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Unveiling Disparities: A Case of Digital Divide in Nepal

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Abstract

This research investigates the digital divide in Nepal, a country witnessing rapid growth in digital adoption. Despite impressive internet penetration rates, disparities persist, rooted in socio-economic factors such as income inequality, gender imbalances, educational disparities, and rural-urban distinctions. Drawing on international literature and employing logistic regression analysis on data from the 2022 National Demographic and Health Survey, the study reveals a significant correlation between socio-economic status (SES) and internet access. Results indicate that individuals with higher SES have a 3.92 times greater likelihood of internet access. Additionally, gender disparities emerge, with females exhibiting higher access probabilities. Urban residents and those with higher education levels also show an increased likelihood of internet access. The findings highlight the persistent digital divide in Nepal and emphasize the need for targeted interventions to promote digital inclusivity. This research contributes to international discussions on digital disparities, offering insights into the multifaceted nature of the digital divide and urging for equitable digital opportunities.

Keywords: *Digital Divide, Socio-Economic Status, Logistic Regression*

1. Introduction

Nepal is making great strides in the digital world. As of the beginning of 2023, an impressive 15.85 million people in the country are using the internet, marking a significant 51.6 percent penetration rate. Social media is booming too, with 12.60 million users, accounting for 41.0 percent of the total population. Mobile communication is flourishing, boasting a whopping 42.78 million active mobile connections, exceeding the country's total population at 139.2 percent (DataReportal, 2023). However, Nepal, a nation celebrated for its awe-inspiring landscapes and rich cultural heritage, stands at the forefront of grappling with a pervasive digital divide, primarily rooted in socio-economic disparities. Unlike traditional divides linked to geographical complexities, the digital landscape of Nepal is marked by pronounced gaps in internet and data communication access driven by factors such as income inequality, gender imbalances, educational disparities, and rural-urban distinctions.

Income inequality plays a pivotal role in shaping the digital landscape, where individuals with limited financial resources face barriers to acquiring digital devices and essential connectivity. This economic constraint perpetuates a stark divide, relegating a significant portion of the population to the outskirts of the digital realm. Gender imbalances further exacerbate this divide, with women often encountering additional obstacles in accessing digital resources, contributing to a notable gender digital gap. In addition to this, educational disparities emerge as a critical factor, influencing the adoption of digital technologies. Limited access to quality education hampers the development

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of digital literacy skills, leaving certain segments of the population ill-equipped to navigate the evolving digital landscape. Rural-urban disparities add another layer of complexity, as remote areas face unique challenges in digital infrastructure development, amplifying the divide between urban centers and the countryside.

The term "digital divide" originated from an unidentified American source in the mid-1990s and was officially introduced in a publication by the US Department of Commerce's National Telecommunications and Information Administration (NTIA) in 1999 (Gunkel, 2003). The digital divide typically denotes the disparity between those with and without access to new information technologies, often involving computers and their networks, although some users of the term also consider other digital devices such as mobile phones and digital television. However, the term digital divide has been a source of confusion rather than clarification, according to Gunkel (2003), due to its ambiguous nature and the dichotomy it implies. Van Dijk (2003, 2005) cautioned against misconceptions, including the notion of a stark division between two distinct groups with an unbridgeable gap, the static perception of the divide, and the belief in absolute inequalities. Both Gunkel and van Dijk criticized the term for echoing technological determinism, implying that resolving physical access issues would automatically solve economic and societal problems. Despite the confusion, the rise of the digital divide as a term in the early 2000s drew attention to the crucial issue of inequality in the information society in scholarly and political discourse. From 2000 to 2004, numerous scientific and policy conferences addressed this issue under the banner of the digital divide. However, by 2004 and 2005, attention began to wane, especially in developed countries where it was perceived that the problem had largely been resolved with increasing access to computers, the Internet, and other digital technologies. While the concept faced challenges and underwent modifications, it remained relevant, acting as a container concept with various meanings. This article aims to assess the main achievements and shortcomings of five years (2000– 2005) of digital divide research, focusing on both theoretical conceptualization/model building and empirical investigations. The article also emphasizes the need to examine the digital divide from a historical perspective, questioning what is genuinely new about access to information and communication technology compared to other resources in society. It poses the crucial question of whether new types of inequality emerge or exist in the information and network society.

