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THE EFFECT OF DISABILITIES ON LITERACY SKILLS

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EXECUTIVE SUMMARY

This study uses the International Adult Literacy Survey (IALS) to provide an initial exploration of the literacy skills of individuals with disabilities. One of the motivations of the study is to see if disabilities have a negative impact on literacy skills, thus introducing an additional barrier to employability.

The study relies exclusively on the IALS data and no attempt is made to integrate the findings with existing literature on various disabilities and learning. Furthermore, the focus of the study is blurred by the fact that the definition of individuals with disabilities in IALS is very broad. Despite these limitations, the analysis provides some tentative insights into the literacy skills of individuals with disabilities. The study focuses on individuals age 16 to 55. The results show that:

- Individuals with disabilities have lower literacy skills than the rest of the population. Among ages 16 to 55, the incidence of document literacy below level 3 (a commonly used benchmark of adequacy of literacy skills) was 77% for those with learning disabilities, compared to 48% for those with physical disabilities, and 36% for those with no disabilities (Table X1).

**Table X1: Education, Work and Literacy Skills by Presence of Disabilities
Ages 16 to 55**

	Average years of education	Percent working or at school	document literacy score	Percent below level 3
Learning disabilities	9.7	67%	216	77%
Physical disabilities (*)	12.2	64%	282	48%
No disabilities	13.0	80%	291	36%
All	12.7	77%	287	40%

(*) *Excluding eye disabilities.*

- The level of education is the most significant determinant of literacy skills, but employment also has a positive correlation with literacy skills. Individuals with disabilities lose out on both grounds: they have fewer years of education (especially those with learning disabilities) and are less likely to be employed.

- The lower literacy skills among individuals with disabilities are in part attributable to their lower level of education and lower incidence of work. Furthermore, in the case of learning disabilities, the level of literacy skills achieved at any given level of education is lower (by the equivalent of 1.7 years) compared to the level of those with no disabilities.
- 42% of individuals with physical disabilities who failed to exceed level 2 in the document literacy scale, are in the upper half of the level 2 literacy range. Generally, a literacy gap of this magnitude can be eliminated with no more than one additional year of education. This finding is encouraging: it suggests that closing the literacy gap for many individuals with physical disabilities may not be a formidable task.

TABLE OF CONTENTS

EXECUTIVE SUMMARY.....	1
1. INTRODUCTION	4
2. ABOUT IALS	6
2.1 MEASURING LITERACY SKILLS.....	6
2.2 STATISTICAL ACCURACY OF ESTIMATES.....	6
3. PRESENCE OF DISABILITIES	8
4. LITERACY SKILLS BY PRESENCE OF DISABILITIES	10
5. THE EFFECT OF DISABILITIES ON LITERACY SKILLS.....	15
5.1 MAIN REGRESSION RESULTS	15
5.2 AN ALTERNATIVE REGRESSION MODEL.....	17
6. THE EFFECT OF DISABILITIES ON THE LEVEL OF EDUCATION.....	19
7. LITERACY EQUIVALENT LEVEL OF EDUCATION.....	21
7.1 LEARNING DISABILITIES VS. NO DISABILITIES	22
7.2 PHYSICAL DISABILITIES VS. NO DISABILITIES.....	22
8. THE IMPORTANCE OF WORK.....	24
9. CONCLUSION.....	26
APPENDICES	27
APPENDIX A: DOCUMENT, PROSE, AND QUANTITATIVE LITERACY.....	28
APPENDIX B: EFFECT OF DISABILITIES ON LITERACY -- ALTERNATIVE MODELS.....	29
APPENDIX C: ESTIMATION OF LITERACY-EQUIVALENT EDUCATION	32
APPENDIX D: EFFECT OF WORK ON LITERACY.....	34
REFERENCES.....	36

1. INTRODUCTION

This study assesses the literacy skills of individuals with disabilities. One of the motivations of the study is to see if disabilities have a negative impact on literacy skills, which may introduce an additional barrier to employability. The importance of literacy for employability is well established. There is growing empirical evidence of a strong link between literacy skills and the ability to maintain steady and rewarding employment.

The study relies exclusively on the International Adult Literacy Survey (IALS) data and is intended to be exploratory in nature. No attempt is made to integrate its findings with existing literature on various disabilities and learning.¹ Furthermore, the focus of the study is blurred by the fact that the definition of individuals with disabilities in IALS is very broad. Despite these limitations, the analysis provides some tentative insights into the literacy skills of individuals with disabilities.

An initial examination of the IALS data suggests that individuals with disabilities have lower literacy skills. To some extent, this result may reflect the fact that older individuals have a higher prevalence of disabilities and lower literacy skills. However, even when the population over age 55 is excluded from the analysis, individuals with disabilities still have lower literacy skills than the rest of the population.

Low literacy skills among individuals with disabilities can be the result of several factors or combination of factors. In particular:

- in the case of some disabilities, like learning disabilities, the disability itself may have a direct bearing on the literacy skills of an individual;
- in other cases, a disability can become a barrier to higher education and higher literacy skills, especially when regular schools are not prepared to accommodate their facilities and programs to individuals with disabilities or the necessary financial and human support mechanisms are not in place.
- it is also possible that in some cases that the quality of education received by individuals with disabilities may be lower; this situation could happen if, for example, teachers push disabled kids through school because they feel sorry for them, while at the same time not having the resources to level the education playing field; and

¹ There is a vast literature on disabilities and learning, including literature on learning disabilities, learning and certain developmental disabilities (e.g. childhood cerebral palsy), and deafness, deaf culture and literacy. For a comprehensive literature review see Roeher Institute (1990).

- finally, failure to integrate individuals with disabilities into the society and the workplace will have a further negative effect on their literacy skills; there is evidence from previous studies that literacy skills, like muscles, are maintained and strengthened through regular use at the workplace, as well as in daily activities.

The factors behind the lower literacy skills of individuals with disabilities are very complex and the IALS data can only provide a partial explanation. In fact, in some cases the direction of causality may be the reverse -- i.e. individuals with low literacy skills may be getting jobs with a higher than average risk of injuries leading to disability.

The objective of this study is to assess the literacy skills of individuals with disabilities and provide some insights into the factors affecting their literacy skills. Such insights could be helpful in prioritizing policies aimed at improving the literacy skills and employability of individuals with disabilities.

The IALS data are also used here to establish a literacy-education equivalence scale for individuals with disabilities. Such a scale can provide a more complete basis for assessing the employability of individuals with disability than the level of education alone. The hypothesis to be tested is that, at the same level of education, the literacy skills of individuals with disabilities are lower than the literacy skills of the rest of the population.

In what follows, Section 2 provides basic information about IALS. Section 3 looks at the prevalence of various types of disabilities among adults. Section 4 examines the literacy skills of individuals with disabilities. Section 5 uses regression analysis to isolate the effect of disabilities on literacy skills, from the effect of education and other factors. Section 6 looks at the effect of disabilities on the level of education. Section 7 develops literacy-equivalent years of education for individuals with disabilities. Section 8 focuses on the possible effect of employment on literacy skills. Finally, Section 9 draws together the main conclusions of the study.

