

Socioeconomic Status and Health Behavior in Nepal

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Abstract

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Background: Socioeconomic status (SES) is an important determinant of health outcomes, but more research is needed to improve our understanding of the relationship between SES, behavior and health, particularly in low- and middle-income countries (LMICs). Efforts to improve our understanding are limited by the difficulty of measuring economic status in low-resource settings where income may be seasonal and informal employment is common. The debate over how to accurately measure economic wellbeing is pertinent in Nepal, where more than 25% of the population lives in poverty and subsistence farming is an important source of livelihood. Additionally, studies suggest a growing burden of noncommunicable disease (NCDs) in Nepal, many of which are impacted by behavioral risk factors.

Objectives: This study aimed to construct an asset-based wealth index to estimate household wealth; and to develop and test prediction models for tobacco use and physical activity in a community-based sample of adults in Dhulikhel, central Nepal.

Methods: We conducted a cross-sectional study using data from 863 adult participants of the Dhulikhel Heart Study in Dhulikhel, Nepal. Household characteristics, individual sociodemographic characteristics and individual health behaviors were assessed using

standard questionnaires completed during in-home interviews. The Demographic and Health Surveys (DHS) wealth index model was used to construct an asset-based measure of household wealth. The wealth index used information collected in the DHS, including access to utilities and infrastructure (e.g. source of drinking water), durable asset ownership, and housing characteristics (e.g. number of rooms for sleeping), to produce a measure household wealth. The wealth index was constructed using principal components analysis (PCA) of these measures.

Backwards stepwise logistic regression was used to develop and test prediction models for tobacco use and physical activity using the developed wealth index and other SES variables. Tobacco use was categorized as ever (lifetime) or never. Participants were categorized as those who met the WHO guidelines for recommended level of physical activity (600 MET-minutes per week) and those who did not. Area under the Receiver Operating Characteristic curve (AUC) was used to assess the performance of the predictive models; an average AUC of 0.70 was considered acceptable.

Results: Of 863 participants included in this study, 59% were female. The average age was 40.6 years and nearly a quarter of participants were in the highest quintile of household wealth. On average, study participants had 6.7 years of formal education; approximately one-third of the study population had no formal education.

The first component of the PCA, designated as the wealth index, found that households with the following characteristics had higher loadings: use of liquid petroleum gas (LPG) as fuel for cooking; had a toilet that flushed to piped sewerage system; had drinking water piped into the dwelling; owned a TV; owned a nonmobile phone; owned a refrigerator; owned a table; owned a chair; owned a sofa; owned a cupboard; owned a computer; owned a clock; owned a fan; owned a bike or rickshaw; owned a motorcycle or scooter; had internet; had a bank account; had cement floors; and had a cement roof. The wealth index accounted for 17% of the variability across all wealth indicators.

Approximately 32% of participants reported lifetime tobacco use, and 40% of participants did not meet the recommendation for physical activity. After adjustment for sociodemographic characteristics, males were found to have significantly higher odds of tobacco use (OR=6.22, 95%CI: 3.7-10.45, $p<0.001$) compared to females. No significant differences in physical activity were seen by sex. The prediction model for tobacco use included sex, age, and education; wealth was not a significant covariate in this model. The average AUC associated with the performance of the model was 0.829. The prediction model for physical activity included age, education, wealth, ethnicity and work status in the past twelve months. The average AUC associated with the performance of the model was 0.649 which is below the cut-off of 0.70 traditionally used for evaluating such models.

Conclusions: This study contributes to the existing literature on socioeconomic status, behavior and health in Nepal. With approximately 30% of participants reporting tobacco use, tobacco prevalence was similar to recent national estimates of tobacco use. As seen in previous studies, tobacco use was significantly higher among men compared to women as well as among older, less educated participants. Considering that approximately 40% of participants did not meet recommendations for physical activity, the prevalence of physical inactivity in this study greatly exceeds national estimates. We found that wealth as indicated by household assets did not predict use of tobacco after consideration of age, sex, and education. While wealth, along with age, education, ethnicity, and work status, was significantly associated with physical activity, the model overall did not predict physical activity well. Increased disease surveillance and stronger national strategies are needed to better understand determinants of behavioral risk factors for NCDs and to improve health in Nepal.

