Access to infrastructure and human wellbeing: evidence from rural Nepal

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This article documents the level of access to infrastructure and assesses its perceived impacts on human wellbeing in rural Nepal. It found more varied level of wellbeing in less remote communities and the perceived impacts of access to infrastructure on human wellbeing is higher in more remote areas. Notably, access to road received the highest priority among respondent followed by drinking water and irrigation. The methodology and findings of this study have practical implication for rural development in hills and mountains where human settlements are highly dispersed and access is the key to human wellbeing.

KEY WORDS: Access to infrastructure; Human wellbeing; Happiness, Hills and mountains; Household survey, Rural Nepal

Introduction

Due to the very nature of the difficult geography and scattered settlement, human wellbeing in hills and mountains primarily depends on access to infrastructure services. Notably, 90% of the hills and mountain population lives in developing countries, and poor access to infrastructure is limiting their socioeconomic development. However, there is limited literature that examine the level of accessibility and its impacts on human wellbeing and happiness in such regions. This article documents the level of access and examines its perceived impacts on the key elements of both subjective as well as objective human wellbeing in three villages that belong to the hilly mountainous region of Nepal. The country is selected because 77% of the country's surface is covered with hills and mountains, where about 50% of the total population live (CBS 2016). Similarly, most of the communities in high hills and mountains rely on foot trails and need to walk hours and even days to reach the nearest bus station or dirt road. Access to other infrastructure services, such as schools, drinking water, medical facilities and markets are also poorer for the communities that are situated at higher altitude. Nepal Living Standard Survey (NLSS) 2010/11 revealed that more children in remote hills and mountains are malnourished, remained out of school, and even die under the age of five compare to the children living in plain and more accessible areas (CBS 2011). NLSS also found 50 to 65% lower per capita incomes in such remote Hill and Mountain Districts than in the more accessible Terai (plains) Districts. Considering these points, a household survey was

conducted in the three selected villages with different levels of infrastructure access to examine its perceived impacts on both subjective and objective wellbeing of the respondents.

The significant and positive relationship between infrastructure and economic growth is well-established in the literature (Samli 2011). The literature suggests three main impacts channels through which the links between access to infrastructure and human wellbeing operate. First, increased access to infrastructure directly benefits individual and households by reducing cost and increasing the quality of health, education and other services (World Bank1994). For example, rural infrastructures increase the level of income and consumption, reduce prices of manufacturing goods, and save time (Ali and Pernia 2003), provide livelihood choices (Rahman and Akter 2014), and improve people's health and education significantly (Khandker, Bakht and Koolwal 2009). Second, increased access to infrastructure benefits local businesses and enterprises through reducing cost and increases quality and quantity of production of goods and services (Jacoby 2002), enhancing banking and communication services, and commercializing agriculture (Kirubi, Jacobson, Kammen and Mills 2009). Third, greater access to infrastructure benefits communities through expanding the size of the community and increasing the interactions among group members within and across the community (Hurlin 2006) thereby growing social capital (Narayan 1999). Increased access to mobile communication and increased rural road networks increase people's interaction among and within community especially hill and mountain communities than for plains due to their highly-dispersed settlement (Choe and Pradhan 2015). Similarly, expanding access to water supply at community level is still challenging in rural hills and mountains (Merz et. al 2004), hence water access could also affect social capital positively. In addition, OECD (2002) claims that infrastructure access helps social inclusion through increased social mobility and preserves environment through the efficient use of natural resources. These facts are more relevant to the hills and mountains where natural resources are abundant yet difficult to utilize, and the richness of traditional knowledge and culture is insufficiently recognized (Korner et. al 2005). More precisely, Kirubi et al. (2009) showed the significant contribution of community-based electric microgrids on rural development through community development in Kenya.

It should be noted here that the linkage goes both ways meaning that increased level of wellbeing also affects access to infrastructure positively (Sapkota 2014). While people's education, health, and income levels rise, they create further demands for

infrastructure services. Similarly, Bhattacharya (2012) argued that increased economic growth rate also help to increase access as well as the quality of infrastructure services through increased investment in infrastructure. Therefore, infrastructure variables are not purely exogenous but endogenous to human wellbeing.