2. ABOUT IALS

2.1 MEASURING LITERACY SKILLS

This section provides a basic description of IALS and of various indicators of literacy used in this report. It also discusses the question of statistical accuracy of the IALS estimates.

The results of the study are based on an analysis of the public use microdata of the Canadian portion of the 1994 International Adult Literacy Survey (IALS). IALS is the first international cooperative effort at measuring literacy skills.

IALS identifies three types of literacy: document, prose, and quantitative literacy (Box 1). For each type of literacy five literacy levels were defined: 1, 2, 3, and 4/5 (the two top literacy levels have been collapsed into one for statistical reasons). Although all three types of literacy are important, they tend to be highly correlated.² For the sake of simplifying the methodology, the study concentrates, for the most part, on document literacy, while selected results on the other two literacy domains are shown in [Appendix A](#).

Two literacy indicators are used in this study:

- (a) the average document literacy score: the literacy score of each IALS respondent in each of the three literacy domains can range from 0 to 500; the average score provides a basis for gauging the effect of various factors on literacy skills; and
- (b) the percentage of individuals who scored below level 3 in the document literacy test: although there is no official definition of minimum literacy level, analysts typically treat level 3 as the minimum literacy skills required by individuals to cope adequately with everyday literacy requirements at work and at home.

2.2 STATISTICAL ACCURACY OF ESTIMATES

All tables and regression estimates in this report are weighted by the weight factor provided by IALS. The weighting takes account of the fact that the IALS sample is not random but stratified by province. The objective of stratification is to improve provincial estimates.

² For example, the recently conducted Ontario Literacy Survey of the Hearing Impaired concentrated exclusively on document literacy, on the grounds that the three types of literacy are highly correlated.

Box 1

Definition of Literacy

Three types of literacy were tested by the IALS:

- (a) prose literacy refers to the knowledge and skills needed to understand and use information from texts including editorials, news stories, poems and fiction;
- (b) document literacy refers to the knowledge and skills required to locate and use information contained in various formats, including job applications, payroll forms, transportation schedules, maps, tables, and graphics; and
- (c) quantitative literacy refers to the knowledge and skills required to apply arithmetic operations, either alone or sequentially, to numbers embedded in printed materials, such as balancing a checkbook, figuring out a tip, completing an order form, or determining the amount of interest on a loan from an advertisement.

In each of the three literacy domains, a scale from 0 to 500 was constructed, upon which tasks of varying difficulty were placed. The range of scores corresponding to each level are as follows: level 1 (0-225); level 2 (226-275); level 3 (276-325); level 4 (326-375); and level 5 (376-500).

Typically, Statistics Canada surveys use cluster sampling -- i.e. residential blocks are drawn first and, then, all eligible residents within the selected blocks are surveyed. Compared to a non-cluster sample, this method of sampling is more economical, but subject to an additional element of sampling variation.

The combination of sample stratification and clustering contributes to additional sampling variability of estimates, referred to as design effect. We dealt with this challenge by being extra conservative with respect to the minimum sample size of each cell table.

With respect to regression analysis, the normal technique when using standard statistical packages (like SPSS or SAS) is to re-scale individual weights by dividing them by the average weight. This technique avoids the problem of fooling the statistical programs into thinking that the actual sample is equal to the weighted count. However, it does not address the problem of the design effect. Therefore, the standard errors of the regression coefficient need to be interpreted more cautiously than usual before the null hypothesis is rejected.

3. PRESENCE OF DISABILITIES

22% of adults age 16 to 55 have or had in the past some form of disability. However, the IALS definition of disabilities is very broad. As a result, IALS tends to understate the effect of more serious types of disabilities on literacy skills.

IALS asked respondents to report if they ever had any eye, hearing, speech, learning, or any other type of disability. The survey identified whether the disability was present while the individual was still at school or not, but no precise information was collected on what age the disability first appeared or the severity of the disability. From a previous study of literacy skills of hearing impaired in Ontario, it is known that these two factors are important. In particular, pre-lingual deaf and individuals who were completely unable to hear had lower literacy skills than other individuals with a hearing impairment.³

Table 1 shows that 28% of Canadians age 16 and over reported some disability. It also shows that the prevalence of disabilities remains fairly stable until age 55. But, with the exception of speech and learning disabilities, the prevalence of disabilities rises significantly at higher ages.

Because the older population also tends to have lower education and literacy skills, individuals age 56 and over were excluded from the analysis in order to make it easier to isolate the impact of disabilities on literacy skills. The prevalence of disabilities among individuals in ages 16 to 55 was 22% in 1994.

Table 1 also shows that 11% of Canadians had a disability when they were at school. The prevalence of disabilities when at school, particularly learning disabilities, tends to be higher among younger Canadians. This finding may be the result of a number of possible factors, such as a worsening trend, a growing rate of recognition of disabilities, or simply better recollection of a disability when at school among those who have left school more recently.

The IALS definition of disabilities is very broad. Individuals are identified as disabled if they ever had a disability, regardless if the problem is still present or not, and regardless if the disabilities restrict their daily activities or not.

As a result, the estimated impact of disabilities on literacy skills is likely to be diluted by the inclusion of individuals with past disabilities, short-term disabilities, and disabilities that do not restrict daily activities. In all three cases, these types of disabilities are not likely to have an impact on literacy skills.

³ Ontario Ministry of Education and Training (1998) *Literacy Profile of the Deaf and Hard of Hearing in Ontario*.

Table 1: Prevalence of Disabilities by Age								
	16-25	26-35	36-45	46-55	16-55	56-65	66+	All
<i>Did you ever have...</i>								
Eye/visual trouble not correctable by glasses	5%	5%	10%	4%	6%	12%	30%	10%
Hearing problems	3%	5%	6%	10%	6%	12%	26%	9%
A speech disability	3%	4%	3%	2%	3%	1%	2%	3%
A learning disability	6%	3%	2%	6%	4%	3%	4%	4%
Other disability or health problems lasting 6+mths	7%	8%	9%	14%	9%	20%	29%	13%
Ever had any disability	21%	19%	25%	23%	22%	35%	61%	28%
<i>Did you have this problem at school</i>								
Eye/visual trouble not correctable by glasses	3%	3%	5%	2%	3%	2%	2%	3%
Hearing problems	2%	2%	2%	2%	2%	1%	1%	2%
A speech disability	3%	3%	3%	2%	3%	0%	1%	2%
A learning disability	6%	3%	2%	4%	4%	3%	2%	3%
Other disability or health problems lasting 6+mths	5%	3%	3%	2%	3%	2%	2%	3%
Any disability when at school	17%	11%	13%	9%	13%	7%	6%	11%
<i>Population estimates:</i>								
Sample size	1,259	1,010	997	658	3,924	576	1,160	5,660
Population ('000s)	3,620	4,978	4,452	3,260	16,310	2,141	2,858	21,308

4. LITERACY SKILLS BY PRESENCE OF DISABILITIES

77% of individual with learning disabilities had low literacy skills, compared to 48% among those with physical disabilities and 36% among those with no disabilities.