Introduction

Globally, socioeconomic status (SES) is an important determinant of health outcomes.^{1–4} Although the relationship between SES and health has been studied extensively, the mechanism by which economic and social status act to influence health is not well understood. In addition to differences in environmental exposures and access to resources, many researchers have considered the relationship between SES, behavior and health. In high-income countries, low SES is associated with behavioral risk factors including tobacco use and physical inactivity; however, more research is needed to improve our understanding of the social determinants of behavior in low- and middle-income countries.^{5–8}

Considering the potential influence of SES on behavior, accurate measures of economic status are vital to examining the relationship between socioeconomic position, behavior and health. SES is commonly measured by income, education or occupation; wealth, another measure of economic status, is less often used.^{5,9–11} Though related, income and wealth are distinct economic indicators: income refers to the flow of financial resources into a household, while wealth is defined as total financial resources and assets amassed over a lifetime.^{10,12}

Research suggests that the domain chosen to measure SES has implications for results, and debate exists about which domain is best. Researchers, however, have identified a number of advantages to using wealth as a measure of SES.^{10,13,14} Studies show wealth is significantly associated with important health outcomes, including obesity, smoking and mortality.^{10,11,15} Because wealth is a reflection of the lifetime accumulation of resources and therefore less subjective to fluctuations over time, wealth may provide a more stable measure of SES than income.^{10,16} This may be particularly

true for health behaviors, which are likely more closely related to long-term financial status, rather than short-term estimates of income.¹⁶ Furthermore, because wealth reflects a variety of social constructs, including prestige and political power, as well as financial resources, wealth may be a better measure of socioeconomic position than income.^{10,12}

Wealth as an economic indicator may be particularly useful in low- and middle-income countries (LMICs), where estimating household economic status has proven difficult.¹⁶ While indicators of SES in high-income countries have traditionally relied on monetary measures, income-based measures may not be appropriate for use in LMICs, where income is often seasonal or dependent on a variety of agricultural and nonagricultural sources.^{8,17} Consumption expenditure, another commonly-used measure, is difficult to collect and requires accurate information about cash expenditure, reducing its utility in low-income settings where transactions may not involve cash exchange.¹

In response to these difficulties, many researchers have advocated for the use of asset-based indices, suggesting that such measures provide a more accurate picture of long-term wealth.^{8,18} Asset-based indices have been shown to produce results comparable to consumption or expenditure.^{14,16,19} The Demographic and Health Surveys (DHS) wealth index, a widely-used asset-based index, was developed to measure a household's economic status in the absence of reliable income and expenditure data.¹⁶ The index uses household information gathered by the DHS, including access to utilities and infrastructure (e.g. source of drinking water), durable

asset ownership, and housing characteristics (e.g. number of rooms for sleeping), to construct a measure of household wealth.

Health and behavioral risk factors in Nepal

The debate over how to accurately measure wealth is pertinent in Nepal, where more than 25% of the population lives in poverty and subsistence farming is an important source of livelihood.²⁰ To date, few studies have developed a standardized method of measuring wealth in Nepal.^{21–24} Recent studies also suggest that Nepal is experiencing a growing burden of noncommunicable diseases (NCDs): deaths attributable to NCDs rose from 51% in 2011 to 60% in 2014.^{25,26} Cardiovascular disease, respiratory diseases, cancer, and diabetes are among the most common causes of death from NCDs in Nepal.^{26–28}

