	(0.062)	0.158	(0.217)	-0.018	(0.107)
Age	0.125***	(0.030)	0.117***	(0.029)	0.123***	(0.029)	0.119***	(0.028)	-0.302***	(0.042)	-0.281***	(0.039)
Age2	-0.005***	(0.001)	-0.005***	(0.001)	-0.005***	(0.001)	-0.005***	(0.001)	0.011***	(0.002)	0.010***	(0.002)
Boy	0.111***	(0.028)	0.087**	(0.030)	0.079**	(0.025)	0.055*	(0.025)	0.066*	(0.030)	0.041	(0.035)
Education HH (None)												
Primary education	0.078	(0.070)			0.088	(0.062)			0.063	(0.045)		
Secondary or higher ed.	0.204**	(0.066)			0.189***	(0.056)			0.277***	(0.061)		
Age HH	0.001	(0.002)			0.003	(0.002)			0.003	(0.002)		
Disability HH	-0.028	(0.052)			0.011	(0.046)			-0.027	(0.042)		
Domicile (Rural area)												
Provincial capital	-0.126	(0.072)			-0.091	(0.061)			-0.065	(0.055)		
Other town	-0.050	(0.053)			-0.022	(0.048)			-0.039	(0.061)		
Household size	-0.012	(0.007)			-0.005	(0.006)			-0.003	(0.006)		
Econ. well-being (Poorest)												
Second quintile	0.210**	(0.064)			0.216***	(0.058)			0.162***	(0.045)		
Middle	0.237**	(0.073)			0.206**	(0.069)			0.243***	(0.058)		
Fourth	0.243**	(0.075)			0.210**	(0.065)			0.306***	(0.068)		
Richest	0.280***	(0.083)			0.235***	(0.070)			0.483***	(0.081)		
Constant	-0.075	(0.218)	0.199	(0.158)	-0.215	(0.205)	0.151	(0.160)	2.223***	(0.246)	2.553***	(0.224)
R2	0.256		0.210		0.247		0.198		0.453		0.351	
Observations	613		613		611		611		611		611	

Note: Author from 2011DHS-MICS data. Coef.: coefficient, SE: standard errors clustered at the household level. * significant at p<0.05 ** significant at p<0.01, *** significant at p<0.001. Variables in parentheses are reference categories.

Table 12: OLS and sibling fixed effects with birth disabilities

	Attends school				Ever attended school				School progress			
	OLS		FE		OLS		FE		OLS		FE	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Child disability (None)												
Non-sev. dis.	-0.134**	(0.045)	-0.077	(0.042)	-0.123**	(0.038)	-0.076*	(0.037)	-0.099*	(0.047)	-0.086*	(0.043)
Sev. dis.	-0.513***	(0.115)	-0.554***	(0.119)	-0.569***	(0.115)	-0.612***	(0.124)	-0.499***	(0.075)	-0.569***	(0.109)
Child illness (None)												
Slight illness	0.022	(0.108)	0.056	(0.101)	0.037	(0.095)	-0.045	(0.048)	0.162	(0.190)	0.175	(0.224)
Moderate illness	0.157**	(0.050)	0.172*	(0.068)	0.089*	(0.036)	0.073*	(0.034)	0.116	(0.110)	0.154	(0.090)
Serious illness	0.065	(0.088)	0.045	(0.113)	0.125*	(0.052)	0.107*	(0.047)	-0.051	(0.138)	0.053	(0.140)
Age	0.065*	(0.025)	0.038	(0.024)	0.031*	(0.015)	0.026	(0.015)	-0.134***	(0.031)	-0.135***	(0.033)
Age2	-0.003**	(0.001)	-0.002	(0.001)	-0.001	(0.001)	-0.001	(0.001)	0.003***	(0.001)	0.003**	(0.001)
Boy	0.086*	(0.037)	0.076	(0.041)	0.062*	(0.028)	0.056	(0.030)	0.022	(0.038)	0.025	(0.046)
Education HH (None)												
Primary education	0.065	(0.097)			0.074	(0.082)			0.041	(0.057)		
Secondary or higher ed.	0.110	(0.101)			0.189*	(0.083)			0.169*	(0.071)		
Age HH	-0.002	(0.003)			0.001	(0.002)						
Disability HH	0.033	(0.056)			-0.027	(0.047)						
Domicile (Rural area)												
Provincial capital	-0.009	(0.049)			0.061	(0.032)			-0.030	(0.060)		
Other town	-0.009	(0.048)			0.032	(0.041)			-0.062	(0.067)		
Household size	0.007	(0.006)			0.008	(0.005)			0.007	(0.005)		
Econ. well-being (Poorest)												
Second quintile	0.264*	(0.108)			0.243*	(0.098)			0.232***	(0.063)		
Middle	0.286*	(0.111)			0.214*	(0.100)			0.258***	(0.073)		
Fourth	0.255*	(0.117)			0.170	(0.106)			0.392***	(0.091)		
Richest	0.288*	(0.118)			0.151	(0.102)			0.450***	(0.085)		
Constant	0.284	(0.243)	0.658***	(0.141)	0.280	(0.189)	0.709***	(0.109)	1.503***	(0.207)	1.891***	(0.214)
R2	0.294		0.212		0.331		0.274		0.450		0.359	
Observations	361		361		361		361		361		361	