Chart 1 shows the prevalence of various types of disabilities among individuals age 16 to 55. About 22% reported some type of disability, while 13% reported that a disability was present when they were at school.

Chart 2 shows the incidence of document literacy below level 3 (a commonly used benchmark of adequacy of literacy skills) among individuals with disabilities. According to Chart 2:

- individuals with disabilities had a higher incidence of low literacy (49%) than those with no disabilities (37%);
- not surprisingly, the incidence of low literacy skills was highest among those with a learning disability (77%);
- individuals with hearing problems or other non-specified disabilities had also a high incidence of low literacy skills (57%); and
- the incidence of low literacy skills was somewhat higher among those with a speech disability, while for those with eye disabilities it was about the same as for those with no disabilities.

The above results should be interpreted as broad indicators. Not only the sample is small, but as was mentioned earlier, the degree of severity of the disability and the duration of the disability are not known.

One interesting observation is that the presence of disabilities at school age does not appear to have a stronger negative impact on literacy skills than disabilities appearing at a later age. There are several likely explanations of this finding:

- in the case of learning disabilities there is a simple explanation: in virtually all cases, learning disabilities appear early in life and, therefore, it is not statistically possible to distinguish between learning disabilities that are present at school age, as opposed to those developing later in life;
- in the case of physical disabilities, the most likely explanation is that their effect on literacy is small (mostly because the definition used by IALS is so broad); as a result, it is difficult to distinguish between the impact of an earlier and a later onset of disabilities.

Chart 1: Prevalence of Disabilities -- Ages 16 to 55

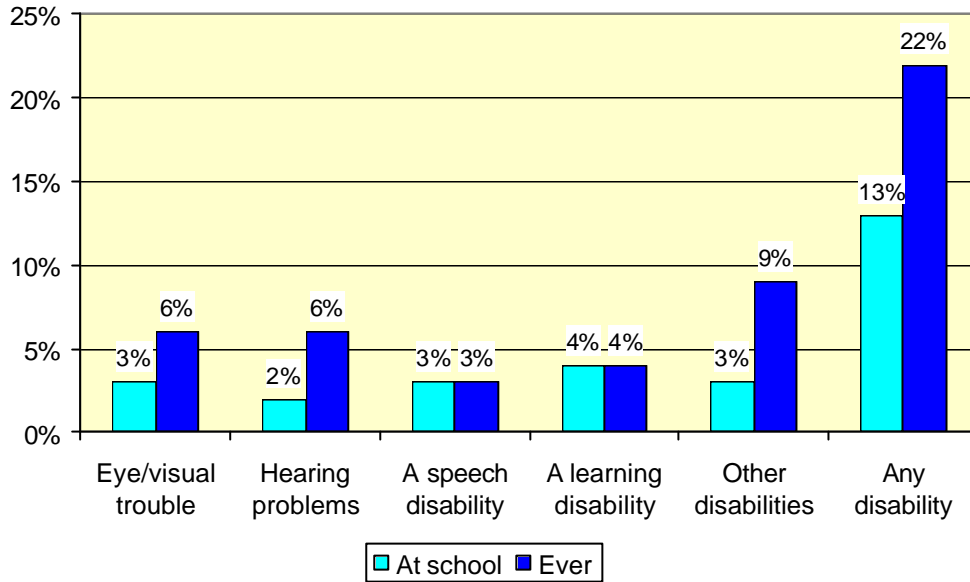
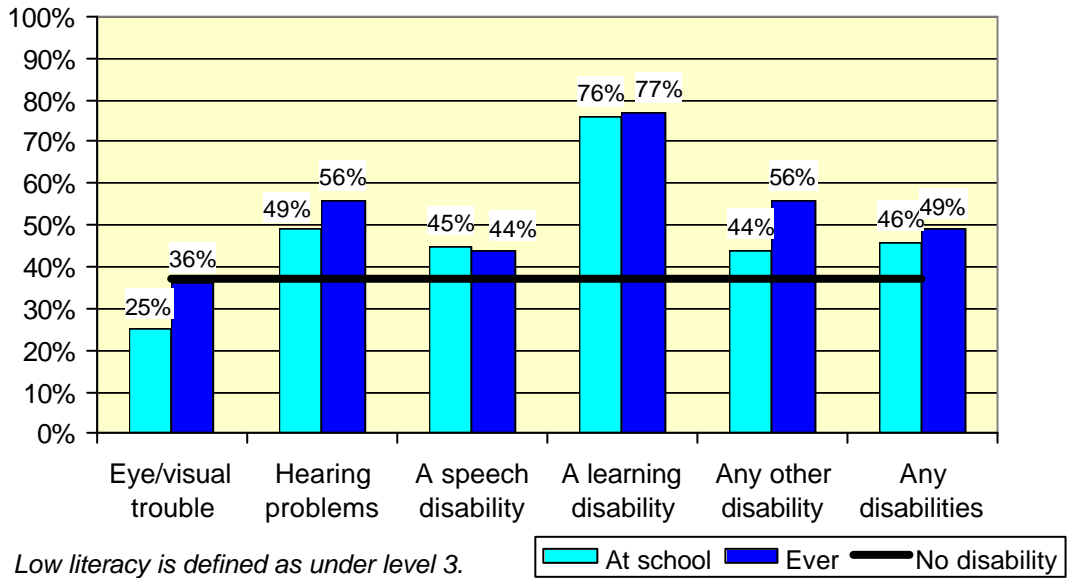


Chart 2: Incidence of Low Document Literacy By Presence of Disabilities -- Ages 16 to 55



There may be still one more possible explanation. There are some indications from the 1991 Health and Activity Limitations Survey that individuals (aged 15 to 35) with disabilities before school-leaving have higher education levels than individuals who developed a disability later in life. This suggests a certain resiliency and determination among young individuals with disabilities to acquire their formal education.

The rest of the analysis concentrates on disabilities regardless if the individuals had the problem when at school or not.

Also, the rest of the analysis excludes those with eye disabilities, since this type of disability does not appear to have a bearing on literacy skills. It should be pointed out, however, that the IALS data do not allow to separate the impact of more serious eye disabilities, like complete blindness.

The focus of the analysis is on two groups of individuals with disabilities:

- (a) individuals with learning disabilities; and
- (b) individuals with physical disabilities (excluding eye disabilities).

Table 2 shows that 2.9 million Canadians, or 18% of all Canadians age 16 to 55, reported learning or physical disabilities in the 1994 IALS. Both disabled groups present methodological challenges. These challenges will affect the type of analysis pursued in the rest of the study:

- (a) individuals with learning disabilities share a relatively more common type of disability, but the small sample size poses relatively more restrictions on the extent of the analysis; and
- (b) on the other hand, individuals with physical disabilities are a larger sample, but they include a wide range of types of disabilities.

