What Predicts Visual Disability?

Niraj Poudyal *
Kathmandu Univeristy School of Arts
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Abstract

In this paper, demographic and socio-economic features of visually disabled population is explored and compared with that of general population using Nepal Living Standard Survey.It is tested whether the prevalence of visual disability is explained by demographic factors, socio-economic factors or both. In most of the countries, the distribution of various forms of disability is claimed to be skewed against male with one exception of visual impairment (Resnikoff et al., 2002). This phenomenon is said to be found in both census data and survey data. This paper aims to test this hypothesis. The paper will test whether females are statistically significantly more likely to get visual disability than male individuals in Nepal controlling for various demographic and socio economic factors. A Bernoulli (Logit) model will be used to test the effect of various demographic, health related, socio-economic variables on the gender distribution of visual disability. The results show that age is the most significant predictor of visual disability. There is also some evidence for the effect of enrolment and location.

Key words: Visual disability, gender, demography, policy

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1 Introduction

According to WHO (2013), 285 million people are estimated to be visually impaired world-wide out of which 39 million are blind and 246 have low vision. The WHO estimates that 80% of the visual impairment can be prevented or cured.

In Nepal, estimates of visually disabled population varies significantly across various sources of data. according to Nepal Census 2011, there are 94,765 visually disabled people, which is 0.36% of the total population and 18.5% of the total disabled population. This is the second largest group of disabled population in Nepal. Nepal living standard survey (NLSS-III) reports 214 cases of visual impairment out of 28474 respondents included in the survey. This is 0.75% of the total number of individuals in the survey and 22.15% of the total number of persons with disability. These statistics is the indication of unreliability of the disability statistics in Nepal.

Visual disability can be used as an important indicator of quality of health an individual is getting (Broman et al., 2002). On the one hand, visually impaired persons are vulnerable to other health problems such as injury from falls, fractures and depression (Vitale et al., 2006). At the same time, in developing countries with little or no disabled friendly infrastructure, their income earning (economic) activities (capacity) are likely to be severely curtailed.

Very little research has been done about the demographic and socio-economic status of visually disabled (or any other type of disabiled population) in Nepal. Most of the research has been focusing on biological and medical aspect of the visually disabled people. Though important, medical factor themselves may not be sufficient to understand the dynamics of visual impairment. According to WHO estimates, 90% of the visually impaired persons live in low income settings.

In section 2, a brief literature review on causes of visual impairment is presented. In section 3, socio-economic status of visually disabled persons is summarized. In section 4, geographical distribution of visually disbaled persons is analyzed across gender dimension. In section 5, several regression models are run on a quasi-experimental setting based on NLSS-III. In section 6 concludes with the major findings of the paper and the way forward.

2 Literature

Most of the literature on visual impairment have focused on medical causes of visual impairment (Group*, 2004). Very few studies have been done which focuses on socio-economic factors that potentially affect the prevelance of visual disability. This study aims to estimate the odd ratio of visual disability given some demographic and socio-economic status of an individual.

Cataract and trachoma are the greatest causes of avoidable blindness (Group*, 2004). The lack of and inequity of access to prevention and eye care services severely limit in these regions of the world, the benefits that can be realized by modern medical advancements (Resnikoff et al., 2004). The lack of economic development is a factor that aggravates the prevalence of visual impairment (Resnikoff et al., 2004).

Gendered analysis of disability has been particularly valuable in demonstrating the web of social and biological factors that disable people, not just women. Gendered analyses address the processes through which both femininity and masculinity are constituted, and the implications of these processes for people with impairments, thereby moving beyond the particular focus of feminism on the experiences of women. (Gerschick 2000).

Finding all the socio-economic factors casuing visual disability is a hopeless task. Instead, in this paper, I ask the question, given the demographic and scocio-economic status of an individual, how precisedly do we know the individual's probability of being visually disabled. This can have a very important policy implication. For example, if school enrollment reduces the chances of getting blindness, then investing more on enrollment has one additional justification. If females are more likely to get visual disability, then policies should be changed so that more female show up in eye check up camps.

Visual disability is considered to be the result of two types of factors: demographic and socio-economic. Demographic factors include age, gender. Socio-economic factors such as enrollment, mother's education, income of the household head, ethnicity.