Globally, modifiable behavioral risk factors contribute substantially to disability and death from NCDs.²⁹ In Nepal, five of the ten leading risk factors contributing to the burden of disease are behavioral risks, including tobacco use.³⁰ In 2013, the prevalence of adult tobacco use in Nepal was 30.8%, with nearly half of men ages 15-69 years (48.1%) reporting tobacco use.³¹ Physical inactivity is another key risk factor for NCDs, including cardiovascular diseases, diabetes and cancer.³² While estimates of physical activity vary widely, especially between urban and rural areas, multiple studies report nearly 50% prevalence of physical inactivity among Nepalese adults.^{31,33,34}

In order to improve our understanding of the relationship between socioeconomic status and health behavior in Nepal, this study aimed to construct a measure of household wealth using the DHS wealth index. It also aimed to develop and test

prediction models for tobacco use and physical activity in a community-based sample of adults in Dhulikhel, central Nepal.

Methods

Study design and participants

We conducted a cross-sectional analysis using data collected as part of the Dhulikhel Health Study, a study of cardiovascular disease risk factors among adult residents (n=1073) of Dhulikhel, Kavrepalanchok district, Nepal in 2013-2014.³⁵

Located approximately 15 miles southeast of Kathmandu, Dhulikhel is a suburban town with a population of about 16,000 people.^{28,36} Prior to initiation of the study,

households in Dhulikhel were enumerated (n=2225) and one-third of households in each of nine administrative districts were randomly selected for inclusion in the study. All eligible members of selected households were then invited to participate. Members of a household were eligible to participate if they were at least 18 years of age and a resident of Dhulikhel for a minimum of six months. Individuals living in institutionalized settings (e.g. hostels and motels), pregnant women, individuals unable to respond due to a cognitive or physical disability, and those who refused to participate were excluded from the study.

Data collection

Data was collected by trained study staff hired by Dhulikhel Hospital in Dhulikhel, Nepal. The study staff administered two electronic, tablet-based questionnaires using Open Data Kit. One questionnaire was completed at the household level by a head of

household (usually female); a second questionnaire was completed at the individual level. Both questionnaires are included in the appendix.

The household questionnaire was administered to obtain information on household characteristics, including asset ownership, property ownership, basic facilities and housing condition. The personal questionnaire was administered to obtain additional information about each eligible individual in the household, including sociodemographic characteristics and health behaviors. Sociodemographic questions were based on the Nepal Demographic Health Survey 2011.³⁷ Birth date of the respondents was used to calculate age in years.

Construction of an asset-based wealth index

Data from the household questionnaire, including possession of durable goods, ownership of agricultural land and animals, and materials used for housing construction, were used to develop the index. First, descriptive analyses of household data were performed, and any indicator variable with a cell count less than 10 was excluded from the analysis. A complete list of the indicators included in the wealth index can be found in Table 1-1. Following the method used by the DHS wealth index, principal components analysis (PCA) was used to produce component scores for each household. Only the first component was used to develop the wealth index. The first component score was divided into five quintiles to create the household wealth index. Household data was merged with data from the personal questionnaire, and each individual was assigned the wealth score of her/his household. Participants who did not complete both the household and personal questionnaire were excluded from the analysis.

Measures: exposure, outcomes and covariates of interest

The primary exposure evaluated in this study was household wealth. Household wealth was defined as quintile of household wealth, based on the wealth index constructed following the method used to create the DHS wealth index (described above).³⁸

Study outcomes

The outcomes evaluated in this study were tobacco use and physical activity. Tobacco use was measured using the World Health Organization (WHO) STEPS Surveillance Manual adapted for use in Nepal.³⁹ The tobacco use variable was derived from the question, “Have you ever used tobacco such as cigarettes, bidi, pipe, cigars, khaini, surti, jarda paan, hukka, chilim, tamakhu?” Participants’ tobacco use was categorized as ever (lifetime) or never.