Despite a large body of literature, there are limited empirical works that focus on access to infrastructure and human wellbeing (Kusharjantoa and Kim 2011). It is further limited in hills and mountains because of two reasons; first, conducting in-depth research in such remote areas is difficult and costly. Second, researchers generally come from developed countries or urban areas, and it is challenging for them to conduct research in remote sites. However, in the context of poverty concentration in rural areas, clear understanding of such areas is urgently important to eradicate extreme poverty by 2030, the number one Sustainable Development Goal of the United Nations. Clearly, lack of data and research on hills and mountain societies is hampering efforts to design and implement appropriate policies and programs for human wellbeing and ending poverty in the most needed areas.

As the general approach to development has changed dramatically from economic concentration to human focus in recent decades, this article follows the notion of human development (HD) as the objective wellbeing concept introduced by many scholars at UNDP in 1990 which equally emphasized health, education, and income as the three pillars of HD.[1] In addition, as growing literature are emphasizing on subjective wellbeing of people, this article also assesses the human *happiness* in relation to the people's access to infrastructure services. For this purpose, Oxford Happiness Questionnaire (OHQ) developed by Hills and Argyle (2002) is included in the household questionnaire.[2]

Methodology

Site selection, sampling, and data collection

The data was collected through the household survey of three remote village development committees (VDCs)[3] of a hilly mountainous district, Sindhupalchok, Nepal from February to March 2014. The enumeration unit of the survey is a household, and the respondents are the household heads. The main objectives of the survey are to collect data on the living standards of the people and to assess the perceived impacts of access to infrastructure on the human wellbeing. The survey followed the third Nepal Living Standard Survey (NLSS) questionnaire with some modification to match the objectives

of this study. The information on the following topics are collected from the survey: demography, access to infrastructure, household income and consumption, health and education, migration and remittances, adequacy of consumption and perception on public services. The income and consumption data include all the production and consumption of the household plus the monetary income and expenditure. Particularly for agricultural income and expenditure, respondents were asked about the quantity of their all agricultural production and consumption, then calculated the income and expenditure based on the local market price of the items. In addition, OHQ was included to measure the subjective wellbeing of the household head.

Villages and communities were selected based on the remoteness in terms of access to the road. Ramche VDC is selected because it is among the least remote village as the Araniko highway passes through the village, and a part of one of the three biggest markets belongs to the village. Araniko Highway is the only highway that passes through the Sindhupalchok district linking Kodari bazaar (the only road connected border area between Nepal and China) and Kathmandu (the capital city of Nepal). Gumba VDC is selected because it is among the most remote village that is not even touched by any road network when the survey was conducted. Baramchi VDC is selected as it lies in between Ramche and Gumba, which is connected via gravelled road network but vehicle passes only in the dry season.[4]

The same criterion of remoteness was used to select the communities and Wards of each selected VDC. Ward is the smallest local administrative sub-unit of the local governance system of Nepal. The study covers three Wards of Gumba and Baramchi, but four Wards from Ramche as it has significantly greater population than the other two VDCs. Then, ten households were selected randomly from each of the selected ten Wards making the total sample size of 100 households. The average altitude of the sample households is 1709 meters ranging between 705 meters at Ramche to 2328 meters at Gumba from the sea level.

Poverty and inequality

Poverty headcount rates and an inequality measure are calculated using the consumption data. The national poverty line of NPR 19,261 (CBS 2011) was used as the cut-off line to calculate the percentage of the poor household. Thus, the annual household consumption was divided by family size and the households whose per capita consumption was less than NPR 19,261 were categorized as being poor.

To measure the income inequality across the households, we used the most common inequality measure Gini index (Gini 1912). The Gini index measures the extent to which the distribution of income (or, in some cases, consumption expenditure) among individuals or households within an economy deviates from a perfectly equal distribution.[5] Inequality on the Gini scale is measured between zero, where every household has same level of consumption, and one, where all the surveyed households' consumption goes to a single household. When the index is expressed in percentage term, it is called Gini coefficient.

Subjective wellbeing, happiness

In the growing efforts to developing better metrics of human progress, works on both subjective and objective wellbeing measure share the similar claim that measuring human progress should go beyond purely economic metrics such as income, consumption or production (Hall and Helliwell 2014). In fact, subjective and objective wellbeing complement development studies (Stieglitz, Sen and Fitoussi 2009). While human development takes a more holistic approach to human progress including health, education and a decent standard of living, happiness is considered the most subjective aspect of human wellbeing. Thus, this study also documents the level of happiness as the subjective wellbeing of the respondents using the OHQ.

