Original article

Out-of-pocket Costs of Disabilities and Their Association with Household Socioeconomic Status Among School-aged Children in Vietnam

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Abstract

Objective: The aim of this study was to assess the economic burden of disability of school-aged children and to evaluate the association between disabilities and household socioeconomic status, as well as the economic burden of disability and household socioeconomic status in Vietnam.

Materials and Methods: Nationally representative data for 9,882 children aged 6 to 17 years from the Vietnam Household Living Standard Survey 2006 were used. Disabilities were measured in six basic functional domains, including vision, hearing, remembering or concentrating, mobility, self-care, and communication. We evaluated the association between area, household income, educational attainment, or occupation of household head, and each difficulty. The ratio of health-care expenditure to per capita household income was compared by presence of a disability as well as household socioeconomic status.

Results: The prevalence of difficulty was 1.9% for vision and 2.3% for at least one of the other five domains. Difficulty in vision was more prevalent in the richer households (p=0.001), whereas difficulty in the other five domains was more prevalent in the poorer households (p=0.002). The ratio of health-care expenditure to per capita household income was greater than 0.05 in 4.6% of children. The adjusted odds ratio of children with difficulty in vision having a health-care expenditure share greater than 0.05 compared with children without difficulty was 4.78 (95% CI: 2.95, 7.73; p<0.001), and that for difficulty in the other five domains was 3.13 (95% CI: 2.04, 4.80; p<0.001). Among children with difficulty in at least one of the five domains other than vision, the proportion of children with a health-care expenditure share greater than 0.05 was higher among children from the poorer households (p=0.033).

Conclusions: Children with a disability spent more on health care relative to their income than those without. Visual disability was more prevalent among children from the richer households, whereas other disabilities were more prevalent among children from the poorer households.

Key words: disability, economic cost, socioeconomic status, children, Vietnam

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Introduction

The Global Burden of Disease 2004 data estimated that 186 million (2.9%) of the world's population were severely disabled and another 797 million (12.4%) had moderate long-term disability[1]. Disability is not found in the elderly exclusively; children are also affected. The average global prevalence of moderate and severe disability in children is 93 million (5.1%)[1]. However, the situation with regard to children with disabilities has often been neglected[2]. The proportion of children among all age groups suffering both moderate and severe disability is higher in low- and middle-income countries than in high-income countries[1]. Previous research on childhood disability in low- and middle-income countries focused on intellectual and hearing disabilities, and little is known about other types of disabilities[3].

Presence of disability is considered as a key component of quality-of-life evaluation[4]. Children with disabilities continue to face discrimination and restricted access to social services up to adulthood[5]. The impacts depend on the social and environmental situations of a country. For example, vision problems correctable by glasses accounted for 40

percent of disabled children not attending school in Brazil[6].

Development of principles and standard scales for disabilities that are sensitive to cultural and resource differences has long been desired. After the United Nations International Seminar on Measurement of Disability in 2001, the Washington Group on Disability Statistics (Washington Group) was formed under United Nations sponsorship and developed a set of general disability measures that have been used by several countries in censuses and surveys. The questions use the World Health Organization's International Classification of Functioning, Disability, and Health as a conceptual framework and focus on functioning in basic actions[7].

The disability status of the population has been a concern in Vietnam due to prolonged periods of war[8]. In 2006, the Washington Group disability measures were translated into Vietnamese and included in the questionnaire of the Vietnam Household Living Standard Survey.

Disability affects economic well-being. Economic burden had been expressed as a percentage of health-care expenditure relative to household income, with the rationale that a high percentage means that "it is likely to force household members to cut their consumption of other minimum needs, trigger productive asset sales or high levels of debt, and lead to impoverishment[9]". A study on data from the World Health Survey in 2002–2004 in 14 developing countries showed that households with disabilities experienced higher ratios of health-care to total household expenditure than households without disabilities in two-thirds of countries[10]. Although the Vietnamese government is developing a universal health insurance system, households with members suffering disabilities have to pay extra expenses for examination, treatment, rehabilitation, and other costs related to health-care use[11]. The economic burden on households with children with disabilities has become a concern[8].

Further, the disability statuses of children differ according to the socioeconomic statuses of their families. Data from the World Health Surveys in 14 countries showed that persons with disabilities are significantly worse off in two or more dimensions of economic well-being (education, employment, assets/living conditions, household expenditures, and household expenditures on health care)[10]. On the other hand, study of the Multiple Indicator Cluster Survey data in 20 countries did not indicate a consistent relationship[5]. Pattern of associations differ by countries and type of disabilities; there are still controversial issues that need to be resolved based on evidence.

The objectives of this study were to assess the economic burden of disability in different functional domains among school-aged children in Vietnam and to evaluate the association between presence of disability and demographic and

household characteristics of children, as well as between economic burden of disability and demographic and household characteristics of children, using a large national representative sample.