Note: Author from 2011DHS-MICS data. Coef.: coefficient, SE: standard errors clustered at the household level. * significant at p<0.05 ** significant at p<0.01, *** significant at p<0.001. Variables in parentheses are reference categories.

Bibliography

Baldwin, M. L. and Choe, C. (2014). Wage Discrimination Against Workers with Sensory Disabilities. *Industrial Relations: A Journal of Economy and Society*, 53(1):101–124.

Barker, D. J. (1995). Fetal origins of coronary heart disease. *BMJ*, 311(6998):171–174.

Becker, G. S. (1962). Investment in Human Capital: A Theoretical Analysis. *Journal of Political Economy*, 70(5):9–49.

Black, S. E., Devereux, P. J., and Salvanes, K. G. (2007). From the Cradle to the Labor Market? The Effect of Birth Weight on Adult Outcomes. *The Quarterly Journal of Economics*, 122(1):409–439.

Bledsoe, C. H., Ewbank, D. C., and Isiugo-Abanihe, U. C. (1988). The effect of child fostering on feeding practices and access to health services in rural Sierra Leone. *Social Science & Medicine*, 27(6):627–636.

Bobonis, G. J., Miguel, E., and Puri-Sharma, C. (2006). Anemia and School Participation. *Journal of Human Resources*, 41(4).

Buis, M. (2010). Sheafcoef: Stata module to compute sheaf coefficients.

Cameroun (2010). Loi No 2010/002 du 13 Avril 2010 Portant sur la Protection et la Promotion des Personnes Handicapées.

Case, A., Fertig, A., and Paxson, C. (2005). The lasting impact of childhood health and circumstance. *Journal of Health Economics*, 24(2):365–389.

Case, A., Paxson, C., and Ableidinger, J. (2004). Orphans in Africa: parental death, poverty, and school enrollment. *Demography*, 41(3):483–508.

Clarke, S. E., Jukes, M. C., Njagi, J. K., Khasakhala, L., Cundill, B., Otido, J., Crudder, C., Estambale, B. B., and Brooker, S. (2008). Effect of intermittent preventive treatment of malaria on health and education in schoolchildren: a cluster-randomised, double-blind, placebo-controlled trial. *Lancet*, 372(9633):127–138.

Currie, J. and Hyson, R. (1999). Is the Impact of Health Shocks Cushioned by Socioeconomic Status? The Case of Low Birthweight. *The American Economic Review*, 89(2):245–250.

Currie, J. and Stabile, M. (2006). Child mental health and human capital accumulation: The case of ADHD. *Journal of Health Economics*, 25(6):1094–1118.

Currie, J. and Stabile, M. (2007). Mental Health in Childhood and Human Capital. Working Paper 13217, National Bureau of Economic Research.

Cutler, D. and Lleras-Muney, A. (2008). Education and Health: Evaluating Theories and Evidence. In *Making Americans Healthier: Social and Economic Policy as HealthPolicy*. Russell Sage Foundation, New York, j. house and r. schoeni and g. kaplan and h. pollack edition.

