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The effect of disability on educational, labor market, and marital outcomes in a low-income context

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ABSTRACT

There is limited evidence from low-income countries on the multifaceted effects of disability on an individual's wellbeing. Using a nationally representative sample of 2.8 million individuals, we documented the association between disability and educational, labor market, and marital outcomes in Nepal. We obtained plausibly causal estimates by comparing these outcomes for siblings living in the same household. Individuals with disability were at a severe disadvantage in almost all of the outcomes we evaluated. Compared to siblings without disability, siblings with disability were 16.5 percentage points less likely to be enrolled in school, 6.9 percentage points less likely to be at the appropriate grade level, and 21.4 percentage points less likely to be employed. Consistent with the prevalent discrimination against girls and stigma on disability, individuals with disability had difficulty getting married, and the adverse effects were more pronounced for girls than for boys.

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Data availability

The Stata codes used to clean the data and conduct the statistical analysis are available from the corresponding author on request.

1. Introduction

Disability is one of the least studied dimensions of disadvantage. One billion individuals, or 15% of the world's population, experience some form of disability, and between 110 million and 190 million individuals experience significant disabilities (World Bank, 2020). Yet, with a few notable exceptions (Mitra et al., 2013; Mizunoya et al., 2018; Mizunoya & Mitra, 2013), the empirical evidence on the effect of disability on wellbeing in low- and middle-income countries (LMICs) is scant. This is an important omission because 80% of the all individuals with significant disabilities worldwide live in LMICs (World Bank, 2020). In these countries, social protection policies and programs for individuals with a disability tend to be weak or lacking altogether (Mitra, 2005), and individuals with disability face harsher living conditions and stronger stigma than do their counterparts in high-income countries (Smythe et al., 2020).

From a policy perspective, five out of the 17 Sustainable Development Goals (SDGs) refer to the need to make services—ranging from education, jobs, and political participation—disability inclusive. A recent United Nations flagship report argues that the "lack of data and research on the situation of persons with disabilities severely constrains the international community from monitoring the situation of children, youths and adults with disabilities" (United Nations, 2018) and calls on countries to "assess the situation of persons with disabilities and the challenges they face" (p.18).

This study responds to that call. We document plausibly causal effects of disability on a wide range of educational, labor market, and marital outcomes in Nepal, a low-income country. In addition to answering a policy question of critical importance, we make two main contributions to the existing literature. First, we compare the outcomes for siblings living in the same household using sibling fixed effects, thus reducing confounding due to household-specific, sibling-invariant factors, such as genetic endowment, parental characteristics, access to education, and economic opportunities.

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Second, as discussed in Methods, we move beyond the standard measures of educational attainment and earnings to examine a number of setting-specific outcomes, such as grade-for-age, timing of first marriage, and quality of employment, thus capturing the full extent of the impact of disability at multiple stages of life. In fact, the standard outcomes used in the existing literature (e.g., school enrollment and employment status) may miss many setting-specific nuances, although they provide greater comparability across countries. Capturing the full extent of the effects is critical for designing social protection policies that enable individuals with disability to maintain the same level of wellbeing as individuals without disability. For example, in Nepal, while the government provides a disability allowance (as discussed in the next section), the determination of the amount has so far been *ad hoc*, with limited analysis on its adequacy.

2. Study setting

There is a wide variation in the overall disability prevalence in Nepal reported by different studies and data sources, ranging from 1.9% in the census—consistent with what we report here—to 3.6% in the 2011 Nepal Living Standard Survey (A. Eide et al., 2016) and as high as 21.7% for 2002–2004 reported in the 2011 World Report on Disability (World Health Organization & World Bank, 2011). In terms of the type of disability, of the 513,321 individuals who reported having a disability in the 2011 census, physical disability is the most common (36.3%), followed by vision- and hearing-related disabilities (35.7%) and speech-related disability (11.5%). Other forms of disability constitute the remaining 16.3% (Government of Nepal, 2011). Men have higher rates of disability (2.2%) than women (1.7%).[1]

The prevalence varies by gender and geographic location, and the age profile of those with disability differs from that of those without. The most common disability among men is physical disability (38.6%), followed by vision- and hearing-related disabilities (33.2%), whereas for women, vision- and hearing-related disabilities are more common (38.8%) than physical disability (33.5%). Geographically, the prevalence of disability is 1.2% in urban areas, compared to 2.1% in rural areas. The average age of individuals with disability is 35 years, compared to 22 years for individuals without disability.

