THE COST OF DISABILITY IN A LOW INCOME COUNTRY

Michael Palmer[*1], Jenny Williams[2], Barbara McPake[1]

[1] Nossal Institute for Global Health, The University of Melbourne, Melbourne, Australia

[2] Department of Economics, The University of Melbourne, Melbourne, Australia

Version: 14th October, 2016

Abstract

We estimate the financial impact of disability on households in Cambodia. Using the Standard of Living approach, we find that having disabled members increases the income required for a household to achieve the same standard of living as an otherwise similar household by 17%. We show that accounting for the additional costs of disability increases poverty at both the extensive and intensive margin; the poverty rate amongst households with disabled members increases from 18% to 34%, and poor households with disabled members fall 7% below the poverty line on average, compared to 3% when the cost of disability is ignored. Finally, we compare transfer payments received from family members, and government and non-government agencies to the cost of disability. We find that the median level of payments across all sources falls well short of the disability costs faced by households.

Key words: disability, low income country, standard of living approach

JEL codes: O12, I15, I32

---

[*] Level 4, 161 Barry Street, Carlton, Victoria, Australia, 3010. Ph. +613 9035 8596. Email: michael.palmer@unimelb.edu.au

1. Introduction

Globally, there are around 1 billion persons with disabilities and the World Health Organisation estimates that one in four households have a disabled member (World Health Organization and World Bank, 2011). This implies that 2 billion people live with disability, either directly or indirectly, on a daily basis. It is well documented that living with a disability is associated with lower likelihood of employment and higher likelihood of little or no formal education relative to persons without disability. As a consequence, persons with disabilities and the households in which they live are over-represented amongst the poor. In order to address the impact of these types of disadvantage, government policy typically combines transfer payments with laws to equalise opportunities in access to education and employment (Acemoglu and Angrist, 2001, Bound and Burkhauser, 1999, World Health Organization and World Bank, 2011). Less well understood is the disadvantage that persons with disabilities and their households face due to a reduced ability to convert income into wellbeing (Sen, 2004, 1999, 1992). This arises because disability necessitates expenditure on items specifically related to disability, such as assistive devices or medication, as well as additional expenditure on items not specifically related to disability, such as transport. Sen (2004) argues that these additional costs have the effect of creating disadvantage because higher income is required so that households with disabled members can achieve the same level of wellbeing as an otherwise similar household. In this research we seek to quantify the disadvantage generated by the additional cost of disability in the context of a low income country.

Quantifying the additional costs faced by households with disabled members is of direct policy relevance. Reliable estimates of the cost of disability are critical for determining the level of poverty and inequality in a population. This issue is of salience in the context of lower income countries where the majority of the world's population with disabilities reside (World Health Organization and World Bank, 2011). Moreover, the millennium development goals, and the sustainable development goals that have succeeded them, specifically target poverty reduction. In order to assess the extent to which targets for poverty reduction are being met, accurate measures of poverty that take into account the extra costs of disability are required.

Knowledge of the costs of disability is important not only for accurately measuring poverty but also to assist policy makers in designing programs that meet their obligations under the UN Convention on the Rights of Persons with Disabilities (CRPD). Ratified in 2008, the CRPD requires signatories to protect the right of persons with disabilities to have an adequate standard of living for themselves and their families, including adequate food, clothing and housing, as well as to safeguard access by families living in situations of poverty to social protection assistance with disability related expenses (Article 28, United Nations, 2008, United Nations General Assembly, 2015).

To meet its responsibilities under the CRPD, the Cambodia government introduced its Law on the Protection and the Promotion of the Rights of Persons with Disabilities in 2009

1

(Kingdom of Cambodia, 2009). To strengthen the implementation of the national disability law and associated sub-decrees, a national disability strategic plan was developed for the period 2014-2018. A key goal of the national plan is to ensure that the poor are provided with assistance from the State with disability-related expenses. An important contribution of this paper is that, by providing the first estimates of the cost of disability borne by households in Cambodia, we provide information critical to determining the level of transfer payments required to ensure an adequate standard of living for the disabled and the households in which they reside.

This research takes a standard of living approach to measuring the additional cost incurred by households with a disabled member. This approach is based on the concept of compensating variation, and measures the additional income required for a household with a disabled member to reach the same standard of living as an otherwise similar household without a disabled member.[2] The method overcomes practical data limitations related to the collection of individual disability related expenditures as well as limitations associated with direct estimation methods (Zaidi and Burchardt, 2005, Tibble, 2005, Cullinan and Lyons, 2014). The standard of living approach to estimating the cost of disability is, however, demanding in terms of the information it requires. Information on disability, living standards, and income is rarely collected within a single survey. The Cambodian Socio-Economic Survey (CSES) is one exception.

We use information collected in the CSES over the period 2009-2014 to estimate the cost of disability in Cambodia. The estimated cost of disability is then used to calculate measures of poverty (specifically, the poverty head count and the poverty gap) adjusted for the cost of disability. We also compare the estimated cost of disability to the level of support received from government, non-government and family sources. Few papers are able to compare the cost of disability to the level of support received (Mitra et al., 2016). Those that attempt to do so are limited to considering support received from government transfers only (Loyalka et al., 2014, Zaidi and Burchardt, 2005, Morciano et al., 2014). This is because detailed information on all sources of income is not commonly collected in household survey data. As the CSES collects information on government, non-government and remittance transfers to households, we are able to compare disability costs with levels of a range of formal and informal supports. This is a notable contribution, especially in the context of Cambodia since the support of persons with disabilities is a shared responsibility under the Cambodian national disability law, which spells out responsibilities for the state, family, and community in the protection of livelihoods (Kingdom of Cambodia, 2009).

The rest of this paper is organised as follows. Section 2 provides background on disability in the context of Cambodia. Section 3 provides the conceptual framework we use to measure the cost of disability. Section 4 describes the data used to implement our framework and provides

---

[2] This approach has been used to value the costs of non-market goods e.g. life events such as unemployment and divorce, health, air pollution, informal care-giving, violent crime (Blanchflower and Oswald, 2004, Groot and van-den-Brink, 2006, Levinson, 2012, van-den-Berg and Ferrer-i-Carbonell, 2007, Johnston et al., 2015).

descriptive information on disability and household living standards in Cambodia. Section 5 reports the baseline results, and a sensitivity analysis. Section 6 translates the estimated costs of disability into outcomes of interest to policy makers, in terms of poverty head counts and poverty gaps. Section 6 also compares the cost of disability with the transfer payments received by households with disabled members from government, non-government and family sources. Section 7 concludes.

2. Disability in the context of Cambodia

For much of the last 50 years, Cambodia's history has been one of civil conflict and instability. The most infamous period is 1975-1979, when the Khmer Rouge reigned. During this time, an estimated two million people died of starvation, forced labour, untreated disease, torture and execution (Dy, 2007).[3] However, political instability and violence continued long after the fall of the Khmer Rouge, and well into the 1990s. While much of the fighting after 1980 was confined to provinces that bordered with Thailand, the ongoing civil conflict impacted on the nation's ability to rebuild the basic economic and public infrastructure that was destroyed during the time of the Khmer Rouge.[4] Today, Cambodia remains one of the poorest counties in South East Asia with a GDP per capita of approximately 1100 USD (National Institute of Statistics et al., 2015). According to government estimates, poverty has decreased since 1992 from around 47% to approximately 20% of the population. Yet large disparities in living standards exist between urban and rural areas, with 80% of the population living in rural areas. Child malnutrition remains high with an estimated one third of children in Cambodia stunted. The vast majority of the population does not have health insurance (84% of women and 87% of men are uninsured), and the first health care provider of choice for the majority of Cambodians is private pharmacies.