Materials and methods

Data source

We used data from the Vietnam Household Living Standard Survey 2006. The Vietnam Household Living Standard Survey has been conducted nationwide by the General Statistics Office, Ministry of Planning and Investment, Vietnam in 1993, 1998 and every 2 years since 2002. Survey households were chosen using a multistage stratified cluster sampling process in which representative clusters were selected from all 64 provinces in Vietnam, and a random sample of households was selected within each cluster. Information collected regularly in every survey included basic demographic characteristics, educational attainment, health care use, and employment for all household members; household income and expenditure; and housing condition. Information was collected through face-to-face interviews with household heads, and key commune officials. The survey employed intensive interviewer training, standardized measurement tools and techniques, and instrument pretesting.

The reason for selecting the survey conducted in 2006 was that it was the latest survey that had collected information about disability. The survey was conducted among a total of 9,189 households in May and September 2006.

Use of the Vietnam Household Living Standard Survey data for this study was approved by the General Statistics Office, Ministry of Planning and Investment, Vietnam. The data set used in this study was provided by the General Statistics Office and did not contain personally identifiable information.

Variables

Two types of main outcome variable were presence of difficulties that were result of some physical or mental health problems, and health-care expenditure in the past 12 months.

Presence of difficulties was assessed according to the standard set of questions recommended by the Washington Group. The validity of this scale in the surveys in Asian and Pacific countries confirmed previously[12]. The questions aimed to identify difficulties in six functional domains: vision (vision difficulties or problems), hearing (hearing limitation or problems), remembering or concentrating (problems with remembering or thinking that contribute to difficulty in doing daily activities), mobility (limitation or

problems getting around on foot), self-care (problems with taking care of yourself independently), and communication (problems with talking, listening, or understanding speech such that it contributes to difficulty in doing daily activities). Furthermore, the response categories captured the degree or severity of the difficulty; the response options were no, at least some difficulty, at least a lot of difficulty, and unable to do it at all. In this study, we dichotomized the response into no and yes (at least some difficulty or more).

Information regarding expenses related to use of medical services was collected for each household member who had used health-care services in the past 12 months. The expenses included out-of-pocket payment for medical service, treatment, and other related costs, such as bonuses for medical staff, and transportation fees. The unit of measurement was 1000 Vietnamese Dong (VND) (equivalent to 0.063-0.066 United States Dollars during the survey periods). We did not include payment for non-prescribed medicine, medical tools, health insurance, and aid, because information about them was not collected at the individual level.

Independent variables included sex, age, area (urban, and rural), household income in the past 12 months, educational attainment, and occupation of household head. Age was categorized into three groups: 6–10, 11–14, and 15–17 years, each corresponding to modal age for a primary school, a lower secondary school, and an upper secondary school, respectively. Household income was calculated as total household revenue minus total expenditure for the revenue-generating activities and divided into quintiles.

Statistical analysis

Data were collected from all chosen households (100% response rate). We analyzed all children (n=9,882) between 6 and 17 years of age in survey households. The analysis did not account for the intra-household correlation because a small proportion of households (7.6%) had more than one child with disabilities. The data set included the household sampling weight for each household, which had been calculated as the inverse of its household selection probability. We used the weight to take into account the multistage sampling design for all analyses.

The prevalence of difficulty in six functional domains was calculated by sex, age, area, household income, educational attainment, and occupation of household head. The difference in prevalence by these characteristics was assessed with a logistic regression analysis.

The multivariable logistic regression analysis required ten cases per independent indicator variable in the model[13]. In the subsequent analysis, a combined variable for difficulty in hearing, remembering or concentrating, mobility, self-care, or communication was used instead of using separate variables for difficulty in each domain. The frequency of having difficulty in vision was high enough for a multivariable analysis, and this domain was not combined.

The per capita household income was calculated by dividing household income by the number of household members. Then the ratio of the mean health-care expenditure to the mean per capita household income in the past 12 months was computed for each difficulty status. To compare the ratio by difficulty status, a dichotomous variable to indicate whether the ratio was greater than 0.05 or not was created and used as a dependent variable in the logistic regression models. The choice of 0.05 was based on the lower threshold value for catastrophic impact of health-care expenditure share used by van Doorslaer[14].

The ratio of the mean health-care expenditure to the mean per capita household income was also compared by characteristics of subjects among all children, among children with difficulty in vision, and among children with difficulty in hearing, remembering or concentrating, mobility, self-care, or communication. The odds ratio was adjusted for sex, age, area, household income in the past 12 months, educational attainment, and occupation of household head.

Results

Among 9,882 children, 397 (4.0%) children had at least one type of disability.

Table 1 shows the prevalence of difficulty in six functional domains marginally and by demographic and household characteristics of the 9,882 children. The overall prevalence of difficulty were 1.9% for vision, 0.5% for hearing, 1.0% for remembering or concentrating, 0.6% for mobility, 0.8% for self-care, and 0.9% for communication.

Table 2 shows the adjusted odds ratios of difficulties in vision as well as those in hearing, remembering or concentrating, mobility, self-care, or communication for each characteristics of subjects. Difficulties in vision were more prevalent among girls than boys, among children who were 11–17 years of age than those who were 6–10 years of age, and in urban areas than rural areas. With regard to the association between difficulty and household income, the direction of association differed between difficulty in vision and difficulty in the other domains: household income of a child with difficulty in vision was higher than that of a child without difficulty in vision, whereas household income of a child with difficulty in domains other than vision was lower than that of a child without difficulty in domains other than vision.