Physical activity was assessed using the WHO Global Physical Activity Questionnaire (GPAQ).⁴⁰ The questionnaire collects information about three domains of physical activity: activity at work, travel to and from places (amount of time spent walking or biking), and recreational activity. Vigorous-intensity activities were defined as activities that require hard physical effort and cause large increases in breathing or heart rate. Moderate-intensity activities were defined as activities that require moderate physical effort and cause small increases in breathing or heart rate. The total duration of activity was then converted into metabolic equivalents (METs); METs are used to

express the intensity of physical activities. To calculate MET-minutes per week, MET values were applied to reported activity levels in each domain; four METs were assigned to time spent engaged in moderate activities and travel, and eight METs were assigned to time spent in vigorous activity. After summing the total activity reported for each domain, participants were categorized as those that met the WHO guidelines for recommended level of physical activity (600 MET-minutes per week) and those that did not meet the recommended level of physical activity.⁴¹ Analysis followed existing guidelines.⁴⁰

Covariates of interest

Covariates of interest included sex, age (years), education (years), ethnicity (Newar, Brahmin/Chettri/Thakuri/Sanyasi, other), religion (Hindu, Buddhist, other), marital status (never married, currently married, separated/widowed), main lifetime occupation (housewife, student, agriculture, sales and service, other) and main work status in the past 12 months (unemployed, employed, student).

Data analysis

All analyses were performed using Stata version 13.1 and SPSS version 21. Descriptive statistics were calculated; sociodemographic characteristics were summarized by frequency and percentage for categorical variables and by mean and standard deviations for continuous variables. We then analyzed the association of each sociodemographic characteristic (wealth, age, sex, ethnicity, years of formal education, religion, lifetime occupation and work status in the past year) with tobacco use and physical activity in unadjusted logistic regression models. The sampling unit was set at the household level to account for clustering at the household level. Multivariate logistic

regressions adjusted for household cluster were completed separately for tobacco and physical activity; the sociodemographic variables listed above were included in the models. Odds ratios (OR), 95% confidence intervals, and p-values were reported.

Backwards stepwise logistic regression was then used to develop prediction models for physical activity and tobacco use. Sociodemographic variables considered for inclusion in the models were sex, age, household wealth, education, ethnicity, religion, marital status, main lifetime occupation and main work status in the past 12 months.

The prediction model was developed in two steps: the model was first developed in a random subsample of half of the participants and subsequently tested for fit in the second half. After the regression analysis was performed on the initial half-sample, variables with significance levels greater than 0.2 were removed from the model. The resulting model for each outcome was then tested in the remaining half of the data. After the model was developed and tested in subsamples of the data, the final model was run using the full dataset. Area under the Receiver Operating Characteristic curve (AUC) was calculated to assess the performance of the model in each subsample of the data; an average AUC of 0.70 was considered acceptable.^{42,43}

Results

Of 1372 eligible participants enumerated in the first wave of the Dhulikhel Heart Study, study staff were able to contact 1103 (80.4%) participants.²⁸ 1073 participants (78.1%) provided informed consent and were recruited into the study. Of those who provided consent, 863 (62.9%) participants from 318 households completed both the household and personal questionnaires. All participants were included in the tobacco

analysis; based on the GPAQ Analysis Guide,⁴⁰ 850 participants were included in the physical activity analysis.⁴⁰

Table 1-1 provides a summary of household characteristics of the sample. Approximately 60% of households used a toilet that flushed to a septic tank, and 59% lived in nuclear families. Approximately 80% of households owned agricultural land, and nearly half owned livestock. More than 90% of households owned at least one of the following assets: a radio, a television, a mobile phone, a table, a chair, and a watch. Less than 10% owned a car or truck, or a dhiki or jaato. Natural materials, including earth and sand, were the most common materials used for flooring in houses, and galvanized sheet was the most common material used for roofing.