Over the short to medium term, the conflict experienced by Cambodia is likely to have increased the level of disability in the population directly through the population's contact with violence, and indirectly through the effects of malnutrition, poor sanitation and a lack of health services (Ugalde et al., 1999). In the long term, however, the impact of Cambodia's history of civil and regional conflict has an ambiguous impact on disability. This is because the death of an estimated one-quarter of the population and low fertility in the 1970s has led to changes in the demographic profile of the country that impact on the prevalence of disability (de-Walque, 2006, 2005).[5] Almost half (43%) of Cambodia's population is below the age of 20 years and just 6% are 65 years of age or older. To the extent that disability is correlated with age, the high levels of mortality that occurred during the period of conflict puts downward pressure on current population disability prevalence.

---

[3] Mortality estimates during the Khmer Rouge period vary widely (Dy, 2007, Heuveline, 1998). Perhaps the most carefully constructed estimate was performed by Heuveline (1998) using 1992 electoral roles where he estimates a median of 2.5 million excess deaths over the period 1970-79 of which 1.4 million were violent deaths with 1.1 million violent deaths occurring during the Khmer Rouge period.

[4] A notable legacy of Cambodia's prolonged civil conflict is that it has one of the highest concentration of land mines in the world (Merrouche, 2011).

[5] Based on projections from the 1962 census, the population size in 1972 is estimated as approximately 8 million (Heuveline, 1998).

Recent estimates of the national prevalence of disability in Cambodia range from around 1.5% to 4% of the population (National Institute of Statistics and Ministry of Planning, 2009, National Institute of Statistics et al., 2015, National Institute of Statistics and Ministry of Planning, 2015). Over and above the demographic effects discussed above, one potential explanation for low estimates of the prevalence of disability lies in the way disability is measured. For example, the 2008 Census of Cambodia used a medical impairment definition of disability, which views disability in terms of disease or impairment, an approach argued to under-report disability (Palmer and Harley, 2012). This definition produced an estimated prevalence of disability 1.4% (National Institute of Statistics and Ministry of Planning, 2009). Subsequent national surveys have aimed to adhere to international standards in place since the early 2000's by measuring disability on the basis of severity of functional difficulty in performing basic activities, such as walking (Palmer and Harley, 2012). Using this approach, the 2014 Cambodian Social Economic Survey returned a prevalence of disability of approximately 4% (National Institute of Statistics and Ministry of Planning, 2015). In the same year using an international standardised measure of disability (Washington Group Short-Set Questionnaire), the Cambodia Demographic Health Survey estimated the disability prevalence to be 2.1%.[6] Substantial variation was recorded across provinces with the war torn province of Battambang/Pailin reporting double the national average of disability (National Institute of Statistics et al., 2015).

Little is currently known about the living standards of persons with disabilities (and the households in which they reside) in Cambodia. To our knowledge there exists no nationally representative research on the association between disability and poverty. The Royal Government of Cambodia has taken several steps to improve the economic position of persons with disabilities. In October 2007, the Royal Cambodian government signed the Convention on the Rights of Persons with Disability (CRPD) which was ratified in December 2012. In July 2009, it introduced an inaugural national disability law (*Law on the Protection and the Promotion of the Rights of Persons with Disabilities*) which aims, among other things, to develop policies to provide livelihood assistance for persons with disabilities (Kingdom of Cambodia, 2009). A sub-decree was passed in June 2011 which entitles persons with severe disabilities living in conditions of poverty to a monthly disability pension (Kingdom of Cambodia, 2011). To strengthen the implementation of the national disability law and associated sub-decrees, a national disability strategic plan was developed for the period 2014-2018 with the primary goal to improve livelihoods (Kingdom of Cambodia, 2014). A key goal of the national plan is to ensure that the poor are provided with assistance from the State with disability-related expenses. A key contribution of this research is that in estimating the cost of disability to Cambodian households, it provides crucial information to assist policy makers in achieving this goal.

---

[6] This prevalence is based on the recommended definition of persons which experience 'a lot of difficulty' or 'cannot do' in at least one functional domain (http://www.washingtongroup-disability.com/washington-group-question-sets/implementation-help/implementation-guide/).

3. Conceptual Framework

Sen discusses two types of disadvantage that disabled individuals may face (Sen, 2004). First, they may experience productivity differentials or discrimination in the labor market, and hence are at risk of poverty due to decreased income. Second, they face what Sen calls a conversion handicap, whereby the disabled require more financial resources in order to achieve the same standard of living as a non-disabled person. This paper is concerned with measuring the second cost. The framework we use to measure this cost is based on compensating variation. Compensating variation measures the additional income required to leave an individual subject to changed conditions as well off as under the status quo. In measuring the conversion handicap faced by households with disabled members, we seek to measure the additional income required to leave a household with a disabled member with the same standard of living as an otherwise similar household without disabled members. This is referred to as the Standard Of Living approach (SOL) to measuring the cost of disability.

The SOL approach has been used to evaluate the financial cost of disability in the by Zaidi and Burchardt (2005), Morciano et al. (2014) and Hancock et al (2013). These studies focus on older persons with disability, as disability and hence government financial support for the disabled is concentrated in older age groups. Overall, these papers suggest that the average financial cost of disability ranges from 23-55% of household income. Loyalka et al. (2014) use the SOL approach to study the cost of disability in China, suggesting the cost of disability to be in the range of 8-19% for households with three or more adults which represent the main household composition. Braithwaite and Mont (2009) and Mont and Nguyen (2011), also using the standard of living approach, estimate the cost of disability in Vietnam to be 9-12%. No previous studies have examined the cost of disability in a low income country, such as Cambodia, and it is in this context that we seek to make a contribution

We formulate the SOL model at the household level. We do so because, while disability may be (typically) experienced by only one household member, the presence of a disabled household member is likely to influence the standard of living of the whole household.[7] Specifying the impact of disability in terms of household standard of living has the advantage of allowing us to account for the ability of households to substitute between expenditures on items that improve the standard of living of the household generally and expenditures related to the needs of a member with disabilities (e.g. personal care-giving, rehabilitation, adaptations to physical infrastructure, transportation, heating etc.) (Zaidi and Burchardt, 2005).

The SOL approach is implemented using a parametric regression model in which the outcome, the household's standard of living (SOL), is modelled as a function of household income (Y), and an indicator for the presence of disabled household members (D), and other sources of observed (X) and unobserved (ε) heterogeneity in living standards.

$$SOL = \alpha.Y + \beta.D + \beta_k.X_k + \varepsilon \qquad (1)$$

---

[7] In our sample, 84% of households with disabled members have one disabled member (16% have more than 1 disabled member), and 0.4% of households are a single person household where that person is disabled.

The household's standard of living is measured using an index of household assets and housing characteristics (discussed in detail in section 4.3). Observed heterogeneity that we control for includes: household size, number of children, rural location, province, year of survey, and characteristics of the household head (refer Appendix Table 1 for a more detailed description of variables).

The financial cost of disability in the compensating variation framework is defined as the additional income required for households with disabled members to achieve the same standard of living as an otherwise equivalent household without disabled members. On the basis of the model for household standard of living given by (1), the additional cost of disability to the household (C), is given by:

$$C = -\frac{\beta}{\alpha} \tag{2}$$

As with previous studies that use the SOL approach to measure the cost of disability, our disability cost estimate is sensitive to the specification of the functional form relating standard of living to income (Zaidi and Burchardt, 2005, Hancock et al., 2013). We investigate this issue by fitting specifications in which income enters the model for household standard of living with differing functional forms (linear, quadratic, square root, and logged). Results are shown in Appendix Table 2. On the basis of Akaike information criterion (AIC), the natural log of income (proxied by household consumption expenditure) is the preferred specification, implying that standard of living increases with income but at a diminishing rate.[8] In our preferred specification, the cost of disability, C, given in (2) above approximately corresponds to the percentage increase in household income required to achieve the same standard of living as an otherwise similar family with no disabled members.