Two Oxford University psychologists Argyle and Hills (2002) developed the OHQ, comprised of 29 questions, which provides a snapshot of the current level of happiness. To measure the level of happiness of an individual, the questionnaire with 29 statements regarding feelings, satisfactions, and life evaluations is structured on a six-point Likert scale, the '1' being the most unhappy score and the '6' being the happiest score, (for detail, see Argyle and Hills 2002). This study used only 25 questions and modified several statements to match them with local context and included them in the household survey questionnaire. The Likert scale answers for negative statements are reversed. Then, all the scores of 25 answers are averaged to a single score of happiness for each respondent. The meaning and interpretation of the happiness score from OHQ is explained together with the results.

Perceived impacts of access to infrastructure on human wellbeing

In this study, the impact of access to different infrastructure services is assessed based on the perception of respondents. Rural people's perception is very useful to understand the local demand and their priority of infrastructure services because local policy makers and development workers can design local development plans and program more effectively. Thus, respondents were asked to rate the level of impacts of each type of infrastructure on their wellbeing. The level of impacts was divided into 'very high impact', 'high impact', 'some impact', 'no impact', and 'don't know'.

Results and discussion

Demographic and socioeconomic characteristics of sample households

Table 1 presents the demographic and socioeconomic characteristics of sample households. Among 100 household heads, 88 are men, 59 are of age between 40 years to 59 years old, and most of them are illiterate. Notably, only two household heads are university graduates, and only 12 have grade six to high school level education, indicating a poor educational level of the overall society. Forty households are taken from Ramche, and 30 households are taken from each of the other two VDCs.

The income and consumption are found lower in more remote villages and Wards. Table 1 shows the results by village. Although detail results by Ward of different aspects of wellbeing are not presented in the text but can be available upon request. Notably, people tend to report a low level of income because the average income per capita is reported as NPR 39,666 whereas average per capita annual consumption is reported as NPR 72,691. The result is consistent with the existing findings which suggest that the consumption is better reported than income in most of the household surveys (Meyer and Sullivan 2003). Thus, consumption data is used as the proxy for a decent standard of living. However, we should be careful about the consumption data as well because there is no practice keeping record of daily consumption and the data is solely based on respondent's estimations on their past consumptions.

Table 1. Sample distribution by demographic, socio-cultural and economic characteristics; sample size=100

Variables	Category	Sample Size (Percent)	Variables	Category	Sample Size (Percent)
Age	Up to 39 yrs.	19	Religion	Buddhist	53
	40-49 yrs.	34		Hindu	44
	50-59 yrs.	25		Christian	3
	60 yrs. & above	22			
Gender	Male	88	Caste / Ethnicity	Tamang	41
	Female	12		Newar	14
Education	Illiterate	53		Chhetri	13
	Literate & grade 1	10		Sherpa	10
	Grade 1 to 5	23		Dalit	7
	Grade 6 to H.S.	12		Magar	6
	College/Univ.	2		Brahmin	5
VDC	Ramche	40		Gharti/Bhujel	2
	Baramchi	30		Thami	1
	Gumba	30		Dhaniya	1

Variable	VDCs	Amount (NPR)	Variable	VDCs	Amount (NPR)
Av. annual income per capita	Ramche	54,551	Av. annual consumption per capita	Ramche	90,745
	Baramchi	34,212		Baramchi	66,178
	Gumba	25,272		Gumba	55,133
	Overall average	39,666		Overall average	72,691

Notes: H.S. = High school; NPR = Nepalese Rupees; Av. = Average; Central Bank's exchange rate on December 31, 2016, is US$ 1 = NPR 109.

Nepal has a high level of ethnic diversity, which is also reflected in the sample. As Tamang is in the majority within Sindhupalchok district, the largest number of sample households (i.e. 41) comes from this ethnic group followed by Newar (14), Chhetri (13), Sherpa (10), Dalit (7), Magar (6), Brahmin (5) and others (4). In Hindu caste hierarchy, Brahmin and Chhetri are considered the most affluent caste/ethnic groups, and Dalit is considered highly suppressed. The rest of the other groups are indigenous nationalities, popularly called 'Janajati'. In terms of religion, 53 sample comes from Buddhist religion followed by 44 from Hindu religion and only three from the Christian religion. Average family size is 6.6 ranging from one to 16.