3 Socio-economic status

According to NLSS-III data, 83% of mothers of non-disabled persons are illiterate. But illeteracy rate of mothers of visually impaired perosns goes up to 90% (87% for male and 93% for female). The highest rate of illiteracy is 97% among mothers of perosns with speech problem.

When it comes to literacy rate of visually impaired persons aged 5 or above, the rate is 29.72%. For the non-disabled perosns the literacy rate is 64.54%. The lowest rate of literacy is for individuals with multiple disability (22%). This indicates that literacy might have a very important role to play when it comes to various forms of disability.

The economic condition of a household can also have a significant impact on the prevelance of visual disability. But including income invites the problem of endogeneity as visual disability directly affects the earning level of that person. So a variable such as type of dwelling can be used because the foundation of a house can be assumed to have been constructed early in the past. When the foundation of dwelling of a visually impaired person is compared with the rest using NLSS, very interesting difference can be noticed. Around 65% of individuals defined as "Nones" in terms of disability live in dwellings with mud or woodden foundation while the percentage for visually impaired individuals goes to 76%. The average percentage

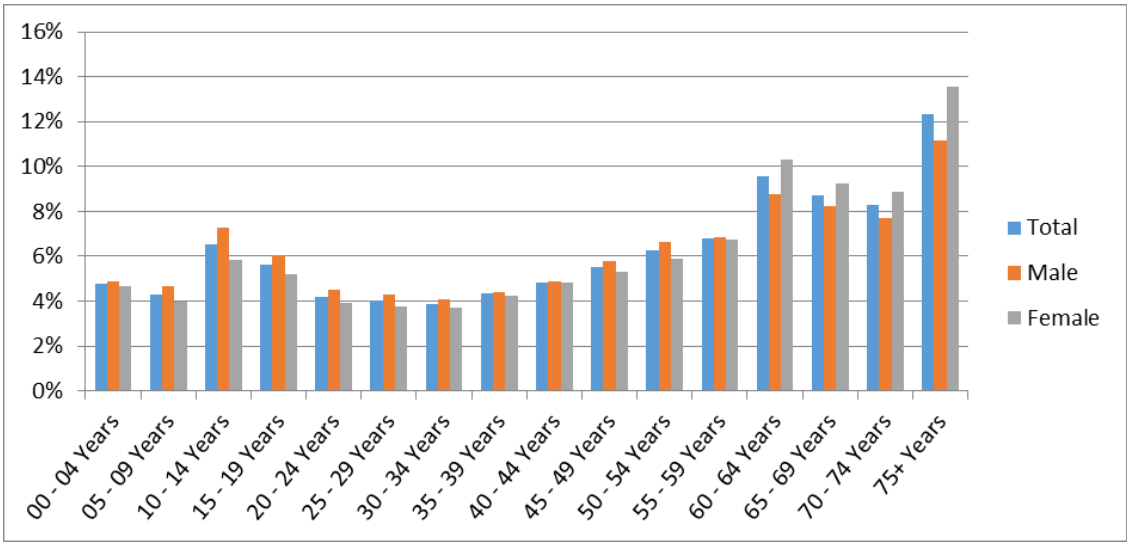

Figure 1: Visual disability and age

of individuals with disability residing in dwellings with mud or wooden foundation is 74%.

Prevelance of visual disability also differs across age dimension. According to census data, 12.36% of the visually disabled people are of age 75 and more. The percentage is minimum at 3.88 for the age group 30-34 and increases for older age groups. The problem of visual impairment seems to get more acute after the age of 60. One can also detect the interaction of age and gender in the figure 1. For up to the age of 59, percentage of blindness/low vision is higher for male than for female. But after that, the percentage is significantly higher for female than for male.

4 Geographical Distribution

To analyze the geographic distribution of the visually impaired population, Nepal Census, 2011 data is used. According to census data, most of the visually impaired perosns live in terai districts and lowest number of visually disabled perosns live in mountain districts (See Appendix 1, 2 and 3 for the maps). However, the distribution of visually disabled persons does not change much across development region. It turns out that terai districts have higher number of visually disbaled persons because they have very high population compared to hilly and mountain districts. When percentage of persons with visual disability is computed for each district, the picture changes drastically. The districts with highest percentage of visually disabled perosns live in mountaineous districts of mid-western and far western development regions. However, the percentage of visually disabled persons out of total disabled population is respectively 17.90%, 16.96%, 20.41% for Mountain, Hill and Terai (see figure 2).