Nepal's policy efforts to protect the rights of individuals with disability have been summarized elsewhere (Brigitte, 2020; Poudyal et al., 2018). Briefly, the earliest efforts go back to the *Disabled Protection and Welfare Act* of 1982, although more visible legislative efforts emerged a decade later, with the enactment of *Disabled Protection and Welfare Regulation* in 1994. In the 1990s, a number of policies in other areas such as education and child rights envisioned ensuring the rights of children with disability. These policies include the *Education Act* of 1992, *Child Rights Acts* of 1992 and *Local Self-Government Act* of 1999. In 2007, the *National Policy and Plan of Action on Disability* outlined 17 priorities to empower individuals with disability and promote their training and employment.

The 2015 Constitution that ushered the country into a federal republic following a protracted conflict and a peace process stipulates equal rights and protection from discrimination for individuals with disability. In 2017, the parliament passed the *Rights of Persons with Disabilities Act*, which prohibits discrimination on work and employment based on disability and establishes a disability card system to guide social protection programs (Brigitte, 2020). Individuals with disability are currently categorized based on severity and receive disability identity card in four different colors. Individuals with severe disability receive blue and red disability identity cards and are entitled to government disability allowance of 600 and 2000 rupees a month ($6 -$19), respectively (Holmes et al., 2018).

There are a number of other accommodations that extend to individuals with less severe disability (who receive yellow or white disability identity cards). These include free education, free medical care, reservations in civil service jobs, and a 50% discount in transportation (Poudyal et al., 2018; Thapaliya, 2016). Furthermore, the *Safe Motherhood and Reproductive Health Rights Act of Nepal 2018* requires that the health services provided by the government be disability inclusive.

Despite these policy efforts, substantial barriers continue to exist for individuals with disability. In education, for example, various difficulties, such as lack of resources for inclusive teaching and bullying from peers, hinder enrolment, attendance, and attainment (Banks et al., 2019). Furthermore, gender and poverty often compound with disability and exacerbate the educational marginalization for girls with disability and those from poor households (Banks et al., 2019). Stigma against disability is common. There are other structural barriers, such as the lack of suitable physical infrastructure (e.g., wheelchair-accessible amenities) that hinder individuals with disability from living to their full potential (National Federation of the Disabled - Nepal, 2018); a 2018 report finds that, of the 150 public infrastructures in Kathmandu surveyed, 132 were inaccessible, 18 were partially accessible, and none was fully accessible to individuals with disability (National Federation of the Disabled - Nepal, 2018). To our knowledge, the full extent of these barriers on educational, labor market, and marital outcomes has not been evaluated before.

3. Data

The data used in this study come from Nepal's National Population and Housing Census 2011 (Government of Nepal, 2011), the latest census available. Unlike many censuses, Nepal's census collected information on disability status of all individuals living in the country at the time of the census, in addition to information on demographics, education, housing, asset ownership and employment. We obtained a 15% sample of the census from the Central Bureau of Statistics. Appendix Table A1 shows how we derived the analytic sub-sample from this sample.

The key independent variable is whether an individual has a disability. For each individual, the census asks, "What is the physical and mental disability of (name)?" and provides nine options. The options are 'not disable', 'physical disable', 'blind and low vision', 'deaf and hard of hearing', 'deaf-blind', 'speech problem', 'mental illness', 'intellectual disable', and 'multiple disable'. We categorize an individual as having a disability if they indicated having some form of disability, including "mentally disabled" or "speech problem."[2]

We evaluate a range of outcomes to capture the full extent of the impact of disability at multiple stages of an individual's life (Table 1). As described below, a few of these outcomes are based on the existing literature. Others are specific to the setting, as the former may miss the setting-specific nuances.

As measures of educational outcomes, we assess enrolment status and grade-for-age—whether a child is at the appropriate age for their age—for individuals ages 5–18, and attainment (years of schooling completed) for those who are no longer in school. We include grade-for-age as one of the outcomes because grade repetition rates are high in Nepal, although some progress has been made recently (UNESCO Institute for Statistics, 2012). Lack of inclusive policies on disability may reduce access to learning resources and increase the likelihood of having to repeat a grade, even if the child maintains enrollment. Grade-for-age is likely to capture such circumstances.