State of human wellbeing

Standard of living, consumption poverty and inequality

Per capita consumption is used as a measure of a decent standard of living. The summary statistics of the average per capita income is reported in Nepalese currency disaggregating by VDC and community/Ward. The annual consumption per capita is NPR 72,691 (equivalent to about US$ 720 with current exchange rate) ranging from NPR 11,400 to NPR 464,250. However, consumption level is lower in more remote villages and communities in general. For instance, Ramche, Baramchi, and Gumba VDCs have an average per capita consumption of NPR 90,745, NPR 66,178 and NPR 55,133, respectively.

The 28% of the sample household are living below the poverty line which is three percent higher than the national poverty rate of 25.16%, but 1.4% less than the rural hills of mid-Nepal as reported by CBS (2011). However, the poverty rate highly differs across the villages; 12.5% in Ramche, 33.3% in Baramchi and 43.3% in Gumba VDCs. Clearly, poverty situation is alarmingly higher in more remote villages. Poverty within the villages vary significantly indicating remoter the wards more the poverty rate in general. For instance, poverty rate in the Ward no. 7 of Ramche VDC from which the Araniko highway passes and the most remote part of the Ward no. 1 are 10% and 20% respectively. The poverty rate varies across the Wards of other VDCs in similar manner.

In terms of inequality, overall Gini coefficient is 0.52 which is much higher than the national average of 0.33 (CBS, 2011). However, the highest inequality exists in Baramchi VDC with Gini coefficient of 0.55. The coefficient for Gumba and Ramche are 0.52 and 0.47 respectively. It indicates that the inequality does not necessarily be higher in poorer areas. However, the inequality is higher in poorer areas within the VDCs. For example, Gini coefficient of Ward no. 2 with poverty rate of 20% and Ward no. 8 with poverty rate of 50% of Baramchi were 0.47 and 0.63 respectively. The inequality measured by Gini coefficient provides better understanding with the Lorenz curve, which is the mathematical basis of the definition of Gini coefficient. Figure 1 shows the Lorenz curves for each of the village.
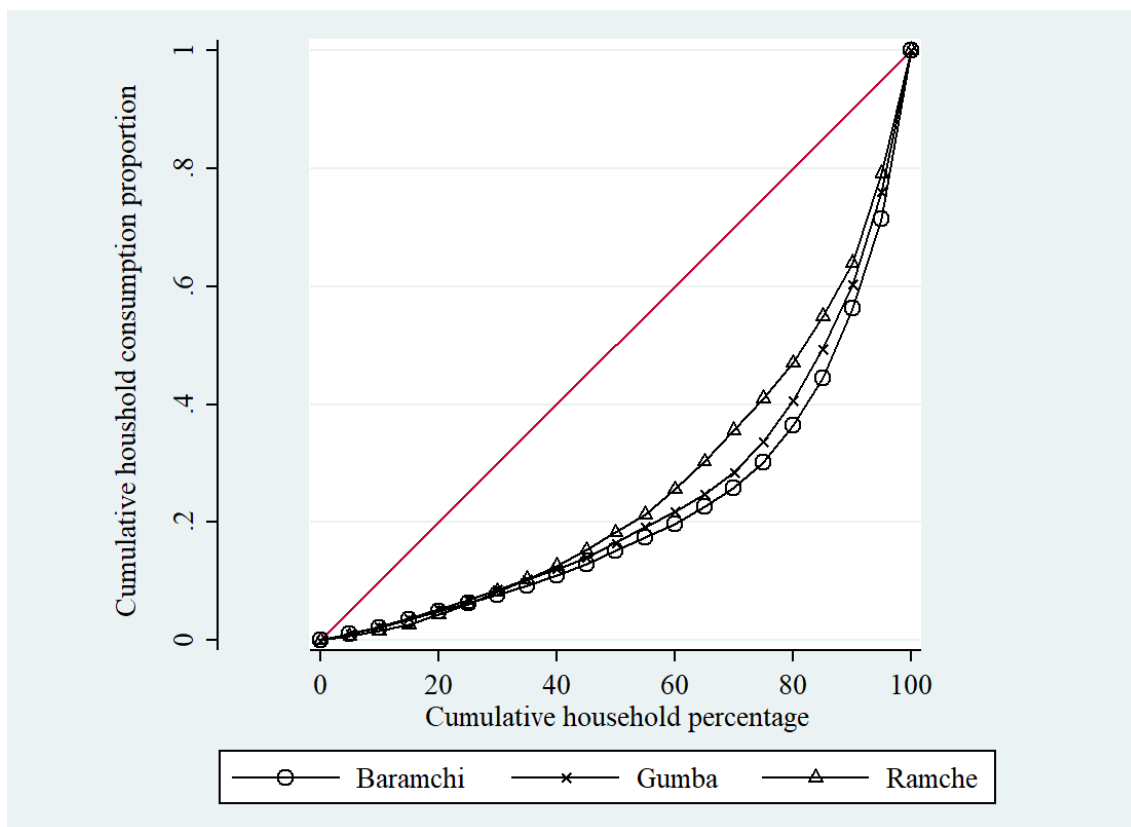
Figure 1. Lorenz curve of annual per capita consumption by VDC