The component loadings from the first component of the PCA are shown in Table 1-2. A total of 48 variables were included in the PCA. Following the method used to construct the DHS wealth index, only the first component was used to develop the wealth quintiles.³⁸ The first component explained 17% of the variation in household wealth. Households with the following characteristics had higher scores in the wealth index (score coefficient > 0.4): used LPG as fuel for cooking; had a toilet that flushed to piped sewerage system; had drinking water piped into the dwelling; owned a TV; owned a nonmobile phone; owned a refrigerator; owned a table; owned a chair; owned a sofa; owned a cupboard; owned a computer; owned a clock; owned a fan; owned a bike or rickshaw; owned a motorcycle or scooter; had internet; had a bank account; had cement floors; and had a cement roof. Households that owned livestock, owned goats, had natural floors and had galvanized sheet roofs had lower scores in the wealth index.

Table 1-3 shows all the assets used to construct the wealth index tabulated by quintile of the wealth distribution. Of note, nearly 70% of households in the highest quintile of household wealth used a toilet that flushed to a piped sewerage system, compared to only 6% of households in the poorest quintile. While the percentage of households in each quintile that owned agricultural land was similar, households in the poorest quintile were more likely to own livestock than households in the highest wealth quintile (84.4% versus 12.7%). Approximately 67% of households in the highest wealth quintile had internet, compared to 0% of those in the lowest wealth quintile. Natural floors and galvanized sheet roofs were more common in the poorest households than the wealthiest households, while cement floors and cement roofs were most common in the richest households than in the poorest.

Table 2 shows the sociodemographic characteristics of study participants. The majority of study participants were female (59%), and the average age was 40.6 years (SD: 16.4 years). Nearly a quarter of participants were in the highest quintile of household wealth, compared to approximately 15% in the lowest quintile. On average, study participants had 6.7 years of formal education (SD: 5.6); however, nearly one-third of the study population had no formal education. The majority of study participants identified as Newar (52%) and Hindu (87%). Housewife was the most common lifetime occupation (29%), and nearly half of the study population was employed during the past twelve months.

Tobacco use

Of 863 participants, 274 (31.8%) reported lifetime tobacco use (Table 2). Males had a significantly higher prevalence of lifetime tobacco use (48.6%) compared to

females (19.9%) ($p < 0.0001$). On average, participants who reported tobacco use were significantly older than participants who did not report tobacco use (50.3 years and 36 years, respectively; $p < 0.0001$). Tobacco use was also significantly different by categories of household wealth, education, ethnicity, religion, marital status, main lifetime occupation and main work status in the past 12 months ($p < 0.01$). Notably, participants in the lowest quintile of household wealth and those with no formal education had the highest prevalence of tobacco use.

Table 3-1 shows the crude and adjusted associations of sociodemographic characteristics with tobacco use. In univariate analysis, significant associations were found between tobacco use and sex, age, household wealth, education, ethnicity (other versus Newar only), religion (Buddhist versus Hindu only), marital status, main lifetime occupation and main work status in the past twelve months. In the multivariate model, sex (OR: 6.22, 95% CI: 3.70-10.45, $p < 0.001$ for males), age (OR: 1.06, 95% CI: 1.03-1.08, $p < 0.001$ per year increase), household wealth (middle and highest quintiles versus lowest quintile only), education (OR: 0.91, 95% CI: 0.86-0.96, $p < 0.001$ per year increase), ethnicity (other versus Newar only), and main lifetime occupation (other versus housewife only) were significantly associated with tobacco use.

Using backward stepwise logistic regression, the final prediction model for tobacco use included sex (OR=8.36, 95% CI: 5.45-12.48, $p < 0.001$ for males), age (OR=1.04, 95% CI: 1.03-1.06, $p < 0.001$ per year increase), and education (OR=0.89, 95% CI: 0.84-0.92, $p < 0.001$ per year increase) as significant predictors of tobacco use (Table 3-2). The average AUC associated with the performance of the model was 0.829 (Figure 1-1).