Digital divide research initially focused on the number and categories of individuals with access to computers and network connections. While early research centered on physical access, there has been a shift since 2002 to "beyond access," emphasizing social, psychological, and cultural factors. Researchers increasingly advocate reframing the digital divide concept and incorporating factors like (digital) skills, competencies, and technology use.

The article introduces a model extending the concept of access, featuring material access, skills access (operational, information, and strategic), and usage access. The succession of these access types is viewed as a process with multiple causes, challenging the notion of access as a one-time event. The article concludes by proposing further empirical research directions and highlighting the ongoing relevance of the digital divide concept. In response to these multifaceted challenges,

various stakeholders, including government entities, private sector initiatives, and nongovernmental organizations, are collaboratively working to bridge the digital gap in Nepal. Policies and programs are being designed to address socio-economic inequalities, with an emphasis on empowering marginalized communities through digital literacy initiatives, improved infrastructure, and inclusive educational opportunities. This exploration sheds light on the dynamic efforts underway to create a more equitable and inclusive digital ecosystem for all residents of Nepal, transcending the barriers posed by socio-economic disparities.

Hence, with this background, the objective of this research is single-fold, to study the relation between access to the internet and socio-economic status. The research paper is organized in such a way that this section is followed by a brief literature review then the methodology of this study is presented. After that, the findings of the research are presented, and a concluding note is provided at last.

2. Literature Review

We can find a lot of literature on the topic related to the digital divide. In an international context, there is an ocean of literature that studies the context of the digital divide. Lythreatis et. al. (2022) in their article present a comprehensive review of the digital divide, focusing on disparities in Information and Communications Technology access, usage, and outcomes from 2017 to 2021. The study identifies 50 studies and categorizes factors influencing the divide into three segments and nine categories. Education emerges as the most significant factor, and Level 2 of the divide is the primary focus in recent literature. Notably, only one article examines the digital divide at the firm level. New aspects, such as type-of-internet access, and potential levels like algorithmic awareness and data inequalities, are identified. The findings contribute to understanding the digital divide concept, determinants, and social inequalities. The review serves as a guide for managers to address organizational capabilities and diminish the digital divide. Heeks (2022) The article challenges traditional views on digital exclusion in the global South, introducing 'adverse digital incorporation.' It explores how certain groups, including in digital systems, face inequalities. The key finding is that more-advantaged groups exploit less-advantaged ones within digital systems. The paper provides a framework detailing the processes and causes of this phenomenon, offering insights into inequality emergence. Relevant for researchers and practitioners, it emphasizes the role of power dynamics in the connection between digital inclusion and inequality. Gorski (2005) The article challenges the traditional view of the digital divide, arguing that the focus on physical access to technology overlooks deeper inequities. It proposes a shift towards equity in access and reviews recent research to support this perspective. The major finding emphasizes the need to address broader issues of alienation in education. The conclusion advocates for a nuanced approach to bridge the digital divide, promoting equitable opportunities in the digital age. Korovkin et.al. (2023) The article addresses the digital divide, particularly in the context of COVID-19, highlighting its incomplete conceptualization and measurement. It introduces a Digital Life Index, measuring digital supply and demand, and employs hierarchical regression analysis on the Russian sub-national digital divide. Surprisingly, the study finds that demand, not supply, primarily drives the divide, with income being insignificant. Instead, the quality of policy and human capital emerges as key determinants. The paper contributes to

both conceptual and methodological understanding of the digital divide and provides practical insights for national and regional digital development strategies. Anrijs et.al. (2023) The article investigates digital exclusion in digitized welfare countries, particularly in Belgium, using a media literacy perspective and capability theory. Through a survey, it finds that people in poverty, lacking education, experiencing loneliness, or having poor health are at a higher risk of digital exclusion. The study emphasizes the role of internet access, skills, and usage frequency in this association. Notably, individuals with high socio-economic resources can still face digital exclusion, calling for inclusive initiatives. The research underscores the importance of internet skills in preventing exclusion and suggests exploring additional social factors contributing to digital exclusion in the future. Qiu et.al., (2023) The article examines the digital divide's impact on income inequality in China using data from 280 cities (2014-2018). Employing a two-stage spatial model, it finds that a 1-unit increase in the digital divide widens income inequality by 0.134 units. Differentiating digital divides, two types have a more significant impact than the income divide, exceeding it by 0.034 units. The effect is more significant in eastern China. The study recommends improving infrastructure, enhancing digital literacy, and optimizing industrial structure to mitigate these inequalities. Van Dijk, J. A. (2006) The article reviews digital divide research from 2000 to 2005, examining types of inequality and shifts in access. It categorizes findings into motivational, physical, skills, and usage access, noting a shift towards emphasizing skills and usage. While physical access improves in developed countries, disparities in digital skills persist or widen. The article criticizes research for lacking theory, clear definitions, interdisciplinary approaches, and qualitative and longitudinal studies. Overall, it highlights the evolving nature of digital inequality and calls for a more comprehensive approach in future research.