Table 2: Individuals Age 16 to 55 by Broad Disability			
	Estimated population (000's)	Percent of population (%)	Sample size
Learning disabilities	627	4%	220
Physical disabilities (*)	2,228	14%	666
All disabilities (*)	2,855	18%	886
Total population	16,071	100%	3,859

(*) *Excluding eye disabilities.*

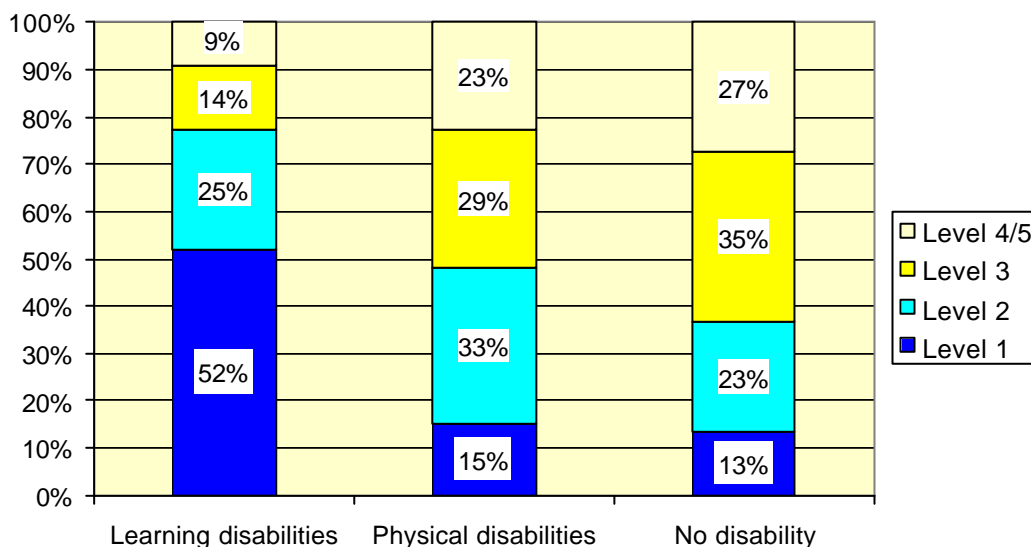
Finally, **Chart 3** shows the distribution of individuals with and without disabilities by level of document literacy.⁴ The chart shows a very different literacy pattern among individuals with learning disabilities and individuals with other types of disabilities. In particular:

- the main effect of learning disabilities is to place individuals in the lowest level of document literacy (52% scored at level 1);
- on the other hand, the main effect of physical disabilities is not so much to increase the number in the lowest level of document literacy, but to decrease the number who succeed in exceeding level two.

It should be added that while there is a correlation between disabilities and literacy skills, the correlation is far from perfect, for two main reasons:

- (a) different degrees of disabilities will tend to have a different impact on literacy skills; and
- (b) within similar types of disabilities, there will be differences in literacy skills because of differences in, for example, the level of education, employment, and literacy tasks at work and in every-day life.

**Chart 3: Distribution by Level of Document Literacy
By Type of Disability -- Ages 16 to 55**



Physical disabilities exclude eye disabilities.

⁴ Table A1 in Appendix A shows the distribution by all three literacy domains: document, prose and quantitative literacy.

5. THE EFFECT OF DISABILITIES ON LITERACY SKILLS

In this section we use regression analysis to isolate the effect of disabilities on literacy skills from the effect of education and other factors. Learning disabilities are shown to have a strong negative effect on literacy skills. On the other hand, the main effect of physical disabilities is a greater clustering of individuals just under level 3 (generally considered a benchmark of adequacy of literacy skills).

5.1 MAIN REGRESSION RESULTS

In the previous section it was shown that individuals with disabilities, particular learning disabilities, have lower literacy skills than the rest of the population. In this section we use regression analysis to isolate the effect of disabilities on literacy skills, from the possible effect of other factors, such as differences in the level of education or differences in various socio-demographic characteristics between individuals with and without disabilities.

The dependent variable of the main regression model presented in the main body of the study is the natural logarithm of the document literacy score.⁵ Independent variables include the years of education and the square power of the years of education. The reason for using a square term is to account for the fact that the relationship between education and the literacy score is not linear.

Other independent variables used in the regression model are: presence of learning and physical disabilities; age; gender; region; place of birth; and labour force status. All these variables are in dummy form -- i.e. they take the value 1 if the individual has the particular characteristic, and zero otherwise.

The regression results are summarized in Table 3. They show that:

- The presence of learning disabilities lowers the document literacy score by 14% (equivalent to the impact of reducing the level of education by about two years).
- The effect of physical disabilities, on the other hand, once differences in education and other factors were taken into account, was not found to be statistically significant.

⁵ Because the dependent variable is in natural logarithmic form, all regression coefficients express the impact of independent variables in percentage terms. For example, the coefficient of learning disabilities (DISAB1) is -0.143. This means, that the presence of learning disabilities is expected to reduce the document literacy score by 14.3%, keeping all other factors constant.

**Table 3: Regression Estimates of Effect of Disabilities & Personal Characteristics
On the Document Literacy Score -- Ages 16 to 55**

		<i>b-coeff</i>	<i>stand. err.</i>	<i>t-stat</i>
Dependent	Natural log of document literacy score			
Independent				
EDUCYRS	Years of education	0.168	0.005	36.364
EDUCYRS2	Square of years of education	-0.005	0.000	-26.998
AGE1	Age 16-25 (reference category)			
AGE2	Age 26-35	-0.008	0.009	-0.881
AGE3	Age 36-45	-0.017	0.010	-1.745
AGE4	Age 46-55	-0.006	0.010	-0.600
GENDER1	Male	-0.010	0.007	-1.420
GENDER2	Female (reference category)			
GDISAB1	Learning disabilities	-0.143	0.015	-9.562
GDISAB2	Physical disabilities	0.011	0.009	1.173
GDISAB3	No disabilities (reference category)			
REGION1	Atlantic	-0.025	0.013	-1.883
REGION2	Quebec	-0.003	0.009	-0.369
REGION3	Ontario	-0.007	0.008	-0.835
REGION4	West (reference category)			
LFS1	Employed/student	0.074	0.008	8.859
LFS2	Unemployed/not in the LF (reference)			
COUNTRY1	Canadian born	0.130	0.009	14.537
COUNTRY2	Foreign born (reference category)			
(Constant)	Constant term	4.148	0.033	125.023
Adjusted R Square	53%			
Standard Error	0.20			
Observations	3,863			

- Education, measured here in terms of years of schooling, is statistically the most significant determinant of literacy. Each additional year of education raises the literature document score by about 6%. The impact of education is greater at lower levels of education.⁶
- Two other factors that have a large and statistically significant positive effect on literacy are (a) being born in Canada; and (b) being employed or student.⁷ The literacy score in these two cases is higher by 13% and 7% respectively.

The above results likely understate the impact of disabilities on literacy skills. The reason is that, to some extent, the lower level of education and the lower employment rate of individuals with disabilities can be attributed to the presence of disabilities. As a result, part of the impact of education and employment on literacy can be traced back to the effects of disabilities.