With regard to all subjects, the average per capita household income was 7441.2 thousand Vietnamese dong, or 469–491 United States dollars; per capita total household

Table 1 Prevalence of difficulty in six functional domains by demographic and household characteristics of children

	N	Vision	Functional domains Hearing, remembering or concentrating, mobility, self-care, or communication					
			Total	Hearing	Remembering or concentrating	Mobility	Self-care	Communication
Overall	9882	186 (1.9%)	223 (2.3%)	49 (0.5%)	98 (1.0%)	58 (0.6%)	82 (0.8%)	93 (0.9%)
Sex								
Boy	5032	71 (1.4%)	119 (2.4%)	27 (0.5%)	53 (1.1%)	29 (0.6%)	51 (1.0%)	52 (1.0%)
Girl	4850	114 (2.4%)	104 (2.1%)	22 (0.5%)	45 (0.9%)	29 (0.6%)	31 (0.6%)	41 (0.8%)
		p=0.002	p=0.459	p=0.614	p=0.539	p=0.849	p=0.047	p=0.328
Age								
6-10	3132	33 (1.1%)	89 (2.8%)	16 (0.5%)	33 (1.1%)	12 (0.4%)	44 (1.4%)	31 (1.0%)
11-14	3641	81 (2.2%)	63 (1.7%)	17 (0.5%)	32 (0.9%)	19 (0.5%)	19 (0.5%)	30 (0.8%)
15-17	3109	72 (2.3%)	71 (2.3%)	16 (0.5%)	33 (1.1%)	27 (0.9%)	20 (0.6%)	31 (1.0%)
		Trend p <0.001	Trend p =0.197	Trend p =0.909	Trend p =0.979	Trend p =0.017	Trend p =0.003	Trend p =0.971
Area								
Urban	2198	104 (4.7%)	39 (1.8%)	8 (0.4%)	14 (0.6%)	12 (0.6%)	21 (1.0%)	13 (0.6%)
Rural	7684	82 (1.1%)	184 (2.4%)	41 (0.5%)	84 (1.1%)	46 (0.6%)	61 (0.8%)	80 (1.0%)
		p<0.001	p=0.090	p=0.271	p=0.066	p=0.814	p=0.484	p=0.044
Household income								
1st quintile (lowest)	2542	18 (0.7%)	82 (3.2%)	20 (0.8%)	35 (1.4%)	18 (0.7%)	26 (1.0%)	37 (1.5%)
2nd quintile	2341	28 (1.2%)	60 (2.6%)	15 (0.6%)	30 (1.3%)	19 (0.8%)	19 (0.8%)	26 (1.1%)
3rd quintile	1948	32 (1.7%)	35 (1.8%)	8 (0.4%)	17 (0.9%)	5 (0.2%)	12 (0.6%)	15 (0.8%)
4th quintile	1575	42 (2.7%)	21 (1.4%)	4 (0.3%)	11 (0.7%)	5 (0.3%)	11 (0.7%)	7 (0.4%)
5th quintile (highest)	1474	65 (4.4%)	24 (1.6%)	2 (0.1%)	5 (0.3%)	12 (0.8%)	13 (0.9%)	9 (0.6%)
		Trend p <0.001	Trend p <0.001	Trend p <0.001	Trend p <0.001	Trend p =0.545	Trend p =0.503	Trend p =0.001
Educational attainment of household head								
Primary school graduate or none	2779	38 (1.4%)	49 (1.8%)	16 (0.6%)	20 (0.7%)	10 (0.4%)	19 (0.7%)	16 (0.6%)
Lower secondary school graduate	3122	65 (2.1%)	79 (2.5%)	22 (0.7%)	43 (1.4%)	22 (0.7%)	24 (0.8%)	39 (1.3%)
Upper secondary school graduate	1219	44 (3.6%)	19 (1.5%)	2 (0.2%)	6 (0.5%)	7 (0.6%)	11 (0.9%)	2 (0.2%)
Junior college degree, bachelor's degree, or higher	2761	39 (1.4%)	76 (2.8%)	9 (0.3%)	29 (1.0%)	20 (0.7%)	28 (1.0%)	36 (1.3%)
		Trend p =0.523	Trend p =0.064	Trend p =0.054	Trend p =0.789	Trend p =0.151	Trend p =0.116	Trend p =0.079
Occupation of household head								
Leaders, professionals, or staffs in any fields	725	35 (4.8%)	11 (1.6%)	2 (0.3%)	3 (0.4%)	7 (1.0%)	8 (1.1%)	3 (0.4%)
Skilled workers in personal services and sales	245	10 (3.9%)	5 (2.0%)	2 (0.8%)	3 (1.2%)	0	0	2 (0.8%)
Skilled workers in agriculture and fisheries	406	5 (1.2%)	8 (2.0%)	2 (0.5%)	5 (1.2%)	0 (0.1%)	2 (0.4%)	4 (1.0%)
Skilled handicraftsman and other skilled manual workers	1092	38 (3.5%)	18 (1.6%)	3 (0.3%)	10 (0.9%)	5 (0.5%)	6 (0.5%)	5 (0.5%)
Assemblers and machine operators	269	5 (1.9%)	3 (1.0%)	2 (0.7%)	2 (0.7%)	1 (0.4%)	1 (0.4%)	1 (0.4%)
Unskilled workers	6360	76 (1.2%)	157 (2.5%)	35 (0.6%)	64 (1.0%)	43 (0.7%)	57 (0.9%)	66 (1.0%)
Armed forces	18	0	1 (4.4%)	0	1 (4.4%)	1 (4.4%)	1 (4.4%)	1 (4.4%)
Not working	767	18 (2.3%)	20 (2.6%)	3 (0.4%)	10 (1.3%)	1 (0.2%)	7 (1.0%)	10 (1.3%)
		p<0.001	p=0.402	p=0.719	p=0.582	p=0.104	p=0.442	p=0.226