3. Research Methodology

The research draws upon data collected during the 2022 National Demographic and Health Survey (NDHS), a collaborative undertaking by the United States Agency for International Development (USAID) and the Ministry of Health and Population in Nepal. To meet the objective of the study there are other datasets available to the researchers such as the Nepal Living Standard Survey (NLSS), Nepal Household Risk and Vulnerability Survey (NHRVS), census, etc. However, among the available datasets, the selected one is the most recent data available. The NDHS is a comprehensive and nationally representative survey designed to illuminate key demographic and health-related indicators, offering crucial insights into the socio-economic landscape of Nepal. Covering a substantial sample of 13,786 households, the survey ensures a representative crosssection of both urban and rural areas, providing a robust foundation for analyzing the digital disparities prevalent across different segments of the Nepalese population. Conducted with rigorous methodological standards, the NDHS follows established survey protocols, utilizing standardized instruments to gather data. The joint effort by USAID and the Ministry of Health and Population signifies a commitment to reliable data collection and analysis. The survey encompasses a diverse range of topics, including socio-economic status, health metrics, and digital technology access, making it a reputable and pertinent source for investigating the nuanced factors contributing to the digital divide in Nepal.

The objective set in this research is aimed to be met by selecting the variables among the pool of the variables from the selected micro dataset. The variables selected for this study are specified in

Table 1. The dependent variable of the study is a dummy variable '*Internet*', which will capture the access to the Internet among the respondents. If the respondent has access to the internet, then it takes the value of 1 and 0 otherwise. Similarly, the independent variable is socio-economic status. From the dataset, there is the variable 'wealth index' from which the *SES* is constructed. The respondents with wealth index of the middle, richer, and richest are categorized as 1, indicating a better socioeconomic status than the *SES* value 0 which is given for those of wealth index poorer and poorest. Similarly, *Edu* is the control variable which will depict the educational status of the respondent. Those respondents who have completed their secondary and higher secondary education are categorized as 1 and 0 otherwise. The variable *Urban* is the dummy which takes the value 1 if the respondents are residing in an urban area and 0 otherwise. To look for the gender inequality in access to the internet, we have introduced the variable *Male* which will take 1 being respondent male and 0 for female.

Table 1: Variable Description

Variable	Type	Remarks
Internet	Dependent Dummy Variable	Internet Access
SES	Independent Dummy Variable	Socio-Economic Status
Edu	Dummy Control Variable	Educational Status
Urban	Dummy Control Variable	Resident area
Male	Binary Control Variable	Gender

The model specifications for the study are as follows:

$$Internet = \alpha + \beta_1 SES + \epsilon \text{ ..... } (1)$$

$$Internet = \alpha + \beta_1 SES + \beta_2 Edu + \beta_3 Urban + \beta_4 Male + \epsilon \text{ .....} (2)$$

$$Internet = \alpha + \beta_1 SES + \beta_2 Edu + \beta_3 Urban + \beta_4 Male + \beta_5 Edu * Male + \epsilon \text{.....} (3)$$

$$Internet = \alpha + \beta 1\, SES + \beta 2\, Edu + \beta 3 Urban + \beta 4 Male + \beta 6 Urban * Male + \epsilon \text{.....} (4)$$

$$Internet = \alpha + \beta 1\, SES + \beta 2\, Edu + \beta 3 Urban + \beta 4 Male + \beta 7 SES * Male + \epsilon \text{.....} (5)$$

The dependent variable used in the study is of a binary dummy nature so logistic regression is preferred. The research question posed in this study would follow either ordinary least squares (OLS) regression or linear discriminant function analysis. However, both methods were subsequently deemed suboptimal for dealing with binary outcomes due to their stringent statistical assumptions, such as linearity, normality, and continuity for OLS regression, and multivariate normality with equal variances and covariances for discriminant analysis (Tabachnick & Fidell, 2001, p. 521). As an alternative, logistic regression was introduced in the late 1960s and early 1970s (Cabrera, 1994) and became widely available in statistical packages in the early 1980s. Since then, the adoption of logistic regression has grown in the social sciences (Peng et.al, 2002).