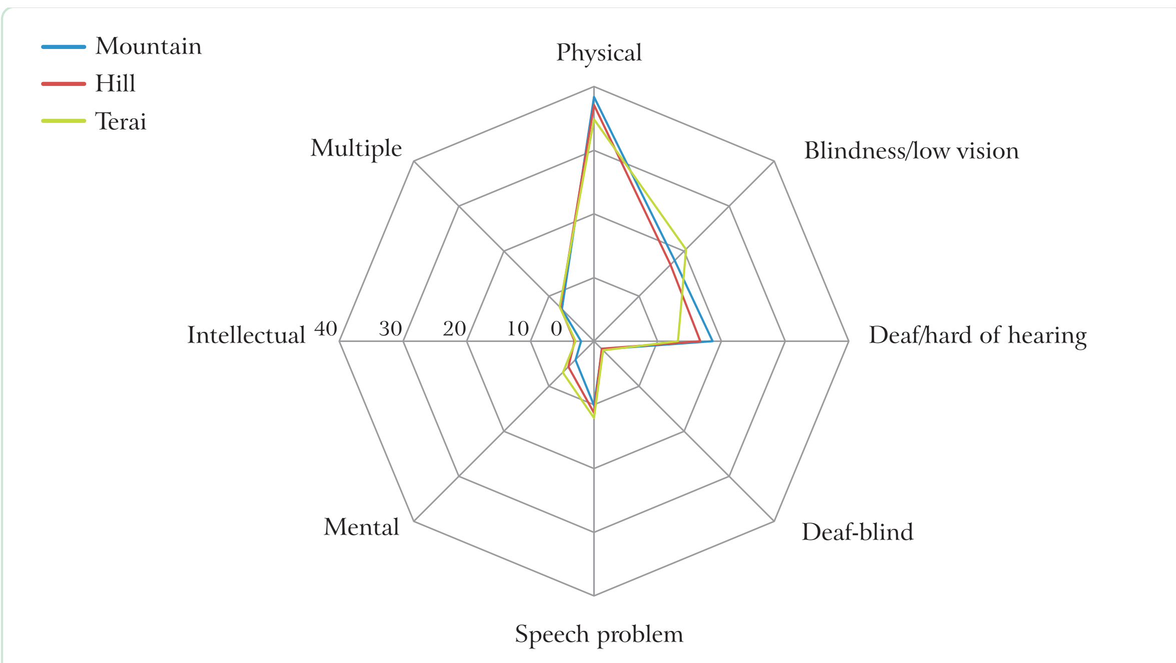

Figure 2: Types of disability and ecological belts

Location (rural/urban) of residence of visually impared persons also vary significantly (see figure 3). Percentage of visually imparaired persons is respectively 0.05% and 0.38% for urban and rural areas (see Figure 3). Looking across ecological zones, western mountain appears as an outlier (see figure 4). The percentage of visually impared persons among total disabled population is only 11.6% (compared to the national average of 18.46%). The percentage for central terai is 24.95%, which is highest in the country.