Notes: R = Lorenz curve for Ramche; G = Lorenz curve for Gumba; B = Lorenz curve for Baramchi

Health and Education

Health is also one of the three main pillars of HD. In general, life expectancy is used to measure the overall health achievement and functioning. However, at the household level, chronic and common illness and treatment seeking behaviour is accounted to gauge the health aspect of wellbeing in this article. Among the sample households, 42% have at least 1 person with chronic illness, with 21% of heart-related disease, 18% respiratory related and remaining 10% others: such as diabetes and epilepsy. Similarly, the percentage of sample households with chronically ill member/s are 50% in Baramchi, 45% in Ramche and only 30% in Gumba. The above percentages might reflect the less access to the health facilities in more remote VDCs, because the diagnosis is necessary to know the actual situation of the family members. However, in case of chronic illness, people tend to visit a health facility even if it is too far. Even though people in remote are receive less health care services, most of the chronically ill people at least likely know their illness. Similarly, we also found very low level of common illness in Gumba, the

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most remote village. The respondents were asked whether their family member/s suffered from any common illness in last 30 days, and 48%, 43% and 33% respondents of Ramche, Baramchi and Gumba responded "yes", respectively. This may also reflect the different perception about common illness in more and less remote areas because people in more remote area do not consider minor headache, minor burns or cuts, or light common cold as illness.[6] This fact was revealed when from the interview with community leaders in the villages.

Treatment seeking behaviour among respondent whose family member/s suffered from common illness in the last 30 days show the importance of health services and its influence of the level of common sickness in the less and more remote villages. We found that the households closer to health facility tend to seek more health care service. For instance, all the households, which have a common illness in the past 30 days and are within the distance of half an hour from the health care facility took treatment, whereas only about 15% of the sick households with more than 2 hours far from the health facility took treatment. Thus, the health situation in more remote areas is not precisely reflected in the result from this perception base questionnaire survey. A detail health assessment by a health professional is required to find out the more accurate situation of the villages.

Education is one of the three main pillars of HD. Literacy and educational attainment are used to measure the level of educational development. Illiteracy of the respondents is very high at 53%. Similarly, 10% respondents are just literate, 23% have passed grade 1 to grade 5, another 10% have passed grade 6 to high school level education, and remaining 4% have higher level of education. It indicates that the high level of educational poverty is persisting in the remote areas. Similarly, more proportion of illiterate people are found in more remote village. For example, the most remote village, Gumba, has 70% of illiterate household heads and no household head with higher education. Baramchi village has 50% illiterate households, and only 3% have higher education. On the other hand, the least remote village, Ramche, has 43% illiterate households and 8% households with higher education.

Subjective wellbeing, happiness

In overall, 12% respondents are found to be *very happy* as they received more than 5 to 6 score in OHQ. It means they are more likely to get benefits like better health, better relationships achieving life goals. Indeed, the score above five is ideal regarding the subjective wellbeing. Figure 2 shows the breakdown of the happiness score by VDC. It