[1] These numbers and those reported in the remainder of the paragraph are similar to those obtained from our analytic sample.

[2] It is not clear how the surveyors or the respondents determine the disability status at the time of the survey. Thapaliya (2016) provides definitions of each category (p. 6) and cites the 2011 Census Report of Nepal. However, these definitions are not included in the 2011 Census Report.

Table 1
Key outcomes and inclusion criteria.

Outcome	Outcome indicator	Sample inclusion criteria
Education	Currently in school (binary)	5–18 years
	At the appropriate grade for their age (binary)	5–18 years, in school
	Completed years of education (continuous)	5–60 years, no longer in school
Labor market	Currently employed (binary)	≤60 years, not in school
	Job is full-time & salaried (binary)	≤60 years, not in school, currently employed
Marriage	Early marriage (married before the age of 15) (binary)	Any age, married at least once
	Currently married (binary)	>30 years
	Age at first marriage (continuous)	>30 years, married at least once

Notes: For labor market outcomes, we include all individuals who are no longer in school (as opposed to limiting to individuals above age 18) so that younger individuals—who are more likely to live in the same household—are included in the analysis. The youngest person employed or employed in a full-time job is 10 years old. The findings do not change substantively when we limit the analysis to individuals above the age of 18. We include individuals of all ages when the outcome is 'early marriage'. The lowest age at which an individual has been married in the sample is 10 years and the oldest married individual in the sample is 96 years old.

In absence of data on earnings, we assess employment status and employment in full-year non-agricultural job as outcomes. Employment status is a commonly used measure in studies from high-income countries (Erin et al., 2018; Khayatzadeh-Mahani et al., 2020; Vornholt et al., 2018). We also examine the latter because employment status by itself may not capture the quality of the job. Individuals with disability may be compelled to take up jobs that are temporary, pay low wages, and are riskier—which are deemed as poor quality under multiple frameworks on the quality of employment (Cazes et al., 2015; International Labor Organization, 2013). In this paper, we consider employment in full-year non-agricultural jobs to be good quality employment because they are not temporary and tend to be paid higher wages. According to a recent report, six out of 10 jobs in Nepal are unpaid (Ruppert Bulmer et al., 2020). These non-wage jobs are primarily in agriculture.

For marital outcomes, we assess child marriage (marriage before the age of 15), marital status by age 30, and age at first marriage. Child marriage is a major problem in the country, with 1.3 million women married before the age of 15 (UNICEF, 2019). Discrimination or stigma based on disability can worsen it—parents may get their son with a disability married earlier to bring in extra agricultural labor, and they may marry off their daughter with a disability earlier to reduce strain on household resources (in Nepal, the convention is for married women to move in with their husband's household). Conversely, it is reasonable to expect that individuals with disability may experience reduced marital prospects due to stigma on disability. Therefore, we examine marital status as an outcome for those above age 30 (which is approximately 2 standard deviations above the average age at marriage in the country) and age at first marriage for those who are married at least once.

4. Methods

In order to estimate plausibly causal effect of disability, we compare the outcomes for siblings living in the same household using siblings fixed effects. As is now widely understood, this approach helps reduce confounding due to household-specific, sibling-invariant factors, such as access to education and economic opportunities, and has been used extensively in many areas of health research to generate plausible causal estimates (Fletcher, 2010; Kim et al., 2020, 2021). In disability research, Mizunoya et al. (2018) use the approach to estimate the effect of disability and school attendance in 15 low- and middle-income countries (Mizunoya et al., 2018).

Although one can generally assume that siblings face similar external environments, such as parental care and health risks, there are two major threats to identification one needs to address. The first is that, irrespective of their disability status, girls might be treated differently than boys. The discrimination against girls in South Asia and its implications for the girls' health has been widely documented (Jayachandran & Kuziemko, 2011). To account for such differences, we control for the gender of the child and include an interaction term between disability and gender, and comment on the heterogeneous effects by gender. The second threat is that siblings may be exposed to different external environments based on their year of birth. For example, parental employment status and incomes could change over time, altering the time and money investments that parents can make on their children. To account for such differences, we include birth-year fixed effects in all specifications.