5.2 AN ALTERNATIVE REGRESSION MODEL

The above results were tested by using an alternative regression model, similar to the previous one, except the dependent variable is not the natural log of the document literacy score, but the probability of scoring below document literacy level 3. The new model was estimated using both OLS and logit regression ([Appendix B](#)).

With respect to individuals with learning disabilities, both models confirmed that learning disabilities have a negative effect on literacy skills

With respect to individuals with physical disabilities the two models gave different results:

- The first model showed that physical disabilities do not have a statistically significant effect on the literacy score.
- However, the second model showed that physical disabilities are associated with a statistically higher incidence of low literacy.

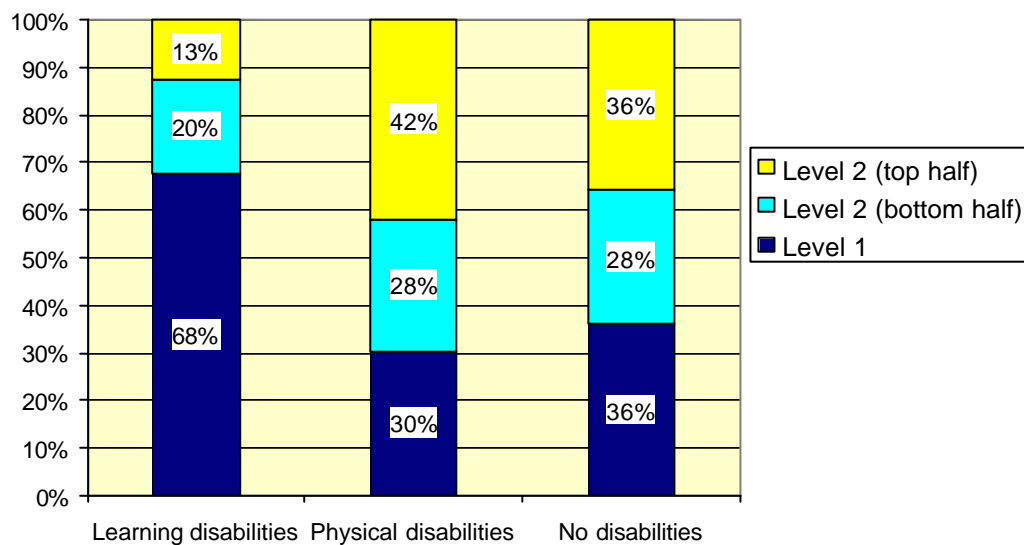
⁶ The relationship between years of education and document literacy score is non-linear. With each additional year of education, the literacy score increases by a smaller percentage.

⁷ Being employed or student had a similar positive effect on literacy. The two groups were joined together in the analysis, however, because of sample size limitations.

The above difference in findings between the two models can, in part at least, be explained by the clustering of individuals with physical disabilities just below level 3 in the document literacy scale ([Chart 4](#)). As a result, although there are no significant differences in average score, a relatively larger percentage with physical disabilities failed to reach level 3.

The above finding suggests that many individuals with physical disabilities, who do not meet literacy level 3, may be within ease reach of that threshold. In particular, 42% of individuals with physical disabilities who failed to exceed level 2 in the document literacy scale, are close to level 3 literacy threshold ([Chart 4](#)). This size of a literacy gap can be eliminated with about an additional year of education.

**Chart 4: Distribution by Document Literacy Level
Among those who failed to Exceed Level 2:
Individuals with Physical Disabilities -- Ages 16-55**



6. THE EFFECT OF DISABILITIES ON THE LEVEL OF EDUCATION

The results of the study to this point have understated the impact of disabilities on literacy skills because they treat education as an exogenous variable, while in fact it is shown here that disabilities are a barrier to education.

The above estimates of the effect of disabilities on literacy do not take into account the fact that the level of education is not a pure exogenous variable but it may be influenced by the presence of disabilities. Table 4 shows the results of regression analysis of the years of education as a function of the presence of disabilities and other exogenous variables. The results show that:

- learning disabilities reduce the years of schooling by about 2.7 years; and
- physical disabilities reduce the years of schooling by half a year.

These estimates of the effect of disabilities on the level of education are based on the regression results and take into account the effect of other factors, besides disabilities. The actual difference in average years of education between those with learning disabilities or physical disabilities, and the rest of the population is somewhat higher (3.3 years and 0.8 years respectively).

**Table 4: Regression Estimates of Effect of Disabilities and Personal Characteristics
On the Years of Education -- Ages 16 to 55**

		<i>b-coeff</i>	<i>stand. err.</i>	<i>t-stat</i>
Dependent	Years of education			
Independent				
AGE1	Age 16-25 (reference category)			
AGE2	Age 26-35	0.407	0.144	2.821
AGE3	Age 36-45	0.881	0.147	5.980
AGE4	Age 46-55	-0.632	0.159	-3.985
GENDER1	Male	-0.190	0.105	-1.813
GENDER2	Female (reference category)			
GDISAB1	Learning disabilities	-2.730	0.224	-12.200
GDISAB2	Physical disabilities	-0.551	0.140	-3.937
GDISAB3	No disabilities (reference category)			
REGION1	Atlantic	-0.487	0.203	-2.402
REGION2	Quebec	-0.905	0.142	-6.370
REGION3	Ontario	0.786	0.126	6.220
REGION4	West (reference category)			
LFS1	Employed/student	1.692	0.128	13.263
LFS2	Unemployed/not in the LF (reference)			
COUNTRY1	Canadian born	-0.433	0.139	-3.122
COUNTRY2	Foreign born (reference category)			
(Constant)	Constant term	11.794	0.213	55.437
Adjusted R Square	16%			
Standard Error	3.16			
Observations	3,863			

7. LITERACY EQUIVALENT LEVEL OF EDUCATION

On average, individuals with learning disabilities are at about the same literacy level as individuals with no disabilities and 1.7 years of education less. Such a gap is not present among those with physical disabilities and no disabilities. However, physical disabilities exercise a negative effect on literacy skills through their negative effect on the years of education.

This section examines the level of literacy skills (measured by the document literacy score) at different levels of education (measured by the years of education) among individuals with and without disabilities. The objective is to see whether, at similar levels of education, individuals with disabilities can reach the same level of literacy skills as those with no disabilities.

The relationship between years of education and document literacy score is estimated through regression equations, estimated separately for each group by type of disability. The regression equations use only years of education as an independent variable (plus a square term to account for the fact that each additional year of education adds a smaller increase to the document literacy score).

Besides education, no other independent variables are used in the regression models here. This choice is deliberate. The objective of the analysis here is not to estimate the effect of education on literacy, but rather to estimate the expected literacy score at different levels of education, regardless of which other differences may exist among individuals at different levels of education. The regression equations are shown in [Appendix C](#).

7.1 LEARNING DISABILITIES VS. NO DISABILITIES

Chart 5a shows that individuals with learning disabilities have lower literacy skills than individuals with no disabilities for two reasons:

- (a) they have fewer years of schooling (by 3.3 years); and
- (b) their literacy skills at any level of schooling is lower than that for individuals with no disabilities.

Each of the above two factors explain about half of the difference in the document literacy score between those with learning disabilities and those with no disabilities.