shows that the proportion of *very happy* people is higher in less remote areas. Notably, remoteness is seriously limiting to achieve this ideal level of happiness as we found that only one respondent was *very happy* in Gumba VDC. Baramchi and Ramche villages have 4 (about 12%) and 7 (about 17%) *very happy* respondents, respectively.
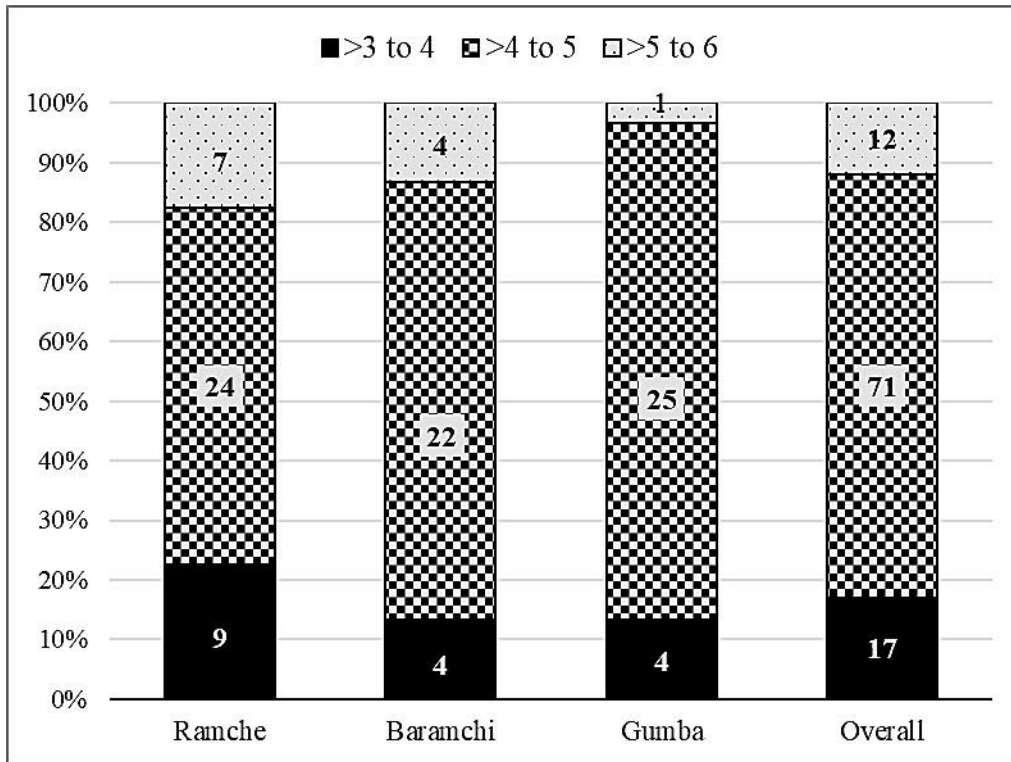

Figure 2. Happiness scores from OHQ by VDC

Notes: 100 percent stacked column chart showing the number of respondents in each group

Overwhelmingly a large proportion of respondents, 71%, are found to be *pretty happy* as they scored more than 4 to 5. These respondents are generally satisfied with their life situation and achievements. It was a higher score than the most likely score of 4 as suggested by Wright (2017). Interestingly, it indicates that people in rural hills and mountains are happier than the average people despite difficult life with limited infrastructure. The remaining 17% are found *not particularly happy* or *unhappy* as they scored more than 3 to 4. They are somewhat indifferent, meaning neither being happy or unhappy. Hills and Argyle (2002) suggest that respondents in this group can improve their happiness level significantly even with some mental exercise. The proportion of such respondents (more than 20%) are higher in Ramche village, which indicates that there is a high variability in terms of the level of happiness in less remote areas.

Interestingly, *not happy* (having score more than 1 to 2) and *somewhat unhappy* (having score more than 2 to 3) respondents are not found in this survey. It indicates that people in the remote area are simple and have not much demand in their life. Most people are hopeful in their future despite difficulties. Family and community bonds are also strong. These all helps them not to be sad and hopeless in their life.

Access to infrastructure

The respondents were asked how long (in terms of time) it takes to reach different infrastructure services and other facilities. Market and Agriculture service centre are the farthest as the average time to reach there are 4.49 hours and 4.37 hours, respectively. Secondary school, health facility, bus stops are within the 3 to 4 hours walk. While road can be reached in nearly 3 hours walk, drinking water sources, primary school, and local shops can be reached by less than half an hour on average.