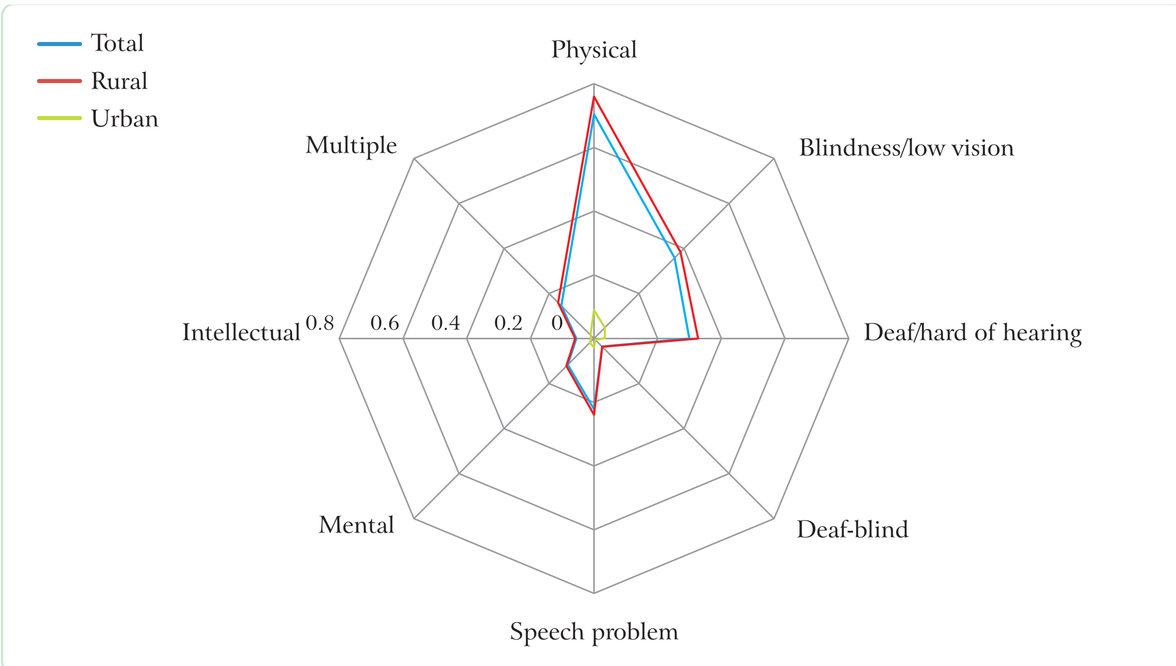

Figure 3: Types of disability and ecological belts

5 What predicts visual disability?

When we compare the disability types across gender, there is one striking exception for visual disability (see figure 2 and table 2). For every category of disability, probability of male being disabled is greater than that of female. But for visual disability, number of visually disabled female is greater than the number of visually disabled male.

Visual disability can potentially be predicted by two types of factors: socio-economic (education, enrollment, foundation of dwelling) and demographic (age, sex). In this paper, an attempt is made to explain the occurrence of visual disability among Nepali citizens using these two types of factors. The variables used to explain visual disability and their measurement scale is shown in table 1. Most of the disabled persons are male. The gender difference is reverse or minimum for visual disability. So sex can be an important variable. Age is included for visual disability is highly correlated with age. Location of the birthplace (Rural/Urban) is used as proxy for access to eye health care. Mother's education has a potential to improve the chances of getting the early treatment and preventive care. If a person is enrolled in school/college, chances of detecting eye problem can be expected to increase.

If sex and age turn out to be significant despite the inclusion of other socio-economic variables, we can conclude that visual disability is caused by demographic factors. But if sex and age turns out to be insignificant (positive or negative) and the socio economic variables turn out to be significant, we have the opportunity to reduce the visual disability through