Therefore, the linear relationship we estimate for each outcome takes the following form:

$$Y_{ij} = \pi_1 Disability_{ij} + \pi_2 Female_{ij} + \pi_3 \left(Disability_{ij} \times Female_{ij}\right) + \theta_j + \eta_t + \delta X + v_{ij} \quad (1)$$

In this equation, Y_{i_j} is the outcome for a sibling i in sibling-pair j. *Disability* is a binary variable which equals one if the individual reported having a disability. θ_j and η_t are sibling-pair and birth-year fixed effects, respectively. X represents potential covariates. In all equations, we include the "generation" of the individual within the household; given the structure of the data, this ensures that someone identified as a daughter is not compared to someone identified as a granddaughter—the "generation" variable takes values 0, 1 or 2 for grandparents, parents, and children, respectively. In equations with the employment outcomes, we also include educational attainment as a covariate, as some of the difference in employment status and the type of job between siblings may originate in the difference in their educational attainment. v_{ij} is the usual error term.

π_1 is the key coefficient of interest and captures the relationship between disability status and the outcomes. The expected sign on π_1 depends on the outcome. We expect π_1 to be negative for educational and labor market outcomes; for example, a child with a disability is less likely to be enrolled relative to their sibling without disability. We have no *a priori* expectation about the sign of π_1 for the marital outcomes; the sign depends on the net effect of two offsetting mechanisms discussed in Section 3.

Given the inclusion of gender and birth year in the regressions, the key identifying assumption is that, without disability, two siblings who are of the same gender and born in the same year would have similar outcomes. In the discussion section, we discuss potential threats to this assumption.

To rule out the possibility that some associations may appear to be significant simply due to the high number of hypotheses (eight) we tested, we use Bonferroni-corrected p-values to determine statistical significance of the coefficients. In effect, this means using 0.0125, 0.00625, 0.000125 as the p-value cutoffs for 10%, 5% and 1% significance levels, respectively.

5. Key results

The descriptive characteristics of the analytic sample, which varies by outcome, are in Table 2 Column 1. Given that the analytic sample is a random 15% sample of the census and we do not lose many observations during the cleanup of the data, the numbers can be assumed to hold for the entire country. Consistent with what previous studies and the census report have documented, approximately 2% of the population has some form of disability. However, this is likely underreported significantly, given the low availability of diagnosis services, stigma associated with disability, and the framing of the question in the census which is geared

Table 2
Summary statistics.

	Analytic sample	Mean (SD) or percentage			
		Overall sample	With disability (A)	Without disability (B)	p-value from A-B
Has a disability	2,861,644	1.91			
Currently enrolled (ages 5–18 years)	1,234,095	85.49	67.49	85.7	<0.001
At the appropriate grade for age (ages 5–18 years)	1,051,251	49.29	31.29	49.46	<0.001
Educational attainment, years (ages 5–60 years & no longer in school)	607,486	8.24 (3.77)	7.29 (3.58)	8.25 (3.77)	<0.001
Currently employed (ages ≤60 years & not in school)	644,173	82.10	73.50	82.25	<0.001
Employed in a salaried job (ages ≤60 years, not in school& currently employed)	528,889	43.88	32.44	44.06	<0.001
Married before age 15 (currently married)	1,022,169	6.94	8.47	6.89	<0.001
Married (age ≥30 years)	760,889	97.20	84.79	97.68	<0.001
Age at first marriage, years (age ≥30 years & married at least once)	1,022,169	20.11 (4.73)	20.58 (5.58)	20.09 (4.70)	<0.001

Source: Nepal Housing and Population Census 2011. Note: This table shows the summary statistics for the sample used in the analysis, separately for individuals with disability and those without. Except for educational attainment and age at first marriage, the reported numbers are in percentages. The p-values reported in the final column are from the *t*-test comparing the values for those with disability and those without disability; the null hypothesis is that there is no difference.

toward not capturing mild forms of disability.

Nearly 86% of all children between ages 5 to 18 are currently enrolled. However, only 49% of them are in the appropriate grade for their age, reflecting late start in schooling and high rates of grade repetition, particularly in rural areas. For those who are no longer in school, the average years of education is eight (equivalent to first year of high school in the US). Approximately, 82% individuals not currently in school report currently being employed. While this may seem high, a significantly share of these individuals are under-employed or employed in seasonal agriculture. Among those not in school and currently employed, about 44% individuals report being employed in a full-year, non-agriculture job. Nearly 7% individuals are married before the age of 15, and nearly 97% individuals are married by age 30. Among those who are married at least once, they were married at an average age of 20 years.