The results indicate a very high variation of accessibility to infrastructure services and other facilities across and within VDCs. Table 2 shows the average one way time to reach different infrastructure by VDC. Some households in Gumba need 24 hours (practically two days) of walk to reach a Motorable road. Secondary school and health facility are also too far for many households. Although the average time to access drinking water source is about 10 minutes, most of the respondents reported that the amount of the water is very limited, and sometime it is not enough even only for drinking purpose. They said that they mostly use river water for washing, bathing, and other household purposes. Indeed, "development in practice must look beyond "wide" to "deep" meanings of access to water" (Obeng-Odoom 2012: 1135).

Table 2. Average time to different infrastructure by VDCs

One way walking time (hours) to near	Ramche	Baramchi	Gumba
Motorable road	0.08	0.28	9.26
Bus station	1.64	1.00	9.70
Drinking water sources in all seasons	0.10	0.27	0.15
Primary school	0.39	0.48	0.16
Secondary school	1.14	1.33	9.97
Health facility	1.62	1.08	9.29
Market	1.78	2.34	10.27
Local shop	0.51	0.39	0.22
Agriculture/Veterinary service centre	1.70	2.13	10.17

Source: Based on respondents' answer

Impacts of access to infrastructure

The impact of access to different infrastructure services is assessed based on the perception of respondents. Interestingly, a majority, 53%, of the respondents believed that easy access to health services has 'very high impact' on their life and overall wellbeing of their family and community. They think so because both qualities of and access to health services are very poor in the region. Similarly, drinking water sources are perceived as the second most important infrastructure with score of 47%, followed by road 44%, primary school 40%, irrigation 39%, secondary school 34%, and electricity 28%.

If the scores for 'very high impact' and 'high impact' are combined, most of the infrastructure access got more than 80% rate. The Police (security) service, Banking services, and Agriculture and/or Veterinary services received the combined rate of 66%, 69% and 76%, respectively. Further details of the results are presented in Table 3. It indicates that respondents give higher importance to social infrastructures, such as health and education than economic infrastructures, such as road, irrigation, and electricity, if they are allowed to rate the infrastructure independently.

Table 3. Perceived level of HD impacts of access to infrastructure

Question: How do you feel the impact of following infrastructure services on your/family's life?

Access to infrastructure	Perceived level of impact					
	Very high impact	High impact	Some impact	No impact	Don't know	Total
Access to Health services	53	45	2	0	0	100
Access to Drinking water sources	47	42	11	0	0	100
Access to Road	44	38	18	0	0	100
Access to Primary school	40	54	6	0	0	100
Access to Irrigation	39	51	7	3	0	100
Access to Secondary school	34	63	3	0	0	100
Access to Electricity	28	61	11	0	0	100
Access to Agro/Vet services	24	52	23	1	0	100
Access to Bank	19	50	31	0	0	100
Access to Police (security) services	17	39	36	5	3	100

Notes: Agro/Vet = Agriculture and/or Veterinary

Usually, a local government faces big challenges to select certain infrastructure project among several important and highly demanded ones within very limited resources. This study put the respondents in a similar situation by giving a list of infrastructure services and asking them to choose three most important infrastructure services for them and their community. They were asked to prioritize their selection with first, second and third, in terms of the importance and urgency that may affect their life most significantly and immediately. Table 4 shows the results in details. In summary, 36% of the respondents ranked road access as the first priority, followed by access to drinking water sources 32%, irrigation 13%, health services 7%, electricity and secondary school 5% each, and others 2%. It indicates that the hilly mountainous area has very high demands for access to road and drinking water sources. It is a paradox that mountain people acutely lack access to drinking water even though the mountain is the source of water for about 50% of global population.

Table 4. Respondents' priority of access to different infrastructure services (%)

Access to infrastructure	1st priority	2nd priority	3rd priority	Total
Access to road	36	15	20	71
Access to drinking water sources	32	17	12	61
Access to irrigation	13	17	17	47
Access to health services	7	16	21	44
Access to electricity	5	17	5	27
Access to secondary school	5	10	11	26
Having mobile phone	1	1	2	4
Access to Agro/Vet services	1	7	8	16
Access to market	0	0	4	4
Total	100	100	100	300

Notes: Agro/Vet = Agriculture and/or Veterinary

Clearly, respondents acknowledged the access to health and education is the most important for their wellbeing however they prioritized access to road and drinking water on the top as they know these infrastructures are the key means to achieve their health and educational objectives. This result has a significant policy implication indicating that a holistic assessment is necessary for the most effective decision for infrastructure development. The most realistic conclusion can be drawn only when all the available alternatives are assessed together. In fact, the respondents took more time to respond to this question of raking different infrastructures because they needed some judgments and analyses to answer the question.