Cutler, D. M. and Lleras-Muney, A. (2012). Education and Health: Insights from International Comparisons. Working Paper 17738, National Bureau of Economic Research.

De Ridder, K. A. A., Pape, K., Johnsen, R., Holmen, T. L., Westin, S., and Bjørngaard, J. H. (2013). Adolescent health and high school dropout: a prospective cohort study of 9000 Norwegian adolescents (the Young-HUNT). *PloS One*, 8(9 e74954):1–7.

Field, E., Robles, O., and Torero, M. (2009). Iodine Deficiency and Schooling Attainment in Tanzania. *American Economic Journal: Applied Economics*, 1(4):140–69.

Filmer, D. (2008). Disability, Poverty, and Schooling in Developing Countries: Results from 14 Household Surveys. *The World Bank Economic Review*, 22(1):141–163.

Fletcher, J. and Wolfe, B. (2008). Child mental health and human capital accumulation: The case of ADHD revisited. *Journal of Health Economics*, 27(3):794–800.

Fletcher, J. M. and Lehrer, S. F. (2009). The Effects of Adolescent Health on Educational Outcomes: Causal Evidence Using Genetic Lotteries between Siblings. *Forum for Health Economics & Policy*, 12(2):1–33.

Grossman, M. (2005). Education and Nonmarket Outcomes. In *Handbook of the Economics of Education*, volume 1 of *Eric A. Hanushek, Finis Welch*, pages 577–633. North Holland.

Hack, M., Flannery, D. J., Schluchter, M., Cartar, L., Borawski, E., and Klein, N. (2002). Outcomes in young adulthood for very-low-birth-weight infants. *The New England Journal of Medicine*, 346(3):149–157.

Jackson, M. I. (2009). Understanding Links Between Adolescent Health and Educational Attainment. *Demography*, 46(4):671–694.

Mani, S., Hoddinott, J., and Strauss, J. (2013). Determinants of Schooling: Empirical Evidence from Rural Ethiopia. *Journal of African Economies*, 22(5):693–731.

Mbouyap, Y.-M. and Ahanda, J. M. (2010). Situation Socio-Economique des Personnes vivant avec un Handicap. Technical Report Volume2 Tome 13, BUCREP.

Mitra, S., Posarac, A., and Vick, B. (2013). Disability and Poverty in Developing Countries: A Multidimensional Study. *World Development*, 41:1–18.

Mitra, S., Posarac, A., and Vick, B. C. (2011). Disability and Poverty in Developing Countries: A Snapshot from the World Health Survey. SSRN Scholarly Paper ID 1908128, Social Science Research Network, Rochester, NY.

OIT (2009). Le point sur Les personnes handicapées et le travail décent. Fiche d'information, OIT.

OMS (2011). Rapport mondial sur le handicap. Technical Report ISBN 978 92 4 068819 3, OMS.

ONU (1948). Déclaration universelle des droits de l'homme.

ONU (1989). Convention relative aux droits de l'enfant.

ONU (2006). Convention relative aux droits des personnes handicapées et Protocole facultatif.

ONU (2014). Objectifs du Millénaire pour le développement :Rapport 2014. Technical report, ONU.

Oreopoulos, P., Stabile, M., Walld, R., and Roos, L. L. (2008). Short-, Medium-, and Long-Term Consequences of Poor Infant Health An Analysis Using Siblings and Twins. *Journal of Human Resources*, 43(1):88–138.

Patrinos, H. A. and Psacharopoulos, G. (1997). Family Size, Schooling and Child Labor in Peru: An Empirical Analysis. *Journal of Population Economics*, 10(4):387–405.

Smith, J. P. (2009). The Impact of Childhood Health on Adult Labor Market Outcomes. *Review of Economics and Statistics*, 91(3):478–489.

Stabile, M. and Allin, S. (2012). The Economic Costs of Childhood Disability. *The Future of Children*, 22(1):65–96.

Unesco-BIE (2010). Données Mondiales de l'éducation , Cameroun. Technical Report IBE/2010/CP/WDE/CM, Unesco-BIE.

Unicef (2013). La Situation des Enfants dans le Monde 2013: Les Enfants Handicapés. Technical Report ISBN : 978-92-806-4657-3, Unicef.