Data for per capita household income and educational attainment of the household head were missing in 2 cases and 1 case, respectively. The p-values were calculated with logistic regression analyses.

expenditure was 5350.6 thousand dong, or 337–353 dollars; and health-care expenditure was 95.0 thousand dong, or 6 dollars.

Table 3 compares the ratio of health-care expenditure to per capita household income between children with a specific disability and those without. The overall ratio was 0.0128.

The proportion of children with a ratio greater than 0.05 was 4.6% and was higher among children with difficulty in vision, remembering or concentrating, mobility, self-care, and communication than those without these respective difficulties. Among children with difficulty in vision, both household income and health-care expenditure were higher

Table 2 Relation between having difficulties and demographic and household characteristics of children

	Difficulties in vision			Difficulties in hearing, remembering or concentrating, mobility, self-care or communication		
	OR	(95%CI)		OR	(95%CI)	
Sex						
Boy	Reference			Reference		
Girl	1.70	(1.23, 2.37)	p=0.002	0.91	(0.69, 1.20)	p=0.513
Age						
6–10	Reference			Reference		
11–14	2.10	(1.35, 3.27)	p=0.001	0.61	(0.43, 0.86)	p=0.004
15–17	2.09	(1.34, 3.28)	p=0.001	0.84	(0.60, 1.18)	p=0.319
	Trend p=0.001			Trend p=0.300		
Area						
Urban	Reference			Reference		
Rural	0.34	(0.23, 0.50)	p<0.001	1.04	(0.69, 1.56)	p=0.842
Household income						
1st quintile (lowest)	Reference			Reference		
2nd quintile	1.35	(0.73, 2.49)	p=0.333	0.83	(0.58, 1.19)	p=0.301
3rd quintile	1.50	(0.82, 2.73)	p=0.184	0.60	(0.39, 0.92)	p=0.020
4th quintile	1.93	(1.05, 3.55)	p=0.034	0.46	(0.27, 0.77)	p=0.004
5th quintile (highest)	2.54	(1.39, 4.66)	p=0.003	0.55	(0.32, 0.94)	p=0.029
	Trend p=0.001			Trend p=0.002		
Educational attainment of household head						
Primary school graduate or none	Reference			Reference		
Lower secondary school graduate	1.25	(0.81, 1.93)	p=0.319	1.57	(1.08, 2.27)	p=0.017
Upper secondary school graduate	1.30	(0.77, 2.17)	p=0.327	1.08	(0.59, 1.98)	p=0.804
Junior college degree, bachelor's degree, or higher	0.82	(0.49, 1.35)	p=0.426	1.47	(1.02, 2.11)	p=0.040
	Trend p=0.380			Trend p=0.124		
Occupation of household head						
Leaders, professionals, or staffs in any fields	Reference			Reference		
Skilled workers in personal services and sales	0.87	(0.38, 1.96)	p=0.731	1.17	(0.39, 3.53)	p=0.782
Skilled workers in agriculture and fisheries	0.43	(0.16, 1.21)	p=0.111	1.09	(0.43, 2.76)	p=0.858
Skilled handicraftsman and other skilled manual workers	1.00	(0.59, 1.70)	p=0.999	0.88	(0.39, 1.97)	p=0.757
Assemblers and machine operators	0.36	(0.13, 0.98)	p=0.045	0.63	(0.17, 2.35)	p=0.490
Unskilled workers	0.48	(0.29, 0.80)	p=0.004	1.19	(0.62, 2.30)	p=0.606
Armed forces	–			3.27	(0.38, 27.94)	p=0.279
Not working	0.67	(0.33, 1.36)	p=0.263	1.32	(0.59, 2.95)	p=0.492

The odds ratios were adjusted for all other characteristics.

among children without difficulty in vision, respectively. On the other hand, among children with difficulty in hearing, remembering or concentrating, mobility, self-care, or communication, household income was lower and health-care expenditure was higher than among children without difficulty, respectively.

Table 4 compares the ratio of health-care expenditure to per capita household income among all children who were 6–17 years of age by their characteristics. The proportion of children with a ratio being greater than 0.05 was higher among children from the poorer households.