We also conduct a sensitivity analysis in which we explore different configurations of disability within the household against the common reference category of households without disabled members. These include a specification in which we enter a single indicator denoting whether the household has at least one disabled member; a set of two indicators variables denoting one, and more than one disabled member in the household, respectively; and a set of three indicators for the presence of a disabled member aged 0-19 years old; aged 20-59 years old; and aged 60 or more years old.[9] Models are estimated for the full sample at national level, and separately for the rural and urban sub-samples. Disability costs as a proportion of household income are constructed as the ratio of the estimated coefficient on the disability indicator and the estimated coefficient on log income. Standard errors for this ratio are bootstrapped at 100 repetitions. All estimations were weighted for the survey design.

---

[8] We present the interaction term model for the preferred specification only with other interaction term model results available upon request.

[9] For the model including indicators for age-group of the disabled household member, we remove households with more than one disabled members because they were few in number and to facilitate comparison with the average cost estimate for households with one disabled member.

4. **Data**
   4.1 The Cambodian Socio-Economic Survey
This study draws on information collected in the Cambodian Socio-Economic Survey (CSES) over the period 2009-2014. The CSES is a cross-sectional survey that provides nationally representative information on income, consumption, assets and wealth of surveyed households as well as demographic characteristics, health status and health care utilization on all individuals residing within surveyed households.

The CSES was first fielded in 1993, and has been conducted annually since 2007. Disability information has been collected in the survey since 2007. However, it was not until the 2009 wave that questions on disability conformed to international standards, enquiring about difficulties in domains of functioning, and the severity of the impact of difficulties on functioning. For this reason, our analysis uses the 2009-2014 waves of the CSES only. Each of these waves is representative at the national level, and all follow the same stratified sampling design. Sample sizes are around 3,000 households for the 2010, 2011, 2012 and 2013 waves, and around 12,000 households in the 2009 and 2014 waves. As a consequence, the 2009 and 2014 account for over 60% of the total number of households in our sample. Pooling the six independent cross-sections for the years 2009-2014 yields a total of 38,886 households which are used in our analysis. Given the low prevalence of disability, and relative to the literature which typically relies on a single cross-section of data, pooling the six waves of the CSES provides the advantage of improved precision in our estimates of the financial impact of disability on households, as well as allowing us to account for the impact of events and circumstances at the national level that may impact on the reporting of disability (such as national decrees related to the rights of people with disabilities) and other relevant outcomes.

   4.2 Disability
Since 2009, the structure of the disability questions in the CSES falls under a broad class of functioning questions and is consistent with the international classification of disability (World Health Organization, 2001, Palmer and Harley, 2012). Specifically, each household's respondent reports on whether each individual that usually resides in the household experiences difficulties in at most three of nine enumerated functioning domains: seeing, hearing, speaking, moving, feeling or sensing, behavioral, learning, fits, and others. Respondents were then asked to grade the degree of difficulty for the reported functioning difficulties (for each household member) as mild, moderate or severe.

For each individual, we construct separate indicators for mild, moderate and severe disability. For example, the severe disability indicator is set equal to one for individuals reported to have a functioning disability, and whose highest degree of functioning difficulty is severe. We follow international standards that recommend categorizing as disabled those persons reporting moderate or severe functioning difficulties only (Mont, 2007, Washington Group on Disability Statistics). Correspondingly, we construct an indicator for disability at the individual level that is equal to 1 if the individual is reported to have one or more functioning difficulties, and the first (most important) difficulty is graded as moderate or severe. For the

purpose of comparison, we also construct a second indicator for disability (called unadjusted disability) that is equal to one for individuals with a reported difficulty at any level of severity, including mild.

Figure 1a graphs the prevalence of disability (at the individual level) over the period 2009-2014. Panel (a) graphs the prevalence of disability based on international standards (degree of difficulty is moderate or severe) labelled as adjusted, and the prevalence of disability with any level of severity including mild, labelled as unadjusted. Panel (b) graphs the prevalence of disability by severity. As can be seen from the graphs, the prevalence of reported severe disability is quite stable over the period under analysis, at around 1% of the sample at each wave of the survey, while the prevalence of moderate disability falls from around 2.7% to 2% over the same period. In contrast, the reported prevalence of mild disability falls strikingly, from around 2.7% to 1.5% between 2009 and 2010, and then falls to around 1.0% by 2014. [10] Correspondingly, the prevalence of unadjusted disability falls from 6.2% in 2009 to 3.4% by 2014. The prevalence of adjusted disability, which reflects moderate and severe disability, is more stable falling from 3.8% to 2.6% over the same period. We suspect that the spike in reported mild disabilities (and consequently, unadjusted disability) in 2009 may be attributable to the heightened awareness of the issue of disability around the time of the introduction of the national disability law in July of 2009. It is reassuring that our measure of disability, which only considers moderate and severe functioning difficulties, appears to be relatively robust to this issue.

Our analysis is conducted at the household level. Accordingly, Figure 2 graphs the distribution of disability at the household level. Figure 2(a) shows that, over the period of 2009-2014, 13.4% of Cambodian households report having at least one member with a disability, with 11.2% of households in the pooled sample having just one member with a disability (84% of households with any disabled members). Figure 2(b) shows that of households with a single disabled member, 1.4% are contributed by households with a disabled household member who is less than 20 years old, 5.2% are contributed by households with an adult disabled member aged 20-59, and 4.7% have an elderly disabled member aged 60 years or older.

4.3 Standard of living
We measure the household's standard of living using an asset index (Anton et al., 2011, Loyalka et al., 2014). The CSES collects information on a broad class of assets, which allows us to differentiate living standards across households. Following the approach recommended by Cambodia's National Institute of Statistics *et al*. (2015) for measuring assets, we include in our asset index household level information on ownership of durable assets (radio, television, mobile phone, fan, wardrobe, DVD/CD player bicycle, and motorcycle) and housing characteristics (number of rooms for sleeping, type of flooring, source of lighting,

---

[10] It is worth noting that the majority of minor functioning difficulties occur in the domain of vision impairment, a difficulty overcome by wearing glasses.

source of water supply, sanitation) (McKenzie, 2005, Filmer and Pritchett, 2001).[11] The index is constructed using weights derived from principal components analysis. This method is commonly used in the construction of proxies for long-run economic status or living standards (Filmer and Pritchett, 2001). Information on the variables used to construct the asset index, including descriptive statistics, are reported in Table 1. Table 1 also reports the eigenvector (scoring factors) corresponding the first principal component, which serves as weights for construction of the assets index. A histogram showing the distribution of the household asset index scores, which we use to measure the household's standard of living, is shown in Appendix Figure 1. The distribution exhibits sufficient range to distinguish between socio-economic groups with a skew reflecting the choice of variables sensitive to the lower-income distribution.

4.4 Income

Measurement of income in low income countries, such as Cambodia where self-employed and agricultural workers constitute the majority of workers, is challenging due to significant seasonal variation, imputation and recall issues (Deaton, 1997). For this reason, total household consumption expenditure is typically considered a more reliable measure of income in LMICs, and this is the approach adopted here. Our construction of the consumption expenditure variable follows the approach recommended in Cambodia's updated national poverty line guidelines (Ministry of Planning, 2013). The variable comprises a collection of food and non-food expenditure items as well as house rent, repair and utility expenditures incurred in cash or in kind including own labour. Food and housing items are reported in the CSES for the last month prior to survey whereas non-food items differ in recall period (monthly, six-monthly, and annually), and we converted them to monthly values. All expenditures items were converted to monthly 2009 Cambodian Riel prices by deflating the nominal values using the Cambodian Consumer Price Index.