Descriptively, individuals with disability fare worse than individuals without disability in all of the outcomes we evaluate (columns 2–4 of Table 2). A significantly lower proportion of children with disability are enrolled in school (67.5% versus 85.7%). Among those currently enrolled, a significant lower proportion are at the appropriate grade for their age (31.3% versus 49.5%), while among those who are no longer in school, attainment is lower by approximately a year (7.3 years of education versus 8.3). Individuals with disability are significantly less likely to be employed (73.5% versus 82.3%). Among those employed, they are significantly less likely to be employed in a full-year salaried job (32.4% versus 44.1%). Individuals with disability have a higher chance of early marriage (marriage before age 15) (8.5% versus 6.9%), but among those above age 30, individuals with disability are *less* likely to be married, or are married later.

Results from estimating coefficients in equation (1) confirm these descriptive findings. The results show that individuals with disability are at a severe disadvantage in almost all educational and labor market outcomes we evaluate (Table 3). On average, individuals with disability have 16.5 percentage points lower chances of being enrolled in school (row 1; column 1). Among those who are enrolled, individuals with disability are 6.9 percentage points less likely to be at the appropriate grade level for their age. Among those who are no longer in school, those with disability have approximately half a year (=0.43 x 12 = 5.2 months) lower attainment than those without disability.

After adjusting for educational attainment, individuals with disability are 21.4 percentage points less likely to be employed. We find no effect of disability in the likelihood of having a full-year salaried job, after education is accounted for.

In terms of the marital outcomes, individuals with disability have approximately 1.1 percentage points lower chances of getting married before age 15. Among individuals above age 30, individuals with disability are 30 percentage points less likely to be married. Among those who are married, individuals with disability are married approximately 5.3 months (=0.44 × 12) later. While we make no judgement as to whether getting married is a better outcome than staying unmarried, the results here—from a setting in which almost everyone gets married—suggest a central role of stigma in affecting the lives of individuals with disability. Overall, disability seems to reduce one's chances of getting married.

Consistent with discrimination against girls in Nepal, girls are 1.7 percentage points less likely to be enrolled (row 2 of Table 3). Strikingly, they are more likely to be at an appropriate grade for their age than boys. They have an attainment disadvantage of approximately eight months (=0.65 × 12) relative to boys. Girls are also less likely to be employed than boys (by 18.8 percentage points) and hold a full-year, non-agriculture job (by 10.4 percentage points). Compared to boys, girls are 11.7 percentage points more likely to be married before age 15 but 17.2 percentage points less likely to be married by age 30. On average, they are married 2.8 years earlier than boys.

Based on the coefficients on the interaction term (row 3 of Table 3), the adverse effect of disability on one of the three educational outcomes—attainment—is more pronounced for girls than for boys. To compare the 'gender disadvantage' to 'disability disadvantage' in attainment, we predicted the years of education for boys and girls separately and by disability status from the regressions. Without disability, boys have approximately 0.46 years higher attainment than girls. With disability, the difference increases to approximately 1.24 years, which is 2.5 times the difference without disability (1.24–0.46 = 0.78, the coefficient on the interaction term). We find no such effects in employment-related measures. Among the marital outcomes we evaluate, we find that women with disability are less likely to get married by age 30 than boys. Without disability, men have approximately 17 percentage points higher chances of getting married by 30 than women. With disability, the difference widens to 23 percentage points (0.23–0.17 = 0.06, the coefficient on the interaction term).

6. Discussion and conclusion

The takeaway from the findings above is that disability is strongly associated with educational, labor market and marital outcomes in Nepal. These findings are consistent with the limited number of previous studies from LMICs, at least for the outcomes we can compare. For example, Mizunoya et al. (2018)—using a similar method as ours—find that the difference in the proportion of out of school children by disability status (i.e., proportion of children with disability who are out of school versus the proportion of children without disability who are out of school) ranges from 3.7 percentage points in South Africa to 62.3 percentage points in Albania (Mizunoya et al., 2018). Among the Asian countries, the authors find that this gap is 48.1 percentage points in Bangladesh, 33.3 percentage points in India, and 9.2 percentage points in Maldives. We estimate a gap of about 16.5 percentage point for Nepal, which is higher than in Maldives but lower than in India and Bangladesh.

Table 3
Linear probability model results for the effect of disability on educational, labor market, and marital outcomes.