On average, individuals with learning disabilities are at about the same literacy level as individuals with no disabilities and 1.7 years of education less. The 1.7 year difference provides a basis for estimating a literacy-equivalent scale of education for individuals with learning disabilities.⁸

A number of factors can explain the above estimated literacy-equivalence of education of individuals with learning disabilities. For example, individuals with learning disabilities:

- (a) may take longer to reach a certain school grade;
- (b) may pass grades at normal pace, but perform nearer the bottom of the class;
or
- (c) may lose literacy skills over time by not being as successful in finding employment as individuals with no disabilities, particularly employment involving literacy tasks.

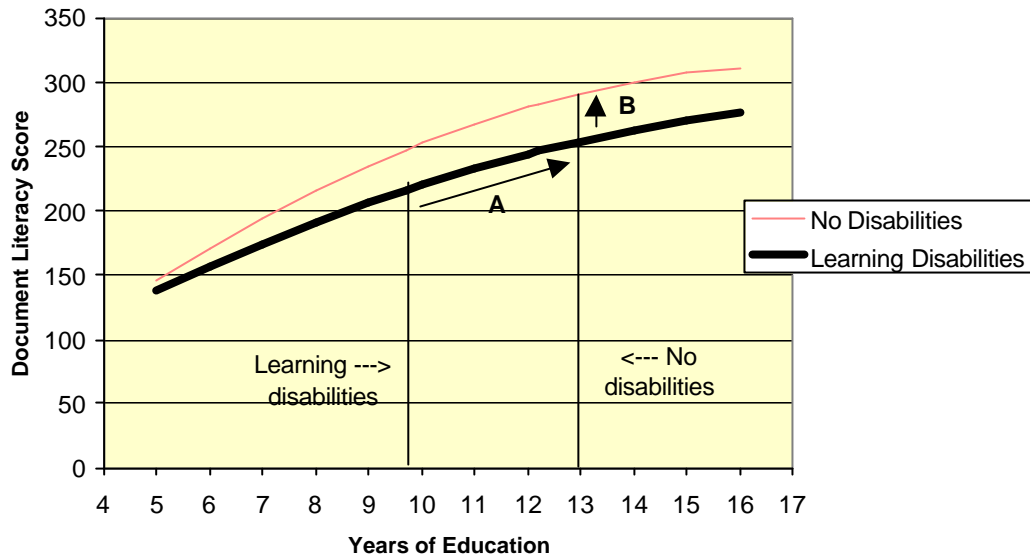
7.2 PHYSICAL DISABILITIES VS. NO DISABILITIES

As for individuals with physical disabilities (i.e. other than learning disabilities, and excluding eye disabilities), their level of literacy at any level of years of education is about the same as that of individuals with no disabilities (Chart 5b). Therefore, disabilities, other than learning disabilities, do not appear to reduce the literacy benefits of education.

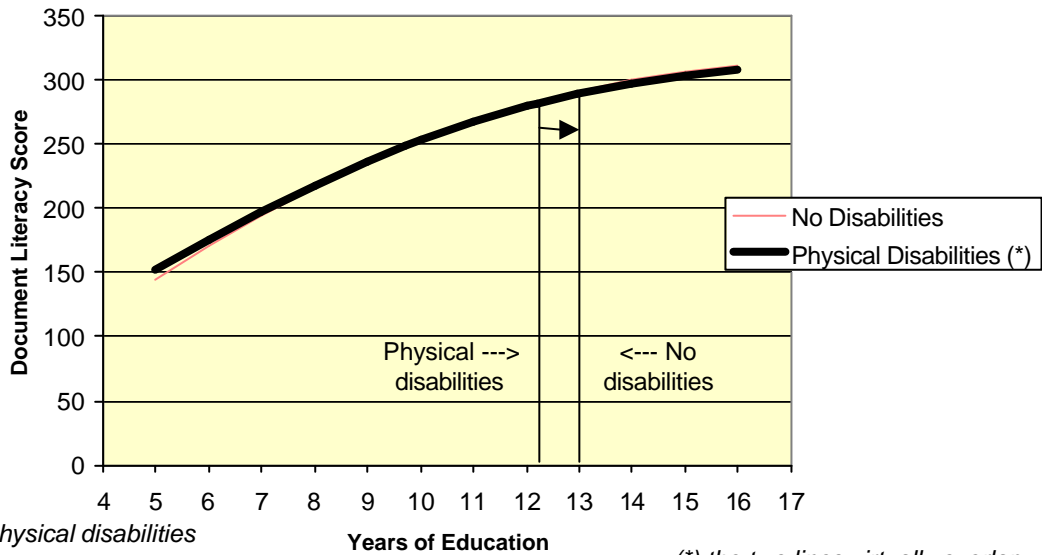
However, physical disabilities appear to exercise a negative effect on literacy skills through their negative effect on the years of education. In particular, physical disabilities appear to explain a big portion of the 0.8 year gap in education between those with physical disabilities and those with no disabilities.

⁸ Those with no disabilities have on average 13 years of education and a document literacy score of 291; those with learning disabilities have on average 9.7 years of education and a document literacy score of 216. The latter score corresponds to that of individuals with no learning disabilities and 7.9 years of education.

**Chart 5a: Literacy Score by Level of Education
Individual with Learning Disabilities vs. No Disabilities**



**Chart 5b: Literacy Score by Level of Education
Individual with Physical Disabilities vs. No Disabilities**



Physical disabilities
exclude eye disabilities.

(*) the two lines virtually overlap

8. THE IMPORTANCE OF WORK

Individuals with disabilities are less likely to be employed than the rest of the population, a factor that contributes to lower literacy skills.

The regression results reported in Table 4 above, showed that both education and work have a positive correlation with literacy skills. Individuals with disabilities tend to lose on both grounds: not only they have less education, but they also are less likely to be employed or be at school ([Table 5](#)).

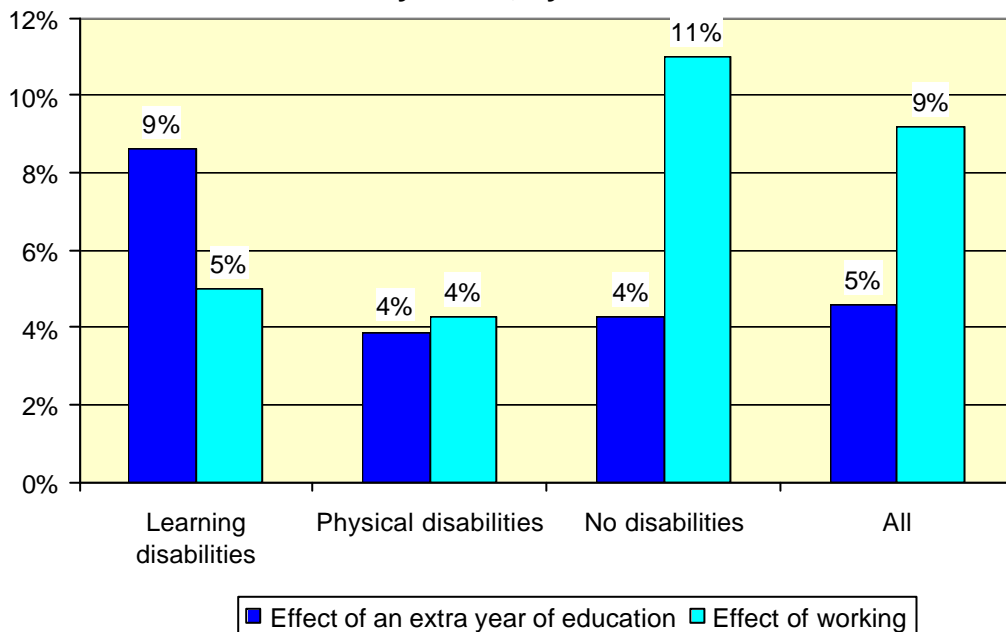
Separate regressions were estimated for those with learning disabilities, those with physical disabilities (excluding eye disabilities) and those with no disabilities. The results with respect to education and work are summarized in [Chart 6](#). The underlying regression results are shown in [Appendix D](#). Chart 6 shows that:

- *Among those with learning disabilities*: each additional year of education increases literacy skills by about 9%, while work (or going to school) is associated with a 5% increase in literacy skills. This finding suggests that work may have the same beneficial effect on literacy skills as an extra half year of education. This conclusion is very crude, however, since the direction of causality between work and literacy is not clear. It is quite possible that the correlation is due to the fact that those with higher literacy skills are more likely to be employed, rather than the other way around.
- *Among those with physical disabilities*: each additional year of education increases literacy skills by about 4%, while work (or going to school) is also associated with a similar increase. A very crude suggestion is that working or attending school has a similar beneficial effect on literacy skills as an extra year of education. Again the direction of causality is not certain.

Table 5: Education, Work and Literacy Skills by Presence of Disabilities				
	Average years of education	Percent working or at school	document literacy score	Percent below level 3
Learning disabilities	9.7	67%	216	77%
Physical disabilities (*)	12.2	64%	282	48%
No disabilities	13.0	80%	291	36%
All	12.7	77%	287	40%

(*) Excluding eye disabilities.

Chart 6: Effect of Education and Work on the Document Literacy Score, by Presence of Disabilities



9. CONCLUSION

In conclusion, individuals with disabilities have lower literacy skills than the rest of the population, especially those with learning disabilities. The lower literacy skills among those with disabilities can in part be attributed to their lower level of education and lower incidence of work. Furthermore, in the case of learning disabilities, the level of literacy skills achieved at any given level of education is lower (by the equivalent of 1.7 years) compared to those with no disabilities. The fact that many individuals with physical disabilities are clustered just below the level 3 threshold in the document literacy scale is encouraging: it suggests that closing that literacy gap for many individuals with physical disabilities may not be a formidable task.

APPENDICES

APPENDIX A: DOCUMENT, PROSE, AND QUANTITATIVE LITERACY

Table A1: Distribution of Individuals by Literacy Scale and Presence of Disabilities				
	Learning disability	Other disability (*)	No disability (*)	All
Document Literacy				
Level 1	52%	15%	13%	15%
Level 2	25%	33%	23%	25%
Level 3	14%	29%	35%	33%
Level 4/5	9%	23%	29%	27%
Prose Literacy				
Level 1	56%	14%	12%	14%
Level 2	17%	30%	25%	26%
Level 3	21%	32%	37%	36%
Level 4/5	6%	24%	26%	25%
Quantitative Literacy				
Level 1	57%	15%	12%	14%
Level 2	23%	32%	26%	27%
Level 3	14%	37%	36%	35%
Level 4/5	7%	16%	26%	24%
All	100%	100%	100%	100%

() Excluding eye disabilities*

APPENDIX B: EFFECT OF DISABILITIES ON LITERACY -- ALTERNATIVE MODELS

The following regression models estimate the effect of disabilities, years of education, and other factors on the average literacy score and the probability of scoring below level 3 on the document literacy scale. For an explanation of the variable names see Table 4 in the main body of the study.

**TABLE B1: OLS REGRESSION ESTIMATES OF
 EFFECT OF DISABILITIES & PERSONAL CHARACTERISTICS ON THE
 DOCUMENT LITERACY SCORE
 (AGES 16 TO 55)**

Dependent Variable..	LNDOC	NATURAL LOG OF DOCUMENT LITERACY SCORE			
Adjusted R Square	.53315				
Standard Error	.20272				
Observations:	3863				
Variable	B	SE B	Beta	T	Sig T
EDUCYRS	.168149	.004624	1.958757	36.364	.0000
EDUCYRS2	-.004629	1.7147E-04	-1.430742	-26.998	.0000
AGE2	-.008183	.009285	-.012658	-.881	.3782
AGE3	-.016709	.009576	-.025037	-1.745	.0811
AGE4	-.006188	.010322	-.008402	-.600	.5489
GENDER1	-.009553	.006727	-.016101	-1.420	.1557
GDISAB1	-.143191	.014975	-.112557	-9.562	.0000
GDISAB2	.010552	.008993	.013424	1.173	.2407
REGION1	-.024500	.013013	-.022865	-1.883	.0598
REGION2	-.003380	.009153	-.004913	-.369	.7120
REGION3	-.006789	.008133	-.011117	-.835	.4039
LFS1	.074266	.008384	.106299	8.859	.0000
COUNTRY1	.130330	.008966	.168784	14.537	.0000
(Constant)	4.147709	.033175		125.023	.0000

**TABLE B2: OLS REGRESSION ESTIMATES OF
EFFECT OF DISABILITIES & PERSONAL CHARACTERISTICS ON THE
INCIDENCE OF DOCUMENT LITERACY BELOW LEVEL 3
(AGES 16 TO 55)**

Dependent Variable..	LODOC	DOCUMENT LITERACY BELOW LEVEL 3			
Adjusted R Square	.28128				
Standard Error	.41652				
Observations:	3863				
Variable	B	SE B	Beta	T	Sig T
EDUCYRS	-.112091	.009501	-.788502	-11.798	.0000
EDUCYRS2	.001938	3.5231E-04	.361718	5.501	.0000
AGE2	.065669	.019078	.061346	3.442	.0006
AGE3	.047208	.019675	.042715	2.399	.0165
AGE4	.115395	.021207	.094616	5.441	.0000
GENDER1	.001895	.013822	.001929	.137	.8909
GDISAB1	.174477	.030770	.082821	5.670	.0000
GDISAB2	.065043	.018477	.049971	3.520	.0004
REGION1	.066828	.026737	.037663	2.499	.0125
REGION2	.085815	.018807	.075332	4.563	.0000
REGION3	.035586	.016710	.035189	2.130	.0333
LFS1	-.100772	.017225	-.087101	-5.850	.0000
COUNTRY1	-.121518	.018422	-.095033	-6.596	.0000
(Constant)	1.549657	.068165		22.734	.0000