Strengths and weaknesses

This study is based on household survey data and the findings are unique, no such study in similar geographic region in the world was conducted before. However, households and communities in hills and mountains face similar challenges in their lives and overall development, the outcome of this study can be useful in other similar areas in Nepal and to some extent in other parts of the world. The finding of the perceived positive impacts of access to infrastructure on human wellbeing is in line with the existing literature. Most recently, using the district level data of Nepal and Uganda, Shively (2017) showed the positive relationships between the HD and the access to different infrastructures, such as roads, hospitals, clean water, and market.

The results are consistent with the ground reality as well as with the existing literature. The road network in hilly mountainous rural areas is critically limited due to

the extremely rugged terrain. However, road increases access to other economic and social infrastructures and boosts the rural farm incomes significantly. For instance, a recent empirical study by Shrestha (2012) revealed that one percent decrease in household travel time in rural Nepal increases farm income by 0.25%. Rural roads in hilly mountainous areas in other parts of the world are also proved to be an effective means to solve the problems of human poverty (Gollin and Rogerson 2010). Thus, it is quite natural for respondents to rank access to road at top among the different infrastructure services.

Research interest on happiness is growing recently. However, most literature focused on relatively advanced countries and society. It is even rare to find literature linking access to infrastructure and happiness. As most people found to be happy or very happy in the extremely remote community, exploring the determinants of happiness in such areas could be very interesting. It is not the scope of this study though.

Furthermore, this study is applicable in choosing the best rural infrastructure project/s in hills and mountainous rural areas. Building rural infrastructure is the key to rural development, and it is always hard to find and get consensus on the most appropriate infrastructure project/s to be developed. It is argued that the local government can easily implement the survey designed in this study and find out the unbiased and effective solutions.

The sample size is too small to represent the district. Due to the resource and other limitations, we selected only three out of 79 VDCs. Even within VDCs, we could not cover all the communities in the sample. Although VDCs and Wards were selected based on the remoteness of the area and the households were selected randomly, the findings can provide only a reasonable reference to the similar area. To establish a causal relationship between the level access to different infrastructure on different aspects of human wellbeing, further research with bigger sample size is suggested.

Conclusion

In the context of limited access to infrastructure services with poor state of human wellbeing in hills and mountains around the world, this study explored the infrastructure accessibility and its perceived impacts on human wellbeing in such area in Nepal. We argue that the findings and the method of this study have practical implication for rural development in hills and mountains where human settlements are highly dispersed and access is the key to human wellbeing. On one hand, it documents the poor accessibility

of some communities where people need to walk more than 9 hours to reach earthen temporary road in dry season. More remote villages possess higher level of poverty, lower level of education, health and happiness. On the other hand, it shows how people prioritise different infrastructure services as per the local needs. These information and assessment techniques are very useful for local government agencies, grass-root NGOs, rural development planners, policy makers and the donor communities alike who are interested in improving human wellbeing in hills and mountains.

Notes

1. For details on the concept of human development, see Human Development Reports published annually by the United Nations Development Program, which can be accessed at: http://hdr.undp.org/en (accessed: September 11, 2016).
2. For details on the OHQ see http://www.meaningandhappiness.com/oxford-happiness-questionnaire/214/ (accessed: February 23, 2016).
3. A Village Development Committee (VDC) was the smallest administrative unit in Nepal until recently. After the state restructuring under the new Constitution of Nepal 2016, the smallest administrative unit is restructured as Rural Municipality increasing its size, power and autonomy. Currently there are 481 Rural Municipalities, 246 municipalities, 11 sub-metropolitan cities 6 metropolitan cities in Nepal.
4. Currently, Ramche VDC belongs to the Ward no. 9 of the Bahrabise Municipality. Baramchi VDC and Gumba VDC belongs to the Ward no. 5 and Ward no. 3 of Jugal Rural Municipality, respectively.
5. OECD (n.d.) The OECD glossary of statistical terms online. Retrieved from http://stats.oecd.org/glossary/index.htm For a formal definition of the Gini index and examples, see http://www.leftbusinessobserver.com/Gini_supplement.html
6. Interview with a local health worker reveal this fact.

Acknowledgements

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