Table 5 compares the ratio of health-care expenditure to per capita household income among children with difficul-

ties in vision by their characteristics. In rural areas, household income was lower and health-care expenditure was higher compared with urban areas, among children with a difficulty in vision. The proportion of children with a ratio greater than 0.05 was higher in rural areas than urban areas.

Table 6 compares the ratio of health-care expenditure to per capita household income among children with difficulties in hearing, remembering or concentrating, mobility, self-care, or communication by their characteristics. The proportion of children with a ratio greater than 0.05 was higher among children from the poorer households.

The goodness-of-fit of the multivariable logistic regression model was higher for analysis in children with difficul-

Table 3 Per capita household income and health-care expenditure in the past 12 months

	Per capita house-hold income (1000 VND) [A]	Health-care expenditure (1000 VND) [B]		[B]/[A]	[B]/[A]>0.05			
	Mean (SD)	Mean (SD)	Share of inpatient care expenditure		%	OR	(95%CI)	
Overall	7441.2 (9043.1)	95.0 (887.9)	54.9%	0.0128	4.6%	–		
Children with difficulties in specific domains								
Vision								
No	7382.2 (9052.6)	81.3 (709.5)	53.4%	0.0110	4.4%	Reference		
Yes	10521.5 (7969.7)	807.4 (3901.1)	62.9%	0.0767	14.6%	4.78	(2.95, 7.73)	p<0.001
	p<0.001	p<0.001						
Hearing, remembering or concentrating, mobility, self-care, or communication								
No	7467.9 (9059.6)	83.3 (792.7)	50.2%	0.0112	4.4%	Reference		
Yes	6284.0 (8234.2)	601.0 (2735.9)	83.1%	0.0956	13.3%	3.13	(2.04, 4.80)	p<0.001
	p<0.001	p<0.001						
Hearing								
No	7454.2 (9061.6)	94.8 (888.4)	54.9%	0.0127	4.6%	Reference		
Yes	4827.1 (2777.5)	133.6 (783.7)	54.2%	0.0277	6.8%	1.33	(0.49, 3.62)	p=0.578
	p<0.001	p<0.001						
Remembering or concentrating								
No	7461.8 (9073.7)	91.6 (845.4)	53.6%	0.0123	4.5%	Reference		
Yes	5391.7 (4743.5)	430.1 (2845.4)	82.3%	0.0798	14.3%	3.22	(1.78, 5.81)	p<0.001
	p<0.001	p<0.001						
Mobility								
No	7441.8 (9055.9)	85.7 (810)	51.2%	0.0115	4.5%	Reference		
Yes	7341.7 (6615.2)	1656.5 (4567.1)	87.0%	0.2256	24.8%	7.49	(3.90, 14.38)	p<0.001
	p<0.001	p<0.001						
Self-care								
No	7438.1 (9014.6)	86.7 (807.7)	51.3%	0.0117	4.5%	Reference		
Yes	7809.8 (12029.1)	1079.7 (4023.4)	89.7%	0.1382	16.2%	3.99	(2.06, 7.74)	p<0.001
	p<0.001	p<0.001						
Communication								
No	7460.0 (9069.7)	89.7 (825.3)	52.8%	0.0120	4.5%	Reference		
Yes	5456.8 (5231.6)	649.4 (3447.4)	84.8%	0.1190	14.9%	3.46	(1.91, 6.28)	p<0.001
	p<0.001	p<0.001						

P-values compairing per capita household income or healthcare expenditure by difficulty status were obtained with Mann-Whitney U tests. The odds ratios compared the odds of [B]/[A]>0.05 between children with a specific disability and those without. The odds ratios were adjusted for sex, age, area, household income, and educational attainment and occupation of household head.

ties than in all children: the pseudo R^2 of the multivariable logistic regression model was 0.013 among all children, 0.163 among children with difficulty in vision, and 0.231 among children with difficulty in hearing, remembering or concentrating, mobility, self-care, or communication.

Discussion

We used a large national representative sample to present the economic burden of disabilities by different functional domains among school-aged children and its association with demographic and household characteristics of children

in Vietnam. We also showed the association between socio-economic status and disabilities. The ratio of health-care expenditure to per capita household income was higher among children who had a difficulty in vision, remembering or concentrating, mobility, self-care, or communication compared with those who did not have the respective difficulty. There was a relation between household income and the presence of difficulty in vision, as well as between household income and the presence of difficulty in hearing, remembering or concentrating, mobility, self-care, or communication: difficulty in vision was more prevalent in richer households; on the other hand, difficulty in hearing, remembering or con-

Table 4 Ratio of health-care expenditure to per capita household income among all children who were 6–17 years of age