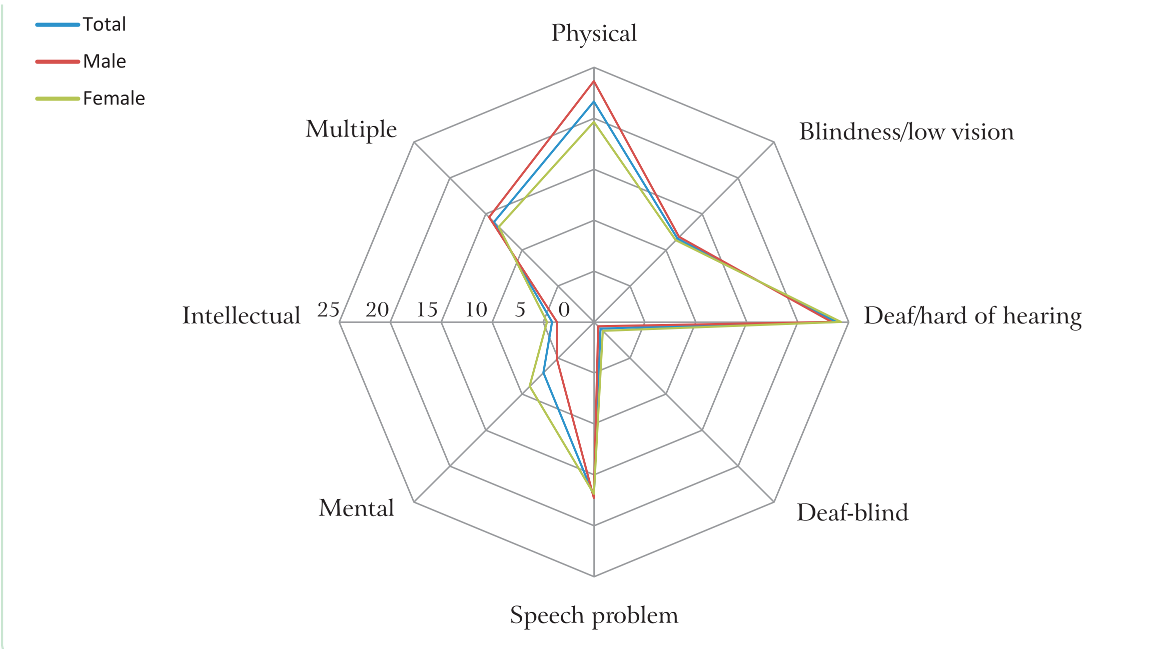

Figure 4: Types of disability in western mountain

Table 1: Potential predictors of visual disability

Variable	Values
Sex	Male, Female
Age	Years
Birthplace	Rural, Urban
Educational background	Enrolled, Not enrolled
Mother's education	Literate, illiterate
Foundation of dwelling	Pillar or cement bonded, mud, wooden or other

policy actions

The data consists of total of 161 individuals with problem of partial or total visual impairment. 47.2% are male and 52.8% are female. 15 male and 10 female individuals are visually impaired by birth. So we exclude them for our analysis is focused on factors contributing visual disability after the birth. So our net sample size is 189 (86 male (45.5%) and 103 female (54.5%)). But when we remove the individuals for whom information on other factors such as age is not available, the sample size of visually impaired reduces to 161. Summary statistics of demographic variables of the sample individuals are summarized in Table 2.

In order to ensure the robustness of the results, 6 different regression models are estimated. The methodology for each model is explained below.

Model 1: OLS (N = 161): Out of total sample of 28670 from NLSS, a random sample of

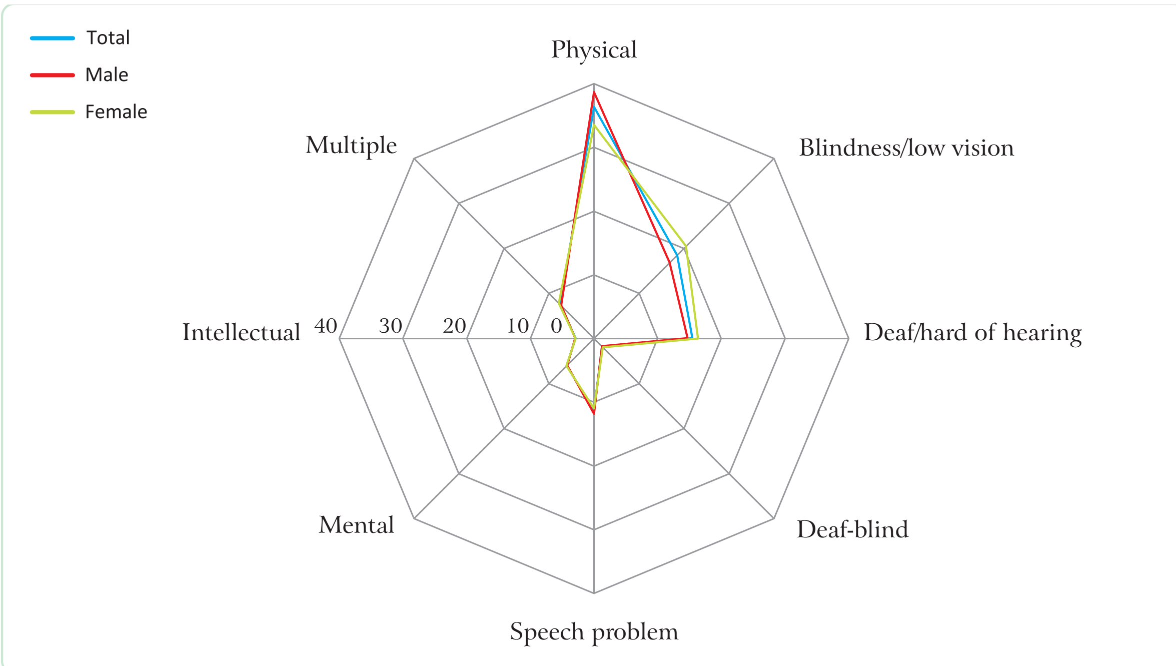

Figure 5: Types of disability and gender

Table 2: Visual Disability and Gender

	Visually disabled Population	Male	Female	Total
Census 2011	Total	47041	47724	94765
	% out of total population	0.36%	0.35%	0.36%
	% out of total disabled population	16.80%	20.46%	18.50%
NLSS-III	Total	101	113	214
	% out of total population	0.76%	0.74%	0.75%
	% out of total disabled population	19.00%	26.00%	22.15%