Distribution of Data

The nature of the data used in this research can be summarized as shown in Table 2. Also, the graphical representation of the data used are presented in the Appendix 3 below.

Table 2: Descriptive Statistics

				Province				
	Koshi	**Madhesh**	**Bagmati**	**Gandaki**	**Lumbini**	**Karnali**	**Sudur paschim**	**Total**
Distribution of Sample	15.62%	14.83%	16.44%	13.09%	14.46%	12.72%	12.84%	100%
Internet Use								
Last Month								
No Access to Internet	44.15%	37.92%	44.35%	39.78%	37.86%	57.10%	50.85%	44.28%
Access to Internet	55.85%	62.08%	55.65%	60.22%	62.14%	42.90%	49.15%	55.72%
Mobile Phone Used for Financial Transaction								
Yes	9.70%	10.62%	26.26%	14.79%	12.84%	7.47%	10.34%	13.48%
No	90.30%	89.38%	73.74%	85.21%	87.16%	92.53%	89.66%	86.52%
Socio-Economic Status								
Fair	47.31%	62.72%	62.62%	55.29%	57.37%	16.66%	34.29%	49.04%
Weak	52.69%	37.28%	37.38%	44.71%	42.63%	83.34%	65.71%	50.96%
Place of Residence								
Rural	49.26%	44.47%	44.70%	49.70%	49.10%	50.43%	47.91%	47.81%
Urban	50.74%	55.53%	55.30%	50.30%	50.90%	49.57%	52.09%	52.19%
Gender of Respondent								
Female	54.64%	54.31%	52.29%	61.39%	60.53%	62.01%	59.66%	57.52%
Male	45.36%	45.69%	47.71%	38.61%	39.47%	37.99%	40.34%	42.48%
Education of Respondent								
Basic/No Education	67.08%	75.10%	63.81%	70.75%	70.91%	71.19%	70.51%	69.73%
Secondary and Above	32.92%	24.90%	36.19%	29.25%	29.09%	28.81%	29.49%	30.27%

5. Results and Discussion

In model (1) we regress the independent variable and dependent variable only and this shows a coefficient of SES 1.368. This suggests, that being in a situation of better social economic status access to the internet seems high. And if the socioeconomic status increases then the odds of internet access are likely to increase by 3.92 times. The odd ratio of the model 1 is specified in the Appendix 1. Similarly, when we introduce the control variables in the model (2), then again, we find that, for an increase in the SES (assuming all other variables are held constant), the log-odds of internet access are expected to increase by 1.142, significantly. If we introduce the control variable Male then other things remain the same, we find that being male the log odds of internet access are expected to decrease by 0.420, significantly. This signifies that the Internet access to females is more than that of men. Again, other things remain the same, the log odds of internet access are expected to increase by 0.259, as the respondent resides in urban areas rather than in rural areas. For the educated respondents, other things remain the same, the log odds of internet access are expected to increase by 0.904. The odd ratio of the model 1 is specified in the Appendix 2. From this result, we can see that there is inequality in internet access between the socioeconomic status. Richer get access to the internet than the poor group. Similar is the case with the gender. Females are more likely to use the internet than the male. And we can see there is a slightly higher probability of internet access to the respondents in the urban area than in the rural. And the role of education in internet access is also seen. As the probability of internet access is higher for those with higher educational status.

Hence, the clear evidence of the digital divide can be traced from this result.

Table 3: Logistics Regression Results

	(1)	**(2)**
VARIABLES	Internet	Internet
SES	1.368***	1.142***
	(0.0365)	(0.0389)
Male		-0.420*** (0.0379)
Urban		0.259*** (0.0382)
Edu		0.904*** (0.0437)
Constant	-0.413***	-0.511***
	(0.0244)	(0.0331)
Observations	13,786	13,786

Again, to further confirm the digital divide, we run the logistics regression analysis introducing the interaction terms to the model (2) where we have used all the control variables. We attempted to interact variables such as observing the internet access between educated men and females, urban males and females, and better socio-economic conditioned males and females.