	Per capita household income [A] (1000 VND)		Health-care expenditure [B] (1000 VND)		[B]/[A]	[B]/[A]>0.05		
	Mean	(SD)	Mean	(SD)		%	OR	(95%CI)
Overall	7441.2	(9043.1)	95.0	(887.8)	0.0128	4.6%	–	
Area								
Urban	12349.6	(13779.1)	126.6	(945.6)	0.0103	4.0%	Reference	
Rural	6036.5	(6480.7)	86.0	(870.4)	0.0142	4.8%	0.91	(0.69, 1.22) p=0.535
Household income								
1st quintile (lowest)	2607.1	(642.9)	44.8	(448.6)	0.0172	5.3%	Reference	
2nd quintile	4324.0	(465.6)	91.3	(746.9)	0.0211	6.0%	1.13	(0.87, 1.45) p=0.364
3rd quintile	6215.7	(642.9)	130.5	(1500.5)	0.0210	4.6%	0.82	(0.61, 1.10) p=0.191
4th quintile	9090.6	(1068.7)	96.1	(685)	0.0106	3.0%	0.52	(0.36, 0.75) p=0.001
5th quintile (highest)	20582.2	(17665.2)	139.3	(754)	0.0068	3.0%	0.53	(0.36, 0.80) p=0.002
							Trend p<0.001	
Educational attainment of household head								
Primary school graduate or none	6528.2	(6541.5)	84.6	(681.4)	0.0130	4.9%	Reference	
Lower secondary school graduate	7223.7	(6977.3)	107.5	(1138.1)	0.0149	4.8%	1.03	(0.80, 1.33) p=0.793
Upper secondary school graduate	11528.2	(14240.1)	136.2	(1135.5)	0.0118	4.5%	1.13	(0.79, 1.63) p=0.497
Junior college degree, bachelor's degree, or higher	6800.9	(9819.9)	73.2	(564.8)	0.0108	4.2%	0.86	(0.66, 1.13) p=0.279
							Trend p=0.319	
Occupation of household head								
Leaders, professionals, or staffs in any fields	14587.6	(19354.9)	120.7	(693.7)	0.0083	2.9%	Reference	
Skilled workers in personal services and sales	12555.6	(18497.1)	142.9	(929.3)	0.0114	4.5%	1.35	(0.61, 2.99) p=0.459
Skilled workers in agriculture and fisheries	8658.4	(11815.4)	99.3	(548.3)	0.0115	5.8%	1.76	(0.91, 3.41) p=0.092
Skilled handicraftsman and other skilled manual workers	7300.0	(5111.7)	114.2	(801.1)	0.0156	5.2%	1.45	(0.82, 2.56) p=0.205
Assemblers and machine operators	11464.5	(9493.2)	84.7	(662.9)	0.0074	3.9%	1.25	(0.53, 2.97) p=0.612
Unskilled workers	6082.9	(5630.6)	92.5	(992.7)	0.0152	4.7%	1.25	(0.75, 2.10) p=0.389
Armed forces	14426.3	(5345.6)	40.6	(82.1)	0.0028	0.0%	–	
Not working	8288.8	(10242.1)	51.9	(157.5)	0.0063	4.7%	1.40	(0.76, 2.58) p=0.280

The odds ratios were adjusted for sex, age, and all other characteristics. The pseudo R^2 of the multivariable logistic regression model was 0.013.

centrating, mobility, self-care, or communication was more prevalent in poorer households.

In the Vietnam Household Living Standard Survey 2006, disability was measured by the international standard measurement tool. The estimated prevalence of difficulty in Vietnamese children ranged from 0.5% for hearing to 1.9% for vision. The prevalence of disability among children in low- and middle-income countries has varied across studies. For example, the prevalence of visual impairment varied between 0.1% and 12.5%; the prevalence of hearing impairment between 0.4% and 19.7%; and the prevalence of intellectual disability between 0.09% and 18.3%[3]. The prevalence of difficulty estimated in this study was within the range of previous reports in low- and middle-income countries.

Households with children with a disability spent more on health care than households without such children. Regarding difficulty in vision, the increase in the economic burden of health care among children with disability was caused by substantially higher health-care expenditure. The higher household income among children with difficulty in vision

than children without this difficulty diluted the influence of the increase in the health-care expenditure for difficulty in vision. The share of inpatient care expenditure relative to total health-care expenditure among children with difficulty in vision was not as high as that among children with disabilities in other domains. This low share of inpatient care is consistent with the fact that among the pediatric population in the UK, the proportion of children who received hospital eye services and required hospital admission was low (less than 10%) and with the fact that the total cost of ophthalmic surgery and inpatient eye services was less than that of ophthalmology outpatient eye services[15].

Regarding difficulties in other domains, the difference in the ratio was caused by both relatively lower income and substantially higher health-care expenditure among children with a disability than those without the respective disability. Households with children with difficulty in hearing, remembering or concentrating, mobility, self-care, or communication tended to be poorer than those without children with difficulties. With the exception of difficulty in hearing, more than 80% of high health-care expenditure were for in-

Table 5 Ratio of health-care expenditure to per capita household income among children with difficulty in vision