161 people without any disability is drawn from uniform distribution. So the total sample size becomes 161 X 2 = 322. Ordinary least square is used to estimate the coefficients of the factors.

Model 2: Probit (N = 161): Out of total sample of 28670 from NLSS, a random sample of 161 people without any disability is drawn from uniform distribution. So the total sample size becomes 161 X 2 = 322. Maximum likelihood estimation of probit model is performed to estimate the marginal effects of the factors.

Model 3: Logit (N = 161): Out of total sample of 28670 from NLSS, a random sample of 161 people without any disability is drawn from uniform distribution. So the total sample size becomes 161 X 2 = 322. Maximum likelihood estimation of logit model is performed to estimate the marginal effects of the factors.

Table 3: Summary statistics for the sample (N=2474)

	mean	sd	max	min
vision	0.066	0.249	0	1
age	42.34	18.02	2	95
enrollment	0.484	0.5	0	1
rural/urban	0.121	0.326	0	1
mother edu	0.153	0.36	0	1
dweling	0.326	0.47	0	1

Model 4: Logit (N = 2474): Out of total sample of 28670 from NLSS, all 2474 people without any disability is drawn from uniform distribution. So the total sample size becomes 161 + 2474 = 2635. Maximum likelihood estimation of logit model is performed to estimate the marginal effects of the factors.

Model 5: Probit (N = 2474): Out of total sample of 28670 from NLSS, all 2474 people without any disability is drawn from uniform distribution. So the total sample size becomes 161 + 2474 = 2635. Maximum likelihood estimation of probit model is performed to estimate the marginal effects of the factors.

Model 6: Logit (N = 161, m = 200): Out of total sample of 28670 from NLSS, a random sample of 161 people without any disability is drawn from uniform distribution m=200 times. Maximum likelihood estimation of logit model is performed 200 times to estimate the 200 marginal effects of the factors. The average of the coefficients and the p-values are computed. Sample size for each estimation is again 161 X 2 =322.

Table 4: Linear and Bernoulli Regression Models

	OLS (N=161)	Probit (N=161)	Logit (N=161)	Logit (N=5140)	Probit (N=5140)	Logit (N=161,m=200)
(Intercept)	0.390 [0.002]					
sex	-0.106 [0.081]	-0.135 [0.051]	-0.123 [0.097]	-0.009 [0.247]	-0.013 [0.153]	-0.114 [0.190]
age	0.008 [0.000]	0.007 [0.000]	0.009 [0.000]	0.002 [0.000]	0.002 [0.000]	0.008 [0.011]
enrollment	-0.131 [0.076]	-0.196 [0.031]	-0.228 [0.017]	-0.031 [0.002]	-0.033 [0.002]	-0.175 [0.143]
location	-0.043 [0.706]	-0.212 [0.134]	-0.294 [0.035]	-0.023 [0.030]	-0.025 [0.025]	-0.150 [0.354]
mother's education	0.138 [0.155]	0.056 [0.559]	0.011 [0.466]	0.016 [0.345]	0.016 [0.345]	0.051 [0.492]
dwelling	-0.097 [0.138]	-0.027 [0.717]	0.078 [0.322]	-0.012 [0.126]	-0.012 [0.194]	-0.017 [0.555]

The estimation results show that age is the most significant factor in determining visual disability (see Table 2). This might be because of the high prevalence of cataract among older people. After controling for other socio-economic variables and age, sex seems to have a slightly significant influence suggesting that female are less likely to get visual impairment than male. This is in contrast to what the percentage of visual impariment suggests (see table 2).