In model (3) we can see that the log odds of the internet access of the educated male are expected to decrease by 0.617 times, with other things remaining the same. Similarly in model 4, we can see the log odds of internet access of the males residing in the urban are expected to decrease by 0.223 times while other things remain the same. In model 5 we can see that the log odds of internet access

to the males with better socio-economic status is expected to decrease by 0.423 with other things remaining the same.

This again presents strong evidence that there is a digital divide. Access to the internet is determined by the factors specified and there is inequality between the respondents based on their socio-economic status, gender, place of residence, and education.

Table 4: Logistics Regression with Interaction Terms

	(3)	(4)	(5)
VARIABLES	Internet	Internet	Internet
SES	1.152***	1.143***	1.327***
	(0.0390)	(0.0389)	(0.0515)
Male	-0.262***	-0.309***	-0.230***
	(0.0439)	(0.0532)	(0.0507)
Urban	0.261***	0.354***	0.260***
	(0.0382)	(0.0498)	(0.0382)
Edu	1.222***	0.907***	0.917***
	(0.0645)	(0.0437)	(0.0438)
Edu*male	-0.617***		
	(0.0877)		
Urban*Male		-0.223***	
		(0.0750)	
SES*Male			-0.423***
			(0.0755)
Constant	-0.577***	-0.559***	-0.590***
	(0.0345)	(0.0369)	(0.0361)
Observations	13,786	13,786	13,786

7. Conclusion

In conclusion, our comprehensive investigation into the determinants of internet access has yielded profound insights, evident through the outcomes of our logistic regression analyses. Model (1) focused exclusively on the interplay between socioeconomic status (SES) and internet access, revealing a significant SES coefficient of 1.368. This substantial coefficient, alongside an odds ratio of 3.92, underscores a robust association, suggesting that an escalation in SES significantly enhances the likelihood of internet access. The stark contrast in access points to a discernible inequality, wherein individuals of higher socioeconomic status enjoy greater internet access opportunities.

Our exploration deepened with Model (2), incorporating control variables to illuminate additional facets of the digital divide. This expanded analysis exposed gender disparities, unveiling that females exhibit a heightened probability of internet access compared to their male counterparts. Simultaneously, urban residents demonstrated a slightly elevated likelihood of internet access in contrast to their rural counterparts. Furthermore, educational attainment emerged as a significant factor, with a positive correlation between higher educational status and an increased likelihood of internet access.

To fortify our findings and unravel nuanced interactions, interaction terms were introduced in Models (3), (4), and (5). The ensuing results reinforced our initial conclusions, emphasizing the persistent nature of the digital divide, even when considering the intersections between variables. Educated males, urban males, and males with better socioeconomic status all displayed decreased log odds of internet access, providing a nuanced perspective on the multifaceted nature of this divide.

In summary, our analyses consistently unveil a digital divide influenced by socioeconomic status, gender, residence, and education. The non-uniform distribution of internet access highlights the imperative for targeted interventions to bridge these gaps and cultivate digital inclusivity. As we navigate the intricate landscape of technological access, these findings contribute substantially to a deeper understanding of the factors shaping internet accessibility, emphasizing the urgent need for equitable digital opportunities.