	Currently enrolled	Appropriate grade for age	Educational attainment	Currently employed	Employed in a salaried job	Married before age 15	Married by age 30	Age at first marriage
Has disability	−0.165***	−0.069***	−0.433***	−0.214***	−0.009	−0.011**	−0.300***	0.443***
	(0.006)	(0.007)	(0.067)	(0.010)	(0.011)	(0.003)	(0.007)	(0.062)
Female	−0.017***	0.012***	−0.653***	−0.188***	−0.104***	0.117***	−0.172***	−2.785***
	(0.001)	(0.001)	(0.019)	(0.003)	(0.004)	(0.002)	(0.003)	(0.024)
Has a disability × Female	−0.006	−0.025	−0.778***	0.033	0.035	0.021	−0.060***	−0.169
	(0.008)	(0.010)	(0.156)	(0.021)	(0.029)	(0.011)	(0.012)	(0.152)
Constant	0.684***	1.001***	2.679***	0.083***	0.315***	0.636***	0.786***	13.156***
	(0.003)	(0.003)	(0.213)	(0.021)	(0.039)	(0.023)	(0.017)	(0.243)
Number of individuals	1,234,095	1,051,251	607,486	644,173	528,889	1,022,169	760,889	1,022,169
Number of sibling-pairs	566,855	519,749	474,317	495,273	437,311	798,056	667,848	798,056
Within R-squared	0.12	0.28	0.19	0.30	0.05	0.14	0.17	0.19

Notes: This table shows the coefficient on whether an individual has a disability, their gender, and the interaction between the two, obtained from estimating equation (1) in the sample of individuals shown in Table 2. All regressions include sibling-pair fixed effects as well as birth year fixed effects. They also include the "generation" the individual belongs to (see text). In addition, models with 'currently employed' and 'employed in a salaried job' include educational attainment as a covariate. In the models for labor market outcomes, the coefficient does not change substantively when the sample is limited to individuals above the age of 18. The standard errors are clustered at the household level. As discussed in the text, the sample on which the regression is estimated differs based on the outcome. *$p < 0.0125$, **$p < 0.00625$, ***$p < 0.000125$. The cutoffs are Bonferroni-corrected for multiple (specifically, eight) hypotheses and correspond to 10%, 5% and 1% significance level, respectively.

In Nepal, Eide et al. (2021) compare access to primary education for individuals with and without disability using data from a nationally representative survey (A. H. Eide et al., 2021). They find that a significantly higher proportion of individuals without disability (52.3%) had access to formal primary education compared to those with disability (35.8%). The authors' sample in the analysis of access to education includes individuals above age 15, compared to children ages 5 to 18 in our study. They also provide only a descriptive comparison, without addressing potential confounding from factors such as poverty. For these reasons, our findings should not be compared directly with their findings. However, the overall findings in Eide et al. are similar to our findings.

Likewise, Kuper et al. (2014) compare school attendance among children ages 0–17 in 30 countries participating in one of Plan International's programs, including Nepal (Kuper et al., 2014). They find that children with disability had significantly lower levels of schooling for their age compare to children without disabilities. In Nepal, 74% children with disability attended schools compared to 95% children without disability. This yields a difference of 21 percentage points—compared to 16.5 percentage points in our study.

Beyond school enrolment, the most commonly assessed outcome in the existing literature from LMICs is poverty (Banks et al., 2021; Braithwaite & Mont, 2009; Filmer, 2008; Mont & Nguyen, 2018; Trani & Loeb, 2012). Evidence on the effect of disability on labor market and marital outcomes is lacking, although employment and marriage are potentially important mechanisms through which disability can lead to poverty.

The magnitude of the associations we find should be understood in light of a number of caveats. First, the analysis assumes that parental investment on a child without disability is not affected by the disability of another child. However, households with someone with disability tend to be poorer, on average, than households without someone with disability (Banks et al., 2017; Groce et al., 2011). In these households, parents may need to shift away resources from a non-disabled child toward a child with a disability—more so than in richer households. In that scenario, the estimates above are an underestimate of the true effect of disability. Conversely, parents may need to pull resources away from a child with a disability, which would lead to an overestimation of the true effect in our analysis. The net direction of the overall bias is indeterminate. Similarly, the data do not contain information on the timing of the onset of disability. The analysis assumes that the outcomes did not precede disability. The findings would be inaccurate if, for example, disability was a result of employment, rather than *vice versa*. For these reasons, and given the cross-sectional nature of the data, we refer to our estimates as *plausibly* causal.