	Per capita household income [A] (1000 VND)		Health-care expenditure [B] (1000 VND)		[B]/[A]	[B]/[A]>0.05		
	Mean	(SD)	Mean	(SD)		%	OR	(95%CI)
Overall	10521.5	(7969.7)	807.4	(3901.1)	0.0767	14.6%	-	
Area								
Urban	13450.2	(9074.0)	308.2	(1432.3)	0.0229	8.0%	Reference	
Rural	6811.5	(3937.7)	1439.8	(5603.3)	0.2114	23.1%	5.19	(1.53, 17.60) p=0.008
Household income								
1st quintile (lowest)	2941.3	(498.8)	296.4	(1044.2)	0.1008	16.6%	Reference	
2nd quintile	4319.3	(477.3)	191.0	(365.9)	0.0442	23.3%	2.29	(0.41, 12.59) p=0.342
3rd quintile	6293.8	(694.8)	1665.8	(7964.4)	0.2647	10.7%	0.83	(0.11, 6.03) p=0.853
4th quintile	8979.4	(900.8)	705.1	(2693.2)	0.0785	9.4%	0.87	(0.15, 5.21) p=0.880
5th quintile (highest)	18369.0	(8705.7)	853.5	(2665.9)	0.0465	15.6%	3.24	(0.61, 17.27) p=0.168
							Trend p=0.383	
Educational attainment of household head								
Primary school graduate	9437.2	(9528.8)	586.8	(2222.6)	0.0622	17.4%	Reference	
Lower secondary school graduate	8397.7	(4406.0)	1601.3	(6128.6)	0.1907	20.0%	1.31	(0.47, 3.64) p=0.611
Upper secondary school graduate	14054.0	(10112.1)	197.9	(343.0)	0.0141	9.9%	0.81	(0.16, 4.07) p=0.796
Junior college degree, bachelor's degree, or higher	11153.5	(7011.5)	392.1	(2088.0)	0.0352	8.4%	0.51	(0.11, 2.37) p=0.386
							Trend p=0.303	
Occupation of household head								
Leaders, professionals, or staffs in any fields	13808.2	(5597.7)	524.8	(1932.6)	0.0380	8.6%	Reference	
Skilled workers in personal services and sales	12739.0	(7626.8)	1212.3	(4290.6)	0.0952	7.9%	0.68	(0.04, 12.59) p=0.798
Skilled workers in agriculture and fisheries	7388.3	(1640.2)	1292.3	(2707.2)	0.1749	20.2%	2.80	(0.14, 54.00) p=0.496
Skilled handicraftsman and other skilled manual workers	7424.0	(4390.7)	1068.1	(3417.2)	0.1439	17.1%	1.08	(0.17, 6.79) p=0.935
Assemblers and machine operators	10534.1	(3370.4)	630.5	(860.6)	0.0599	41.9%	9.18	(0.95, 88.46) p=0.055
Unskilled workers	9511.7	(8433.8)	876.3	(5236.1)	0.0921	16.8%	1.15	(0.21, 6.20) p=0.871
Not working	14710.4	(13221.9)	205.4	(290.6)	0.0140	6.2%	0.52	(0.04, 7.47) p=0.628

The odds ratios were adjusted for sex, age, and all other characteristics. The pseudo R^2 of the multivariable logistic regression model was 0.163.

patient services. There were systematic differences in the mechanisms of high economic burden of disability between difficulty in vision and difficulty in other domains.

In our analysis among children 6–17 years of age, a higher prevalence of disability was observed in the poorer households with regard to disability in hearing, remembering or concentrating, mobility, self-care, and communication. With regard to difficulty in vision, on the other hand, the prevalence was higher among those better off. In studies among adult populations, the prevalence of disability is generally higher among those worse off[16]. It has been reported that a larger percentage of children among those who are less wealthy were screened positive with the disability questions, but the association was not consistent[5]. The possible reason for the reverse trend with regard to difficulty in vision observed in this study is longer study hours among children from better off households than those from worse off households. In Vietnam, besides engaging in the standard school curriculum, children are enrolled in many kinds of academic tutorials to improve their knowledge and skills. These extra classes have proliferated, since teachers often organize home-based classes to supplement their income [17].

Extra classes mean an increased workload for the participating students compared with those not participating. The location can be at school, a teacher's house, or a student's house. Lengthy exposure to such factors as inadequate indoor illumination in the reading environment or a chair or table unsuitably large for a child's body size are reported to adversely impact a student's visual acuity[18, 19]. In addition to known risk factors of visual difficulties, such as retinopathy of prematurity and family history of high refractive error[20], these environmental conditions and lifestyles are now suggested as modifiable causes. The increase in the working hours of children under uncontrolled conditions is considered as a potential concern for child visual development.

The authors hypothesized that the different impact of health-care expenditure by demographic and household characteristics of subjects was captured by the fitness of the regression model to the observed data. The model, which included socioeconomic factors, namely household income, educational attainment, and occupation of the household head, explained the variation in the ratio of health-care expenditure to the per capital household income better in the analysis including only children with a disability than in

Table 6 Ratio of health-care expenditure to per capita household income among children with difficulty in hearing, remembering or concentrating, mobility, self-care, or communication