4.5 Independent variables

The CSES contains rich information on household and community level characteristics that we use as controls in our analysis. Table 2 presents descriptive statistics for these control variables for households with and without disabled members. As shown in Table 2, households with at least one disabled member are slightly larger in size with fewer child members compared to households with no disabled members. They are poorer as measured by household consumption expenditure and wealth, and are more likely to be located in rural areas. Households with disabled members are more likely to be headed by persons that are older and in higher proportion female, unmarried, uneducated, and unemployed than households without disabled members.

---

[11] Composite measures of different items (typically household assets) are recommended as they reduce the risk of single item preferences or tastes being systematically related to disability status (Zaidi and Burchardt, 2005). We do not include durable assets that they are likely to generate income such as ownership of productive land and cattle or a computer.

5. Results

5.1 Baseline estimates

Table 3 presents the results from estimating the model for households' standard of living as a function of household income and having members who are disabled. The table reports on three specifications that differ in the way that disability is accounted for at the household level. The first specification does so by including an indicator equal to one if one or more household members are disabled (defined as having a functioning difficulty that is moderate or severe). The second specification replaces the disability indicator with two mutually exclusive indicators for one, and more than one disabled household member. The final column includes three mutually exclusive indicators for the household having a disabled person who is less than 20 years of age, a disabled member who is 20-59 years of age, and a disabled member who is 60 years or older. The sample over which this last model is estimated excludes the 768 (out of 38,886) households that have more than 1 disabled member. All estimations were weighted for the survey design.

As can be seen from the results presented in Table 3, having one or more disabled members reduces a household's standard of living, all else being equal. The coefficient estimate for column 1's specification indicates that having at least one member with a disability reduces the index of living standards of the household by 0.27. The point estimates in column 2 suggest that the reduction in the index of living standards experienced by households with more than one disabled member is 0.33 compared to a reduction of 0.25 experienced by households with a single disabled member. While we are unable to reject the null hypothesis that the effect on household standard of living is the same for having one or more than one disabled household member at standard levels of significance (*p-value=0.34*), this likely reflects a lack of precision due to the small number of households with more than one disabled member.[12] The results for the specification allowing for differential effects on household standard of living by age of the disabled household member are reported in column 3 of Table 3. The point estimates in column 3 suggest that the reduction in household living standards is greater for households with a disabled member aged less than 20 compared to households with disabled members aged 20 or older. However, the null hypothesis that the impact of disability is equal for the three age groups cannot be rejected at standard levels of significance (*p-value*=0.91).

As a final point, the results in Table 3 show that the log of household consumption is positively and significantly associated with households' standard of living for all specifications, with a 10% increase in consumption expenditure associated with a 0.16 rise is the standard of living index. Although not reported, the number of household members, the presence of children in the household, the age, gender, and education of the head of the household, whether the household lives in an urban or rural area, and province of residence, are all significantly related to household living standards in the expected manner.[13]

---

[12] 2.2% of households in the sample have more than one disabled member, while 11.2% of households have one disabled member.

[13] These results are available by request.

Using the coefficient estimates from Table 3, we calculate the cost of disability in terms of the additional income required for the household to achieve the same standard of living as an otherwise similar household that does not have a disabled member, as described in section 3.[14] Note that as household consumption expenditure enters in logged form, the cost of disability is in terms of the additional income as a proportion of current income. These costs are reported in Table 3. They show that, at the national level, households with at least one disabled member require an additional 17% of household income in order to achieve the same standard of living as an otherwise similar household that has no disabled members. Costs are higher for households with two or more members with disabilities (21%) and are slightly higher for households with a young versus older member with disability (18% versus 16%).

5.2 Sensitivity analysis

In Table 4 we explore the extent to which the impact on living standards of having disabled household members differs by rural versus urban location. To do so, we re-estimate the three specifications reported in Table 3 for the rural and urban sub-samples separately. Noting that 70% of households in our sample live in rural locations, it is not surprising that the results for the rural sub-sample in Table 4 are similar to those reported for the full sample in Table 3. The point estimates for the urban sample are larger but also noisier and not statistically different than those based on the rural sample as a result of the much smaller sample size over which estimation is carried out. For example, comparing estimates of the coefficient on the indicator for having one or more disabled household members (specification 1) across the two sub-samples suggests that having disabled household members has a large adverse impact on the standard of living of households in an urban location (-0.34) compared to a household in a rural location (-0.26). However, the coefficient estimates are not statistically different (p=0.20). Similarly, the estimated impact on the household's index of standard of living associated with having one, and more than one disabled member (specification 2) in a rural location is -0.234 and -0.313 respectively, compared to -0.339 and -0.349 for households located in urban locations. However, the results are neither statistically different within nor across samples.[15]

The issue of small samples sizes is apparent from the point estimates and associated standard errors for the specification which allows for differential effects of disability by the age of the disabled household member. For example, the standard error for the point estimate for having a disabled member aged less than 20 based on the urban sample is three times the size of the corresponding standard error based on rural sample. As a result, we find no significant difference in the impact on household standard of living by the age of the disabled household member across the rural or urban sub-samples (p-$value$=0.40), in addition to finding no significant differences within specifications.

---

[14] Specifically, they are calculated as the ratio of the disability and income coefficients.
[15] The *p-value* for testing equal effects in rural and urban location is 0.38 and 0.95, respectively. The *p-value* for the null of equal effects across the number of disabled household members and location is 0.47.

The cost of disability estimated using the standard of living approach is known to be sensitive to the choice of standard of living measure (Zaidi and Burchardt, 2005). As discussed in section 4.3, we use a principal components analysis to construct an index of standard of living based on the households' ownership of durable goods, housing characteristics and utilities. While PCA is a common technique used in the construction of wealth or living standards indices, and has been used in previous research estimating the cost of disability (e.g., Loyalka et al., 2014, Anton et al., 2011, Mont and Nguyen, 2011), the resultant index may be sensitive to the choice of assets included. In order to investigate the sensitivity of our results to this issue, we construct two alternative indices. The first is based on household durable goods, while the second is based on housing characteristics and access to utilities. We also consider a third alternative measure of living standards based on a count of the number of consumer durable goods owned by the household (Zaidi and Burchardt, 2005). The alternative measures of standard of living are used to form estimates of the cost of disability and these costs are shown in Table 5. For ease of comparison, the first column repeats the estimates based on the standard of living index reflecting household durables, household construction and access to utilities, and aggregated using weights from principal component analysis. Columns two and three show the estimated cost of disability based on a principal component weighted index of durable assets and simple count of durable assets, repsectively. The fourth column reports disability costs based on standard of living captured by a principal component weighted index based on housing characteristics and utilities.

As shown in Table 5, the additional income required to compensate a household for having a disabled member in order to achieve the same standard of living as an otherwise similar household is slightly higher when the living standards measure is based upon durable good items only (column 2 and 3). The housing characteristics and utilities living standards index produces lower disability cost estimates compared with the baseline results. Nonetheless, the general patterns and magnitudes of the estimated cost of disability across all standard of living measures are broadly consistent with the baseline results.

Our investigation into the cost of disability in Cambodia has excluded in the definition of disabled those individuals whose highest level of functioning difficulty is reported as mild. We now examine the impact of this restriction on our estimated cost of disability be re-defining our disability measure to include persons with mild, moderate or severe functioning difficulties. The resulting estimates of the household cost of disability are reported in column 5 of Table 5. While, as expected, the estimated costs are smaller than those based on the definition of disability which excludes mild functioning difficulties, they display a similar pattern across the disabled household types. We therefore conclude that the exclusion of persons with mild functioning limitations from the definition of disabled does not qualitatively affect our results.