Second, the 2011 Nepal census did not follow Washington Group's classification (Madans et al., 2011) or WHO's International Classification of Functioning model, thus reducing the comparability of our findings with that of other studies using these classifications (for example, Mizunoya et al., 2018). For reasons mentioned previously, the census likely captures only more severe disabilities in the spectrum, which leads to an overestimation of the exclusion experienced by individuals with disability. Data from the 2021 census, which uses broader definitions of disability—consistent with the Washington Group's classification—were not available at the time of writing this manuscript. We caution the reader that our findings may not accurately reflect the current circumstances of individuals with disability in Nepal.

Finally, an important limitation of using sibling fixed effects is that the estimated effects come, in this case, from a subsample of sibling pairs with at least one of whom has disability (Hutcheon & Harper, 2019; Miller et al., 2019). These individuals may differ from the broader population, thus threatening the external validity of the findings. In households that have someone with disability, which tend to be poorer (Banks et al., 2017; Groce et al., 2011), the differences in the outcomes between siblings are likely to be smaller, which means that our estimates are downward biased. Likewise, the estimates apply to siblings who are living in the same household and are thus likely to be younger. It is possible that the differences in outcomes among older individuals are higher (for example, if siblings without disability have greater mobility and are able to pursue better opportunities).

Given the large size of the effects and lack of clarity on the overall direction of the bias from the factors mentioned above, the limitations

are unlikely to alter the key message—that disability has notable adverse effects on educational, labor market, and marital outcomes in this context. More importantly, the current study is an important step toward quantitatively documenting the wide-ranging disadvantages that individuals with disability face. Any social protection measures the government designs, including the revamping of the disability allowance currently in place, needs to reflect these disadvantages.

Our study also points to a number of areas for further research which can inform the design of new programs and policies that cater to the needs of individuals with disability, including whether the programs need to be targeted to specific groups. Primary among these areas is the differential effect of disability by gender. In our study, although girls and women have worse outcomes than their boys and men, the effects of disability differ between the two groups only for educational attainment and the probability of getting married by age 30. Additional qualitative research is needed to uncover mechanisms through which the differential effects operate and to understand why the effects do not differ for other outcomes.

Second, additional research is needed on heterogenous effects on the outcomes by the *type* of disability. The lack of such assessment in the current study is intentional; the 2011 census does not use the more-appropriate classification available now, and the categorization the census used, such as 'deaf-blind' and 'multiple disable', makes attribution to a specific type of disability challenging.

Third, in Nepal—and more generally across LMICs—we have yet to see studies that rigorously assess the role of specific social protection programs, such as disability allowance or reservations on civil service, on reducing the disadvantage that individuals with disability face in educational, labor market, and marital outcomes. In Nepal, assessing the extent to which the policy efforts made since 2011—especially after the promulgation of the new constitution in 2015—have helped improve the wellbeing of individuals with disability is the natural next step.

Ethical clearance

Ethical clearance was not required for this study because it uses de-identified, publicly-available census data.

Author statement

Yubraj Acharya: Conceptualization, Methodology, Formal Analysis, Writing-Original Draft, Writing-Review and Editing.

Di Yang: Data Curation, Formal Analysis, Writing-Original Draft, Writing-Reviewing and Editing.

Declaration of competing interest

Yubraj Acharya and Di Yang declare that they have no conflict of interest.

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Appendix

Appendix Table A1
Derivation of the Analytic Sample

	N
Population of Nepal according to the 2011 census	26,494,504
15 percent sample	4,037,885
Nepalese citizens	4,018,206
Identified as sibling, child or grand-child of household head	2,899,784
Non-missing information on disability	2,861,644
Analytic sample by outcome:	
Currently enrolled	1,234,095
At appropriate grade for age	1,051,251
Years of education completed	607,486
Currently employed	644,173
Employed in a salaried job	528,889
Married before age 15	1,022,169
Married by age 30	760,889
Age at first marriage	1,022,169

Source: Nepal Housing and Population Census 2011
Note: This table shows how the analytic sample for each of the outcomes was derived. The final numbers for each outcome correspond to the sample size for that outcome reported in Tables 2 and 3

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