	Per capita household income [A] (1000 VND)		Health-care expenditure [B] (1000 VND)		[B]/[A]	[B]/[A]>0.05			
	Mean	(SD)	Mean	(SD)		%	OR	(95%CI)	
Overall	6284.0	(8234.2)	601.0	(2735.9)	0.096	13.3%	–		
Area									
Urban	12824.1	(16921.9)	282.8	(675.7)	0.022	15.4%	Reference		
Rural	4907.6	(3477.6)	668.0	(2991.4)	0.136	12.9%	1.34	(0.29, 6.26)	p=0.710
Household income									
1st quintile (lowest)	2618.1	(632.8)	349.0	(2097.2)	0.133	11.9%	Reference		
2nd quintile	4322.5	(506.4)	749.1	(2560.5)	0.173	17.0%	1.05	(0.32, 3.43)	p=0.929
3rd quintile	6222.9	(687.4)	937.6	(4695.9)	0.151	11.1%	0.15	(0.03, 0.86)	p=0.033
4th quintile	9108.4	(1140.7)	61.4	(85.8)	0.007	0.0%	-		
5th quintile (highest)	21188.9	(18713.3)	1074.0	(2424)	0.051	24.0%	0.59	(0.15, 2.23)	p=0.432
							Trend p=0.033		
Educational attainment of household head									
Primary school graduate	4801.7	(3129.5)	319.8	(1365.7)	0.067	10.1%	Reference		
Lower secondary school graduate	5816.4	(4466.5)	861.3	(3858.1)	0.148	14.2%	1.40	(0.33, 5.85)	p=0.648
Upper secondary school graduate	11232.7	(22455)	1471.4	(3432.9)	0.131	38.4%	12.30	(2.29, 66.07)	p=0.003
Junior college degree, bachelor's degree, or higher	6515.3	(6914.2)	298.1	(1508.6)	0.046	8.4%	0.70	(0.13, 3.68)	p=0.673
							Trend p=0.972		
Occupation of household head									
Leaders, professionals, or staffs in all fields	24946.8	(26821.6)	1751.4	(3303.5)	0.070	28.6%	Reference		
Skilled workers in personal services and sales	5541.4	(1866.3)	92.3	(143.1)	0.017	25.7%	1.40	(0.04, 43.55)	p=0.848
Skilled workers in agriculture and fisheries	6949.9	(4327.8)	1062.1	(2487.6)	0.153	35.9%	0.92	(0.10, 8.60)	p=0.944
Skilled handicraftsman and other skilled manual workers	6118.2	(3232.9)	264.8	(378.6)	0.043	29.3%	0.42	(0.05, 3.73)	p=0.439
Assemblers and machine operators	8885.6	(5298.1)	969.6	(932.7)	0.109	72.2%	-		
Unskilled workers	4917.6	(4013.0)	611.4	(3070.9)	0.124	7.6%	0.09	(0.01, 0.65)	p=0.017
Armed forces	10092.0		0.0		-	0.0%	-		
Not working	5985.4	(4888.2)	79.9	(121.6)	0.013	15.5%	0.35	(0.02, 5.65)	p=0.462

The odds ratios were adjusted for sex, age, and all other characteristics. The pseudo R^2 of the multivariable logistic regression model was 0.231.

the analysis including all children. This finding was interpreted as indicating that the association between socioeconomic status and household burden was stronger; in other words, the impacts of differences in socioeconomic status on the household burden of health-care expenditure were higher for children who had disabilities than for those who did not. Socioeconomically disadvantaged children not only suffered from higher risk of disability but also experienced heavier disadvantage from their socioeconomic status when they had a disability compared with those who were well off. More attention should be paid to reducing the disadvantage caused by poor socioeconomic conditions when households have children with disabilities. The results of the present study will be useful for the design of equitable health systems in Vietnam.

This study used a nationwide household sample that was representative for the whole country, that is, the 8 regions, urban/rural areas and 64 provinces in Vietnam. The sample size was large, allowing us to reliably estimate the prevalence of difficulties and to conduct multivariable analyses.

The information was self-reported, and there is a potential for information bias; however, the magnitude of the bias is considered to be low because of several reasons: The survey employed high-quality interviewer training and standardized data collection procedures across geographic regions; the response rates were high, and there were only a small amount of missing data; and validated measurement scale for disability was used, and the calculated prevalence of disability was within the range from studies in other countries. The survey was originally designed to make an accurate estimation of living standard. Income was measured as a sum of all reported revenue and costs for all types of activities. Health-care expenditure was collected for each member of family and asked separately for inpatient and outpatients care.

The survey was cross-sectional and suitable for estimating prevalence and national average income and expenditure. However, no temporal relation was definitively confirmed because of the possibility of reverse causation. To ascertain if poor socioeconomic status causes difficulty or

difficulty leads to poor socioeconomic status or both, further studies are necessary. This study did not take into account the difference in access to health care. If the poor families had difficulty in accessing health care and did not receive all the needed care, their health-care expenditure would tended to be lower than needed, leading to underestimation of the potentially higher burden of disability among the poor households. Data included siblings living in the same household, and underestimation of standard errors was possible, because the analyses did not take the intraclass correlation into account. The magnitude of the bias, however, is considered to be small because there was only one child with a disability in most of the households.

Conclusion

Health-care needs of children with a disability pose a higher burden on households with lower financial resources. Visual disability was more prevalent among children from richer households, whereas other disabilities were more prevalent among children from poorer households.

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