6. Policy implications

Using the estimated costs of disability, we are able to calculate the poverty head count and poverty gap taking into account the additional costs faced by households with disabled members. To estimate the impact of disability costs on poverty, we deduct each households

estimated cost of disability from total household consumption expenditure and re-calculate poverty head ratios and poverty gap indices based upon national poverty lines.[16] The results are shown in Table 6. We find that, for households with at least one disabled member, the unadjusted poverty head count increases from 18% to 34% when the additional costs of disability are taken into account. This represents a 16 percentage points (or 89%) increase in the rate of poverty in this group. In terms of the poverty gap, Table 6 shows that before accounting for the additional costs faced by households that have a disabled member, a poor household with disabled members in Cambodia fell 3% beneath the poverty line, on average. However, when the financial cost of disability is accounted for, the gap more than doubles, rising to 7% below the poverty line.

As a final point of policy interest, we are able to compare our estimated costs of disability with detailed information collected in the CSES on financial support received by disabled household members from government and non-government sources as well as non-resident family members. Table 7 presents median disability costs in USD (2014 prices) and compares them to median amounts of positive unearned income received from government, non-government agencies and relatives, also measured in 2014 USD.

The additional median cost incurred by households with disabled members is 40 USD per month. Less than four per cent of disabled households report receiving any financial support from the government in the past twelve months to survey, with the median reported amount amongst those receiving a payment of 33 USD per month. Across disabled households, those in urban areas were most likely to receive a government pension or transfer (9.2%) whereas households with a disabled child or adolescent (person aged less than 20) member were least likely to receive financial support from the government (0.8%). Amongst recipients of government payments, the median amount paid is considerably lower for households in which the disabled member is less than 20 years old compared to recipient households in which the disabled household member is 20 years old or older (1.89 USD versus 33.97 USD). As with government transfers, only a small proportion (4%) of households with disabled members reported receiving any financial assistance from non-government organisations in the past twelve months. The median monthly amount of non-government transfer is 2 USD, with recipient households in urban locations receiving significantly more than those located in rural locations (13.41 USD versus USD 2.19). One half of disabled households reported receiving a median monthly amount of 6 USD support from relatives in the past twelve months which increased to 10 USD in urban areas. Households with a young disabled member were least likely to receive remittance support (33.5% versus 43% for households with a disabled member aged 20-59 and 59% for households with a disabled member aged 60 years or older). Amongst those households that did receive family remittance support, those with a disabled member aged less than 20 received a lower amount (3.85 USD versus 5.36

---

[16] Disability costs in absolute terms were calculated as $Y.\left[exp\left(-\frac{\beta}{\alpha}.D\right)-1\right]$. The poverty lines have recently been updated to account for differences in minimum living standards across geographical regions and were derived from the 2009 CSES consumption data used in this study (Ministry of Planning, 2013).

USD for households whose disabled member is aged 20-59 and 6.80 USD for households in which the disabled member is 60 years or older).

7. Discussion

The overwhelming majority of the world's disabled people live in low- and middle-income countries. Despite this, little is known about the additional costs faced by the disabled in low income countries, and the impact of these additional costs on the financial wellbeing of the households' in which they reside. This paper addresses this issue in the context of Cambodia, one of the least developed nations in South East Asia.

We take a Standard of Living approach to measuring the financial impact of disability on households' wellbeing. Our analysis uses the Cambodian Socio-Economic Survey, which measures disability based on difficulties in functioning domains. Our findings suggest that households with disabled members require an additional 17% of income compared to an otherwise similar household with no disabled members, in order to achieve the same standard of living. Further, we find that if the additional costs of disability are accounted for, the poverty rate amongst households with disabled members almost doubles, increasing from 18% to 34%. In addition to the extensive margin, accounting for the cost of disability also increases poverty at the intensive margin. For example, after subtracting the cost of disability, poor households with disabled household members fall 7% below the poverty line, on average, compared to 3% when the cost of disability is ignored.

Finally, we compare transfer payments received from family members, and government and non-government agencies by households with disabled members to the cost of disability faced by these households. For the households in our sample, the median cost of having a disabled household member is around 40 USD per month. We find that while the median payment made by government agencies to households with a disabled member comes close to covering the cost of disability at around 33 USD per month, only 4% of households with a disabled member actually received a government payment. A similarly small proportion of households receive a transfer payment from non-government agencies, and the median level of payment made by non-government agencies is small at 2 USD. And while more than 50% of households with disabled members receive transfers from family members, the median level of these payments is only 6 USD, falling well short of the disability costs faced by these households.

Collectively, the findings suggest that, in the absence of improved coverage of financial support by the government, households with disabled members will continue to face a higher level of financial disadvantage and poverty compared to otherwise similar households without disabled members in Cambodia. Moreover, we show that current estimates of poverty based on measures such as the poverty head count and poverty gap that fail to account for the costs associated with disability borne by households lead to a significant under-estimate of the breadth and depth of poverty in Cambodia.

8. References

Acemoglu, D. & Angrist, J. D. 2001. Consequences of employment protection? The case of the Americans with Disabilities Act. *Journal of Political Economy,* 109**,** 915-957.

Anton, J. I., Brana, F. J. & Bustillo, R. M. D. 2011. An analysis of the cost of disability across Europe using the standard of living approach. Department of Applied Economics: University of Salamanca.

Blanchflower, D. B. & Oswald, A. J. 2004. Well-being over time in Britain and the USA. *Journal of Public Economics,* 88**,** 1359-1386.

Bound, J. & Burkhauser, R. V. 1999. Economic analysis of transfer programs targeted on people with disabilities. *In:* ASHENFELTER, O. & CARD, D. (eds.) *Handbook of Labour Economics.* Amsterdam: Elsevier Science.

Braithwaite, J. & Mont, D. 2009. Disability and poverty: A survey of World Bank poverty assessments and implications. *ALTER European Journal of Disability Research,* 3**,** 219-232.

De-Walque, D. 2005. Selective mortality during the Khmer Rouge period in Cambodia. *Population and Development Review,* 31**,** 351-368.

De-Walque, D. 2006. The Socio-Demographic Legacy of the Khmer Rouge Period in Cambodia. *Population Studies,* 60**,** 223-231.

Deaton, A. 1997. *RE: The Analysis of Household Surveys: a microeconomic approach to development policy.*

Dy, K. 2007. A history of democratic Kampuchia (1975-1979). Phnom Penh: Documentation Center of Cambodia.

Filmer, D. & Pritchett, L. H. 2001. Estimating wealth effects without expenditure data - or tears: An application to educational enrolments in states of India. *Demography,* 38**,** 115-132.

Groot, W. & Van-Den-Brink, M. 2006. The compensating income variation of cardiovascular disease. *Health Economics,* 15**,** 1143-1148.

Hancock, R., Morciano, M. & Pudney, S. 2013. Nonparametric estimation of a compensating variation: the cost of disability. Colchester: Instiute of Social and Economic Research, University of Essex.

Heuveline, P. 1998. 'Between one and three million': Towards the demographic reconstruction of a decade of Cambodian history (1970-1979) *Population Studies,* 52**,** 49-65.

Johnston, D. W., Shields, M. A. & Suziedelyte, A. 2015. Vicitmisation, wellbeing and compensation: Using panel data to estimate the costs of violent crime. *IZA Discussion Paper Series No. 9311.*

Kingdom of Cambodia 2009. Law on the Protection and the Promotion of the Rights of Persons with Disabilities.