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Appendices

Appendix 1

Odds Ratio of Model 1

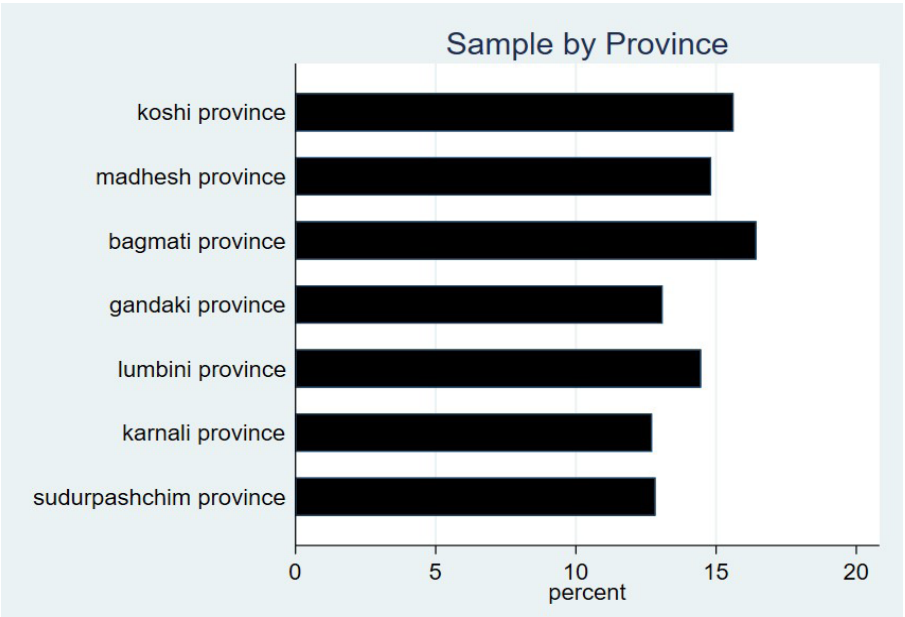
Internet	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
SES	3.928038	.1433193	37.50	0.000	3.656945	4.219226
_cons	.6619352	.0161324	-16.93	0.000	.6310596	.6943214

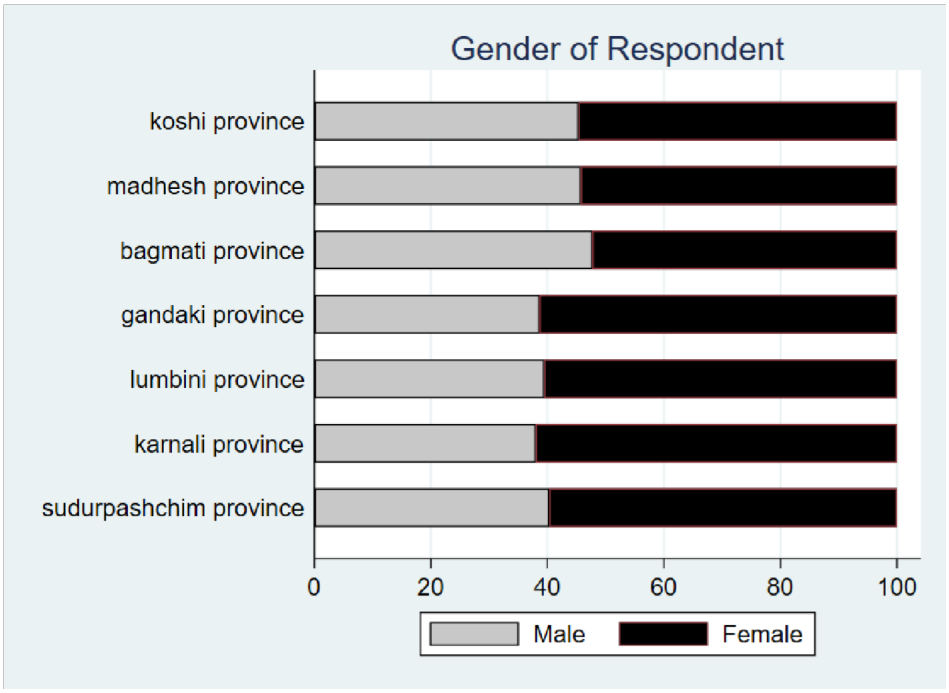
Appendix 2

Odds Ratio of Model 2

Internet	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
SES	3.133102	.1219186	29.35	0.000	2.903031	3.381406
Male	.6568741	.0248928	-11.09	0.000	.609853	.7075208
Urban	1.296154	.0494874	6.79	0.000	1.202701	1.396869
Edu	2.469205	.1078043	20.70	0.000	2.2667	2.689801
_cons	.5996694	.0198634	-15.44	0.000	.5619747	.6398925

Appendix 3


Sample by Province
koshi province
madhesh province
bagmati province
gandaki province
lumbini province
karnali province
sudurpashchim province
0
5
10
15
20
percent


Gender of Respondent
koshi province
madhesh province
bagmati province
gandaki province
lumbini province
karnali province
sudurpashchim province
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20
40
60
80
100
Male
Female