**TABLE B3: LOGIT REGRESSION ESTIMATES OF
EFFECT OF DISABILITIES & PERSONAL CHARACTERISTICS ON THE
INCIDENCE OF DOCUMENT LITERACY BELOW LEVEL 3
(AGES 16 TO 55)**

Dependent Variable..	LODOC	DOCUMENT LITERACY BELOW LEVEL 3					
Initial Log Likelihood Estimate:		5222.259					
Improvement		1343.515					
Percentage Improvement:		25.7%					
Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
EDUCYRS	-1.0496	.0963	118.9024	1	.0000	-.1496	.3501
EDUCYRS2	.0246	.0034	51.2270	1	.0000	.0971	1.0249
AGE			30.1942	3	.0000	.0681	
AGE(1)	.4201	.1110	14.3219	1	.0002	.0486	1.5221
AGE(2)	.2510	.1163	4.6602	1	.0309	.0226	1.2853
AGE(3)	.6469	.1237	27.3397	1	.0000	.0697	1.9096
GENDER(1)	.0058	.0815	.0050	1	.9434	.0000	1.0058
GDISAB			53.6705	2	.0000	.0975	
GDISAB(1)	1.4448	.2033	50.5015	1	.0000	.0964	4.2408
GDISAB(2)	.2761	.1087	6.4466	1	.0111	.0292	1.3180
REGION			19.0090	3	.0003	.0499	
REGION(1)	.3521	.1557	5.1133	1	.0237	.0244	1.4220
REGION(2)	.4705	.1104	18.1593	1	.0000	.0556	1.6008
REGION(3)	.1998	.0980	4.1586	1	.0414	.0203	1.2211
LFS(1)	-.5028	.0989	25.8508	1	.0000	-.0676	.6048
COUNTRY(1)	-.7601	.1106	47.2110	1	.0000	-.0930	.4676
Constant	9.0279	.6805	175.9856	1	.0000		

APPENDIX C: ESTIMATION OF LITERACY-EQUIVALENT EDUCATION

The literacy-equivalent levels of education reported in the main body of the study are based on the results of three separate regressions, one for each of the following groups of individuals: with learning disabilities; with physical disabilities; and with no disabilities.

The dependent variable is the document literacy score. The only independent variable used was years of education (plus a square term to account for the non-linear relation between years of education and literacy score). The reason other control variables were not used is because, in this case, we are not interested in the effect of education on literacy, but rather the expected literacy score at different levels of education. In other words, we do not want to remove the influence of other factors that may be correlated with education, such as the presence of employment.

C1. INDIVIDUALS WITH LEARNING DISABILITIES

Dependent Variable..	DOC	Document Literacy Score			
Adjusted R Square	.62720				
Standard Error	51.78864				
Observations	222				
Variable	B	SE B	Beta	T	Sig T
EDUCYRS	25.835181	3.186683	1.277431	8.107	.0000
EDUCYRS2	-.532043	.163661	-.512231	-3.251	.0013
(Constant)	24.732927	14.519693		1.703	.0899

C2. INDIVIDUALS WITH PHYSICAL DISABILITIES

Dependent Variable.. DOC Document Literacy Score

Adjusted R Square .51658
Standard Error 39.24325
Observations 664

Variable	B	SE B	Beta	T	Sig T
EDUCYRS	35.309614	2.502615	2.085790	14.109	.0000
EDUCYRS2	-.932822	.095768	-1.439953	-9.740	.0000
(Constant)	.021209	15.799001		.001	.9989

C3. INDIVIDUALS WITH NO DISABILITIES

Dependent Variable.. DOC Document Literacy Score

Adjusted R Square .37789
Standard Error 49.76731
Observations 2975

Variable	B	SE B	Beta	T	Sig T
EDUCYRS	37.472192	1.391282	1.962322	26.934	.0000
EDUCYRS2	-.998135	.050249	-1.447221	-19.864	.0000
(Constant)	-15.905841	9.438511		-1.685	.0921

APPENDIX D: EFFECT OF WORK ON LITERACY

The following three regressions are similar to that shown in Table 4b, except a separate regression is estimated for each group depending on the presence and the type of disabilities.

D1. INDIVIDUALS WITH LEARNING DISABILITIES

Dependent Variable.. LNDOC Natural Log of the Document Literacy Score

Adjusted R Square .64153
Standard Error .28869
Observations 222

Variable	B	SE B	Beta	T	Sig T
EDUCYRS	.086283	.005623	.750495	15.345	.0000
AGE2	-.171233	.061022	-.138603	-2.806	.0055
AGE3	-.097610	.064270	-.075985	-1.519	.1303
AGE4	-.018157	.057751	-.017083	-.314	.7535
GENDER1	-.081675	.042922	-.083475	-1.903	.0584
REGION1	-.127388	.075649	-.084485	-1.684	.0937
REGION2	-.005632	.060633	-.005151	-.093	.9261
REGION3	-.043844	.055641	-.044029	-.788	.4316
LFS1	.050058	.051260	.049053	.977	.3299
COUNTRY1	-.292768	.111094	-.109787	-2.635	.0090
(Constant)	4.823225	.132475		36.409	.0000

D2. INDIVIDUALS WITH PHYSICAL DISABILITIES

 Dependent Variable.. LNDOC Natural Log of the Document Literacy Score

Adjusted R Square .46932
 Standard Error .17050
 Observations 664

Variable	B	SE B	Beta	T	Sig T
EDUCYRS	.038912	.002249	.554303	17.300	.0000
AGE2	-.042206	.020601	-.082313	-2.049	.0409
AGE3	-.009592	.020740	-.018667	-.462	.6439
AGE4	-.113997	.022671	-.209400	-5.028	.0000
GENDER1	-.038371	.014000	-.082030	-2.741	.0063
REGION1	-.026729	.024898	-.032978	-1.074	.2834
REGION2	-.057803	.021127	-.086597	-2.736	.0064
REGION3	-.030272	.015702	-.063778	-1.928	.0543
LFS1	.042936	.015631	.088166	2.747	.0062
COUNTRY1	.045472	.024479	.055516	1.858	.0637
(Constant)	5.158349	.040719		126.681	.0000

D3. INDIVIDUALS WITH NO DISABILITIES

 Dependent Variable.. LNDOC Natural Log of the Document Literacy Score

Adjusted R Square .37813
 Standard Error .21646
 Observations 2975

Variable	B	SE B	Beta	T	Sig T
EDUCYRS	.042930	.001268	.516775	33.864	.0000
AGE2	-.004264	.011118	-.007196	-.384	.7013
AGE3	-.045910	.011432	-.074593	-4.016	.0001
AGE4	-.017488	.012519	-.024920	-1.397	.1625
GENDER1	-.014562	.008141	-.026523	-1.789	.0738
REGION1	-.022505	.016229	-.022184	-1.387	.1656
REGION2	-.008030	.010974	-.012973	-.732	.4644
REGION3	-.004799	.010039	-.008465	-.478	.6326
LFS1	.112878	.010558	.164758	10.691	.0000
COUNTRY1	.179578	.010128	.267051	17.731	.0000
(Constant)	4.884530	.021883		223.215	.0000

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