Kingdom of Cambodia 2011. Policy on the disability pension for the poor disabled people. Phnom Penh: Kingdom of Cambodia.

Kingdom of Cambodia 2014. National Disability Strategic Plan 2014-2018. *In:* COUNCIL, D. A. (ed.). Phnom Penh.

Levinson, A. 2012. Valuing public goods using happiness data: the case of air quality. *Journal of Public Economics,* 96**,** 869-880.

Loyalka, P., Liu, L., Chen, G. & Zheng, X. 2014. The cost of disability in China. *Demography,* 51**,** 97-118.

Mckenzie, D. J. 2005. Measuring inequality with asset indicators. *Journal of Population Economics,* 18**,** 229-360.

Merrouche, O. 2011. The long term educational cost of war: Evidence from landmine concentration in Cambodia. *Journal of Development Studies,* 47**,** 399-416.

Ministry of Planning 2013. Poverty in Cambodia - A new approach. Redefining the poverty line. Phnom Penh: Ministry of Planning, Royal Government of Cambodia.

Mitra, S., Palmer, M., Kim, H., Mont, D. & Groce, N. 2016. The extra costs of disabilty: A review and agenda for research. New York: Department of Economics, Fordham University.

Mont, D. 2007. Measuring disability prevalence. *SP Discussion Paper 0706.* Washington D.C.: The World Bank.

Mont, D. & Nguyen, C. V. 2011. Disability and poverty in Vietnam. *The World Bank Economic Review,* 25**,** 323-359.

Morciano, M., Hancock, R. & Pudney, S. 2014. Disability costs and equivalence scales in the older population in Great Britain. *Review of Income and Wealth,* DOI: 10.1111/roiw.12108.

National Institute of Statistics, Directorate General for Health & Icf International 2015. Cambodia Demographic Health Survey 2014. Phnom Penh, Cambodia, Rockville, Maryland, USA: National Institute of Statistics, Directorate General for Health, and ICF International.

National Institute of Statistics & Ministry of Planning 2009. General Population Census of Cambodia. Phnom Penh: National Institute of Statistics, Ministry of Planning.

National Institute of Statistics & Ministry of Planning 2015. Cambodia Socio-Economic Survey 2014. Phnom Penh: National Institute of Statistics, Ministry of Planning.

Palmer, M. & Harley, D. 2012. Models and measurement in disability: an international review. *Health Policy and Planning,* 27**,** 357-364.

Sen, A. 1992. *Inequality Reexamined,* Oxford, Clarendon Press.

Sen, A. 1999. *Development as freedom,* New York, Knopf.

Sen, A. Disability and Justice. Disability and Inclusive Development Conference, 2004 Washington D.C. . The World Bank.

Tibble, M. 2005. Review of existing research on the extra costs of disability. *Department for Work and Pensions Working Paper No. 21.* London: Department for Work and Pensions.

Ugalde, A., Richards, P. L. & Zwi, A. 1999. Health Consequences of War and Political Violence. *In:* KURTZ, L. (ed.) *Encyclopedia of Violence, Peace and Conflict.* San Diego, CA: Academic Press.

United Nations 2008. Convention on the Rights of Persons with Disabilities. United Nations Department of Public Information. Entered into force, May 3. Available at http://www2.ohchr.org/english/law/disabilities-convention.htm.

United Nations General Assembly 2015. Report of the Special Rapporteur on the rights of persons with disabilities. New York: United Nations.

Van-Den-Berg, B. & Ferrer-I-Carbonell, A. 2007. Monetary valuation of informal care: the well-being valuation method. *Health Economics,* 16**,** 1227-1244.

Washington Group on Disability Statistics. http://www.washingtongroup-disability.com/ [Online]. [Accessed 2016].

World Health Organization 2001. International Classification of Functioning, Disability and Health Geneva: World Health Organization.

World Health Organization & World Bank 2011. World Report on Disability. Geneva: World Health Organization.

Zaidi, A. & Burchardt, T. 2005. Comparing incomes when needs differ: equalization for the extra costs of disability in the U.K. *Review of income and wealth,* 51.

Table 1. Summary statistics of standard of living indicators and principal component

	Mean	Standard Error	Mean Poorest 40%	Mean Middle 40%	Mean Richest 20%	Scoring factors for first principal component
Durable assets						
Radio	0.377	(0.005)	0.355	0.380	0.409	0.026
Television	0.640	(0.008)	0.447	0.715	0.886	0.251
Mobile phone	0.661	(0.007)	0.451	0.755	0.909	0.225
Fan	0.310	(0.011)	0.108	0.328	0.671	0.335
Wardrobe	0.424	(0.008)	0.226	0.467	0.732	0.264
Dvd/cd player	0.273	(0.005)	0.133	0.296	0.505	0.188
Bicycle	0.661	(0.007)	0.653	0.695	0.630	-0.030
Motorbike	0.584	(0.007)	0.343	0.689	0.869	0.217
Number of rooms for sleeping	1.429	(0.011)	1.199	1.395	1.897	0.192
Type of floor material						
Earth	0.067	(0.003)	0.085	0.061	0.042	-0.042
Wood plank	0.500	(0.011)	0.518	0.535	0.407	-0.076
Bamboo	0.232	(0.010)	0.321	0.214	0.090	-0.139
Hard/permanent materials[i]	0.200	(0.008)	0.074	0.189	0.462	0.268
Source of lighting						
Electricity	0.411	(0.013)	0.214	0.442	0.738	0.333
Generator/battery	0.364	(0.010)	0.424	0.395	0.202	-0.161
None/Other[ii]	0.225	(0.008)	0.362	0.162	0.060	-0.207
Source of water supply						
Piped into dwelling	0.182	(0.010)	0.054	0.172	0.444	0.277
Tubed/piped well or borehole	0.228	(0.011)	0.280	0.220	0.142	-0.072
Dug well	0.174	(0.010)	0.215	0.167	0.107	-0.094
Other[iii]	0.417	(0.013)	0.451	0.441	0.307	-0.085
Sanitation facility						
Flush toilet	0.451	(0.010)	0.260	0.479	0.770	0.325
Pit latrine	0.021	(0.002)	0.025	0.021	0.013	-0.027
None/Other	0.529	(0.010)	0.715	0.500	0.217	-0.316
Eigenvalue associated with first component						5.752
Share of variance associated with first component						0.240

[i] cement, parquet, stone, brick, ceramic

[ii] kerosene lamp, candle, other

[iii] Pond, river or stream (pumped or non-pumped), rainwater, bought, other

Notes: 'Other' type of floor material is not shown due to small number of observations.

In the calculation of income terciles the top and bottom 1% of the income distribution were trimmed from the sample.