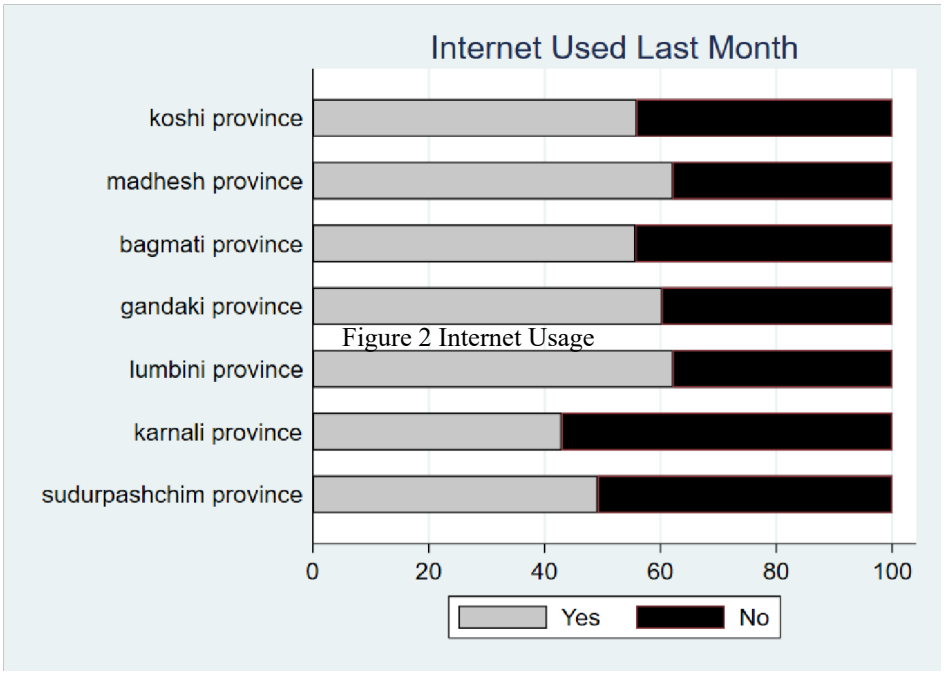
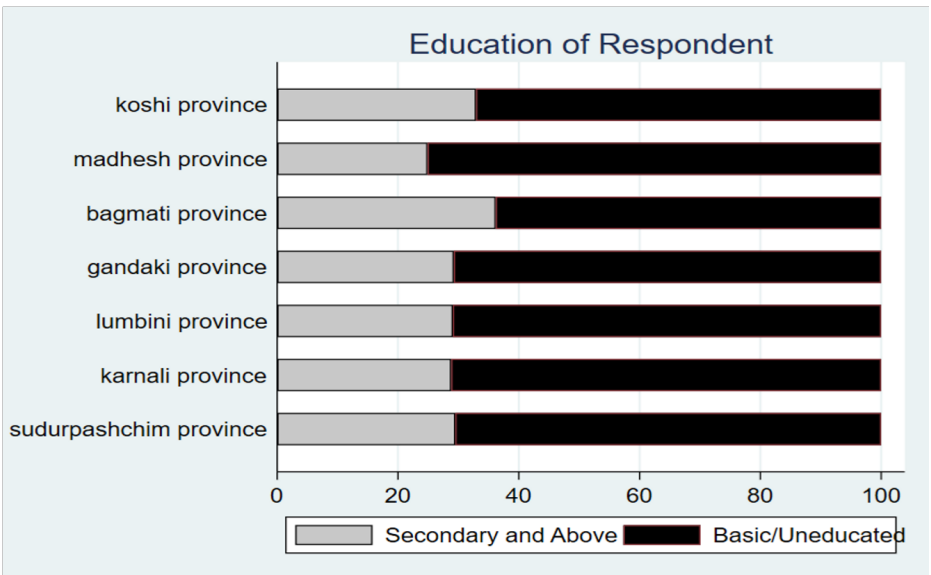
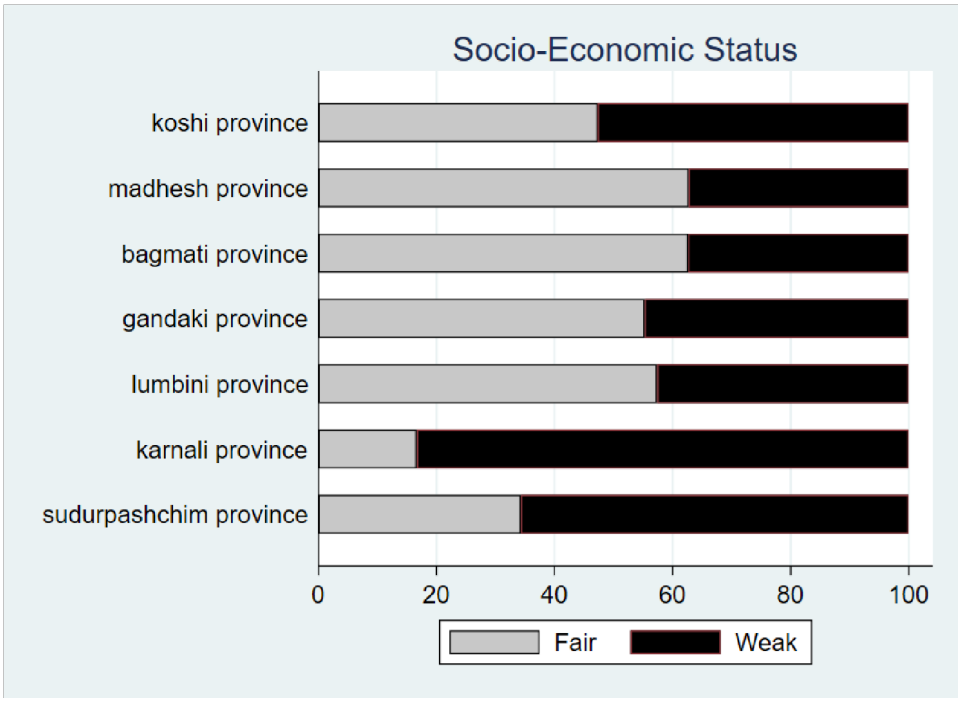