The most significant result of this research are the coefficient of enrollment and rural/urban variables. Except for model 6, both of them are significant at 10% and negative. Negative coefficient of enrollment suggests that if a person has ever attended school, he/she is less likely to get visually impaired. The probability of getting visually impaired can be reduced by 16% if the person is enrolled in a school. This may be the result of increased chances of early detection of problem with vision among children in the class room environment. Similarly, getting access to health services can also reduce the probability of visual impairment by 17% as urban residents are significantly more likely to get access to health services.

Mother's literacy does not have statistically significant effect on the probability of visual impairment. This can be because of the inclusion of people of all ages in the sample and mother's education plays role when children are young. This can significantly reduce the power of the model to detect the effect of mother's education of children's visual health.

Likewise, the dwelling status of a household has negative coefficient, though statistically insignificant. Negative sign indicates that visually imparired individuals are likely to be living under poor housing conditions such as houses with mud or wooden foundation.

6 Conclusion

The result can be further substantiated if census data can be used to estimate the model. The much larger sample should allow more predictors to be included in the model and the evidence for the effect of mother's education and dwelling status might show up.

Although, the study is limited by the size and the representativeness of the sample, it shows some indication to where the problem may lie and the potential policy intervention. Age, enrollment status and location being the major predictors of visual impairment, the policy should address the eye health of old age people. Economic status of a household (dwelling foundation) also has some predictive power when it comes to visual impairment. Also, getting children enrolled seems to reduce the impairment significantly. Education has health benefits too.

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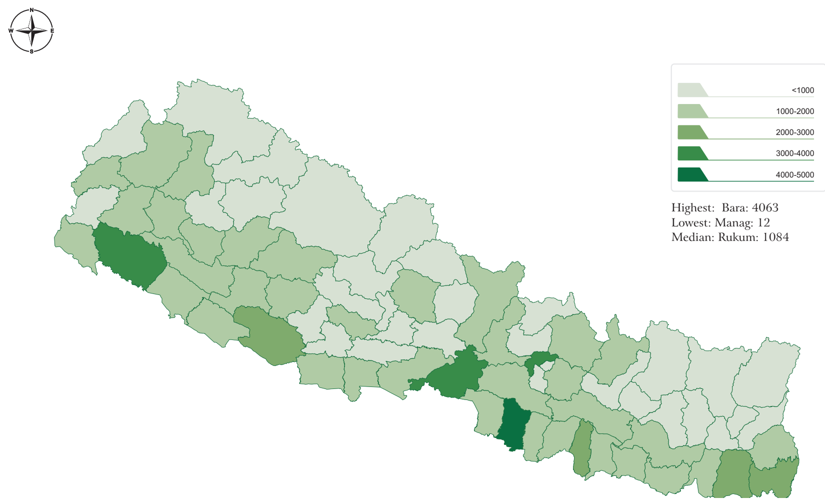

Figure 6: Number of persons with blindness/low vision

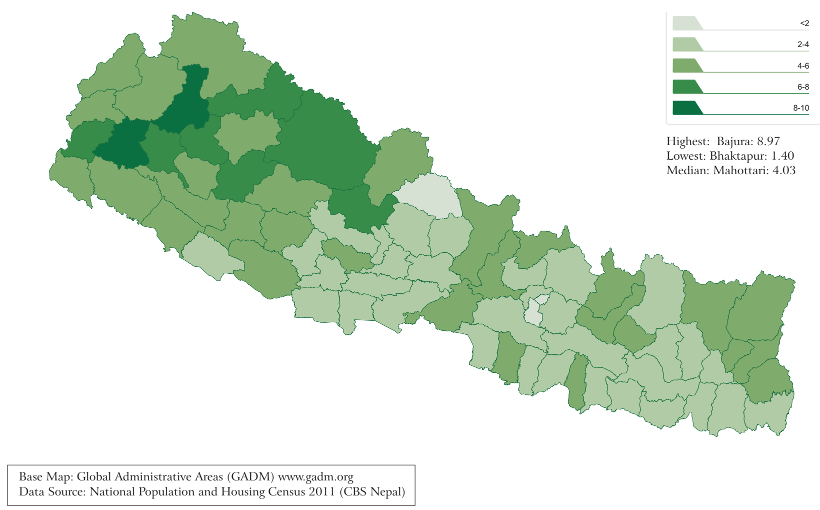

Figure 7: People with blindness/low vision per 1000