Table 2. Summary statistics at household level

	Households with no members with disability	Households with at least one member with disability	Difference in means
Household size	4.524	4.879	0.355**
	(0.017)	(0.040)	(0.040)
Number of children in household (<10 years age)	0.927	0.746	-0.181***
	(0.010)	(0.018)	(0.018)
Log of total consumption expenditure	13.593	13.537	-0.056***
	(0.011)	(0.012)	(0.012)
Poverty head count	0.136	0.179	0.043***
	(0.005)	(0.008)	(0.008)
Poverty gap ratio	0.024	0.033	0.009***
	(0.002)	(0.001)	(0.001)
Asset index*	0.077	-0.498	-0.575***
	(0.064)	(0.062)	(0.054)
Location			
Rural	0.788	0.861	0.074***
	(0.012)	(0.010)	(0.008)
Urban	0.212	0.139	-0.074***
	(0.012)	(0.010)	(0.008)
Household head characteristics			
Age	45.440	54.533	9.093***
	(0.131)	(0.286)	(0.286)
Male	0.788	0.733	-0.055***
	(0.004)	(0.009)	(0.009)
Married	0.793	0.728	-0.065***
	(0.004)	(0.008)	(0.008)
Completed primary school	0.419	0.298	-0.121***
	(0.006)	(0.010)	(0.010)
Working in paid production activity (past 7 days)	0.912	0.748	-0.164***
	(0.003)	(0.009)	(0.008)
Observations	33942	4971	38913

Table 3: Baseline estimates of the model for household standard of living

	All households with members with disabilities		Number of household members with disabilities		Age category of single disabled member households	
	Coefficient	St. Error	Coefficient	St. Error	Coefficient	St. Error
Log household consumption expenditure	1.553***	(0.043)	1.553***	(0.043)	1.572***	(0.043)
Households with >=1 disabled member	-0.266***	(0.037)				
Cost of disability	0.171***	(0.018)				
Households with 1 disabled member			-0.254***	(0.038)		
Cost of disability			0.164***	(0.019)		
Households with > 1 disabled members			-0.333***	(0.082)		
Cost of disability			0.214***	(0.049)		
Households with disabled member aged < 20 years					-0.283***	(0.078)
Cost of disability					0.180***	(0.047)
Households with disabled member aged 20-59 years					-0.243***	(0.051)
Cost of disability					0.155***	(0.026)
Households with disabled member aged > 59 years					-0.257***	(0.042)
Cost of disability					0.163***	(0.031)
Observations	38.886		38.886		38.118	
R-squared	0.634		0.634		0.636	

Standard errors in parentheses. Standard errors of disability costs are bootstrapped at 100 repititions. *** p<0.01, ** p<0.05, * p<0.1

Notes: Although not reported, all regressions control for household size, number of children less than 10 years, rural location, province, year of survey and the following characteristics of the household head: gender, marital status, completed primary education, employed.

Table 4: Sensitivity of the model for household standard of living across rural and urban samples

	Rural sample						Urban sample					
	All households with members with disabilities		Number of household members with disabilities		Age category of single disabled member households		All households with members with disabilities		Number of household members with disabilities		Age category of single disabled member households	
	Coefficient	St. Error	Coefficient	St. Error	Coefficient	St. Error	Coefficient	St. Error	Coefficient	St. Error	Coefficient	St. Error
Log household consumption expenditure	1.562***	(0.052)	1.562***	(0.052)	1.573***	(0.053)	1.428***	(0.066)	1.428***	(0.065)	1.428***	(0.066)
Households with >=1 disabled member	-0.246***	(0.041)					-0.341***	(0.065)				
Cost of disability	0.157***	(0.020)					0.239***	(0.038)				
Households with 1 disabled member			-0.234***	(0.042)					-0.339***	(0.070)		
Cost of disability			0.150***	(0.022)					0.237***	(0.042)		
Households with > 1 disabled members			-0.313***	(0.091)					-0.349**	(0.141)		
Cost of disability			0.200***	(0.051)					0.244***	(0.089)		
Households with disabled member aged < 20 years					0.238***	(0.080)					-0.676***	(0.244)
Cost of disability					0.151***	(0.053)					0.473***	(0.137)
Households with disabled member aged 20-59 years					-0.207***	(0.055)					-0.384***	(0.109)
Cost of disability					0.132***	(0.132)					0.269***	(0.063)
Households with disabled member aged > 59 years					-0.261***	(0.059)					-0.210**	(0.086)
Cost of disability					0.166***	(0.035)					0.147***	(0.056)
Observations	27,180		27,180		26,569		11,706		11,706		11,549	
R-squared	0.389		0.389		0.392		0.522		0.522		0.523	

Standard errors in parentheses. Standard errors of disability costs are bootstrapped at 100 repititions. *** p<0.01, ** p<0.05, * p<0.1

Notes: Although not reported, all regressions control for household size, number of children less than 10 years, rural location, province, year of survey and the following characteristics of the household head; gender, marital status, completed primary education, employed.

Table 5: Sensitivity testing of disability costs estimates

	Composite asset index (baseline)	Durable goods index	count	Housing/utilities index	Full disabled sample
Households with >=1 disabled member	0.171***	0.210***	0.250***	0.139***	0.129***
	(0.018)	(0.020)	(0.026)	(0.024)	(0.016)
Households with 1 disabled member	0.164***	0.193***	0.233***	0.140***	0.131***
	(0.019)	(0.021)	(0.028)	(0.026)	(0.017)
Households with >1 disabled members	0.214***	0.305***	0.342***	0.136**	0.121***
	(0.049)	(0.050)	(0.062)	(0.061)	(0.041)
Households with disabled member aged < 20 years	0.180***	0.255***	0.283***	0.109	0.150***
	(0.047)	(0.048)	(0.065)	(0.068)	(0.042)
Households with disabled member aged 20-59 years	0.155***	0.179***	0.245***	0.139***	0.133***
	(0.026)	(0.029)	(0.037)	(0.035)	(0.023)
Households with disabled member aged > 59 years	0.163***	0.190***	0.206***	0.147***	0.122***
	(0.031)	(0.031)	(0.041)	(0.045)	(0.028)
Households with >=1 disabled member in rural areas	0.157***	0.192***	0.227***	0.125***	0.122***
	(0.020)	(0.021)	(0.026)	(0.028)	(0.018)
Households with >=1 disabled member in urban areas	0.239***	0.309***	0.361***	0.194***	0.171***
	(0.038)	(0.041)	(0.052)	(0.046)	(0.028)

Standard errors are bootstrapped at 100 repetitions. *** p<0.01, ** p<0.05, * p<0.1

Notes: Although not reported, all regressions control for household size, number of children less than 10 years, rural location, province, year of survey and the following characteristics of the household head: gender, marital status, completed primary education, employed.

Table 6: Estimates of the impact of disability costs on poverty

	Poverty head count			Poverty gap index		
	Unadjusted	Adjusted	Difference	Unadjusted	Adjusted	Difference
Households with >=1 disabled member	17.9	34.3	16.4	3.3	6.8	3.5
Households with 1 disabled member	18.2	33.8	15.6	3.3	6.6	3.3
Households with >1 disabled members	16.4	38.2	21.8	3.3	7.9	4.6
Households with disabled member aged < 20 years	24.3	46.5	22.2	4.6	9.8	5.2
Households with disabled member aged 20-59 years	20.5	34.5	14.0	3.9	7.2	3.3
Households with disabled member aged > 59 years	13.8	28.9	15.1	2.3	5.0	2.7
Households with >=1 disabled member in rural areas	18.1	32.9	14.8	3.5	6.8	3.3
Households with >=1 disabled member in urban areas	16.4	37.6	21.2	2.0	5.4	3.4

Table 7: Estimates of absolute disability costs and receipt of social protection transfers

	Disability costs	Government		Non-Government		Remittance	
	USD	%	USD	%	USD	%	USD
Households with >=1 disabled member	40.22	3.6	32.65	3.6	2.19	50.4	6.10
Households with 1 disabled member	38.41	3.3	32.45	3.4	2.19	48.6	6.28
Households with >1 disabled members	51.89	4.7	32.91	4.4	2.42	60.2	5.39
Households with disabled member aged < 20 years	44.50	0.8	1.89	3.9	2.89	33.5	3.85
Households with disabled member aged 20-59 years	37.07	3.4	33.97	4.3	2.19	43.0	5.36
Households with disabled member aged > 59 years	36.29	3.9	32.65	2.2	1.90	59.3	6.80
Households with >=1 disabled member in rural areas	35.16	2.7	30.81	3.7	2.19	52.0	5.59
Households with >=1 disabled member in urban areas	86.13	9.2	40.60	3.0	13.41	40.5	9.56
January 2016 USD prices. Median USD amounts are reported. Medians are reported for positive unearned income transfers.							