Figure 2 Internet Usage




Socio-Economic Status
koshi province
madhesh province
bagmati province
gandaki province
lumbini province
karnali province
sudurpashchim province
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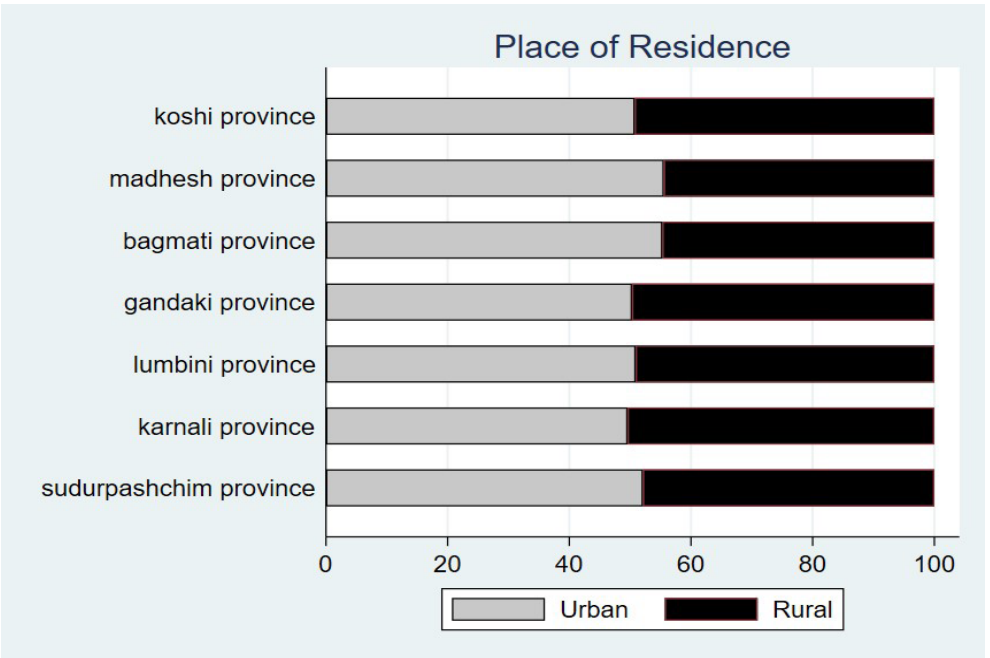
60
80
100
Fair
Weak


Place of Residence
koshi province
madhesh province
bagmati province
gandaki province
lumbini province
karnali province
sudurpashchim province
0
20
40
60
80
100
Urban
Rural