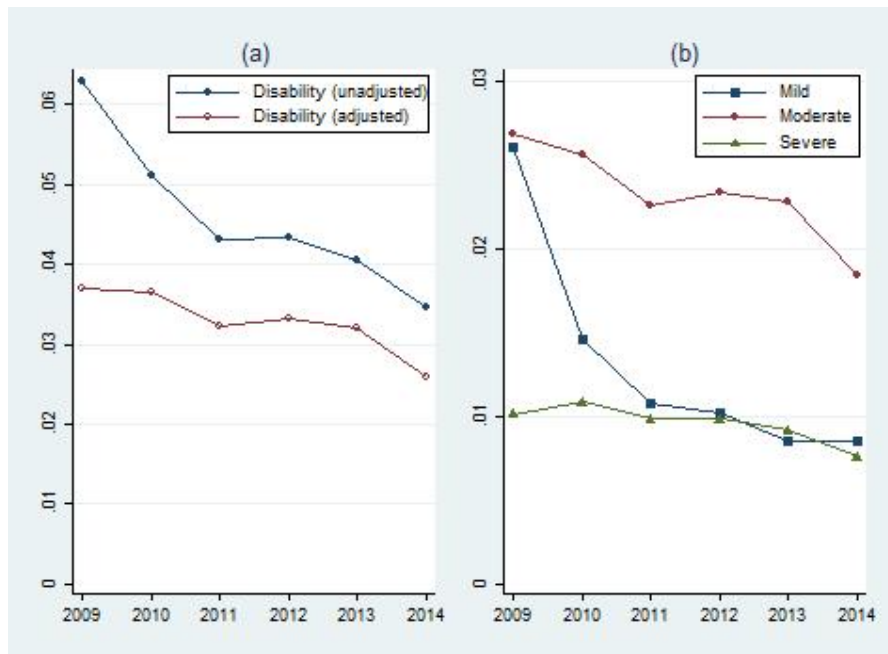Figure 1. Disability prevalence at individual level, by degree of severity

Figure 2. Disability prevalence at household level, by number of members with disabilities (a) and age category of member with disabilities in households with one disabled member (b)
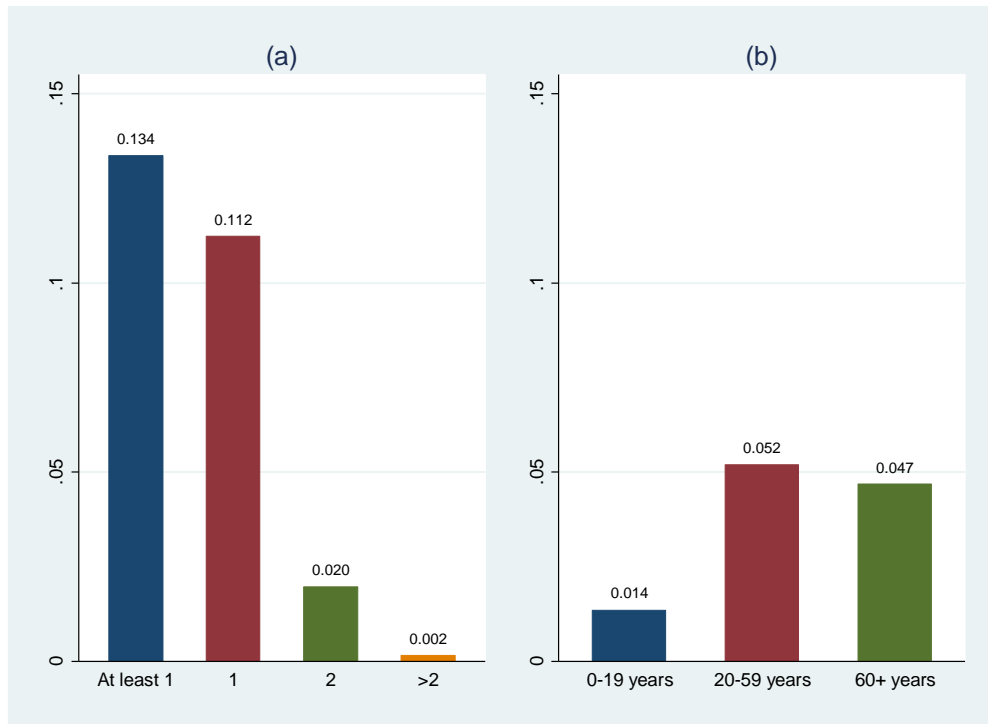
Table A1. Description of variables

Variable	Definition
Dependent variable	
Standard of Living (SOL)	Composite index of household durable goods, housing characteristics and access to utilities
Disability variables (and models)	
Household with at least one disabled member	= 1 if household contains at least one member with disability; = 0 otherwise
Household composition of disability	= 1 if household contains at one member with disability; = 2 if household contains two or more members with disability; = 0 if otherwise
Life cycle of household with disabilities	= 1 if household contains one member with disability aged 0-19 years; = 2 if household contains one member with disability aged 20-59 years; = 3 if household contains one member with disability aged 60 years and above; = . if household contains two or more members with disability; = 0 if otherwise
Other independent variables	
Ln(Income)	Natural log of total household consumption expenditure (food and non-food)
Household size	Number of persons in the household
Number of children in household	Number of persons aged less than ten years in the household
Age of household head	Age of the household head in years
Sex of household head	= 1 if household head is male; = 0 if female
Married status of household head	= 1 if household head is married; = 0 if otherwise
Education level of household head	= 1 if household head completed primary school or above; = 0 if otherwise
Working status of household head	= 1 if household head engaged in paid productive activities in the past 7 days; = 0 otherwise
Rural urban location	= 1 if household resides in an urban area; = 0 if in a rural area
Province of residence	24 provincial dummies
Year of interview	= 1 if 2009; = 2 if year 2010; = 3 if year 2011; = 4 if year 2012; = 5 if year 2013; = 6 if year 2014

Table A2. Tests of the functional form

	(1)	(2)	(3)	(4)	(5)
At least one disabled member in household	-0.314***	-0.301***	-0.292***	-0.270***	0.839
	(0.039)	(0.039)	(0.038)	(0.037)	(0.640)
Consumption expenditure	0.000***	0.000***			
	(0.000)	(0.000)			
Consumption expenditure squared		-0.000***			
		(0.000)			
Square root of consumption expenditure			0.003***		
			(0.000)		
Natural log of consumption expenditure				1.564***	1.577***
				(0.043)	(0.044)
Natural log of consumption expenditure*At least one disabled member					-0.082*
					(0.047)
Other control variables					
Household size	Y	Y	Y	Y	Y
Number of children in household (< 10 years age)	Y	Y	Y	Y	Y
Age of household head	Y	Y	Y	Y	Y
Sex of household head	Y	Y	Y	Y	Y
Household head married	Y	Y	Y	Y	Y
Household head completed primary school	Y	Y	Y	Y	Y
Household head working (past 7 days)	Y	Y	Y	Y	Y
Location dummies	Y	Y	Y	Y	Y
Provincial dummies	Y	Y	Y	Y	Y
Time dummies	Y	Y	Y	Y	Y
Akaike Information Criterion	143885.8	142075.1	141305.1	139663.6	139660.7
R-squared	0.590	0.609	0.616	0.632	0.632
Observations	38,910	38,910	38,910	38,910	38,910

Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Figure A1. Histogram of standard-of-living index at country level