Physical activity

Of 850 participants, 341 (40.1%) did not meet physical activity recommendations (600 MET-minutes per week) (Table 2). The prevalence of physical inactivity was not significantly different between males and females. On average, participants who did not meet physical activity recommendations were significantly older than participants who engaged in sufficient physical activity (43.2 years and 38.8 years, $p=0.0001$). Significant differences in physical activity were also seen within categories of household wealth, marital status, main lifetime occupation and main work status in the past 12 months ($p<0.05$).

Table 4-1 shows the crude and adjusted associations of sociodemographic characteristics with physical activity. In univariate analysis, significant associations were found between physical activity and age, household wealth (middle, fourth and highest quintiles versus lowest quintile only), marital status, main lifetime occupation (student and agriculture versus housewife only), and main work status in the past twelve months. In the multivariate model, age (OR: 1.02, 95% CI: 1.00-1.03, $p<0.05$ per year increase), household wealth (middle, fourth and highest quintiles versus lowest quintile only), and work status in the past twelve months (employed versus unemployed only) were significantly associated with physical activity.

Using backward stepwise logistic regression, the final prediction model for physical activity included age (OR: 1.02, 95% CI: 1.00-1.03, $p<0.01$ per year increase), education (OR: 1.03, 95% CI: 0.99-1.07, $p=0.122$ per year increase), wealth, ethnicity and work status in the past 12 months as significant predictors of physical activity (Table 4-2). The average AUC associated with performance of the prediction model for

physical activity was 0.649 (Figure 1-2); thus, the model was determined to be unacceptable at the 0.70 level.

Discussion

This study provides important insights into relationships between SES and the prevalence of tobacco use and physical inactivity in Nepal. The majority of households included in this study lived in nuclear families, owned agricultural land, and owned at least one of the following assets: a radio, a television, a mobile phone, a table, a chair, and a watch. In this study, sex, age, and education were significant predictors of tobacco use. Despite substantial evidence of wealth as a predictor of tobacco use in LMICs globally, including Nepal, household wealth did not predict tobacco use in this study.⁴⁴⁻⁴⁷ Age, education, wealth, ethnicity and work status in the past 12 months were identified as significant predictors of physical activity.

In this study, approximately 32% of participants reported any tobacco use, including nearly 50% of men and 20% of women. These results are consistent with recent national estimates of tobacco use that reported the prevalence of tobacco use near 30%.^{26,37} Tobacco use estimates ranged from 37-52% for males and 13-25% for females.^{26,31,37} In all of these studies, the prevalence of tobacco use among women was significantly lower than the prevalence reported by men; despite these differences, a comparison of South Asian countries found that women in Nepal had the highest prevalence of tobacco use.⁴⁸ Though the prevalence of tobacco use among Nepali men clearly demands a public health solution, this comparison highlights the need to aggressively address tobacco use among Nepali women as well.

While this study measured lifetime history of tobacco use rather than current tobacco use, participants who reported ever using tobacco were also asked about use in the past month. Of those who reported ever using tobacco, the majority (69%) reported using tobacco in the past month; approximately 72% of men and 65% of women who had ever used tobacco reported use in the last month. Of the entire sample, 22% of participants used tobacco in the last month, including 35% of all men and 13% of all women. These results suggest that most people who initiate tobacco use will continue using tobacco, highlighting the need for prevention efforts. Furthermore, this evidence supports the need for an increase in tobacco cessation programs in Nepal.⁴⁹

In addition to differences by sex, this study found significant associations between age and tobacco use. After adjustment for other sociodemographic characteristics, the odds of tobacco use increased by 6% per each year increase in age. We also found that smoking was most common among participants in the lowest wealth quintile and those with no formal education. Again, these findings are consistent with existing literature.³⁷

The final prediction model for tobacco use included sex, age, and education as significant predictors of tobacco use. Studies regarding the predictors of tobacco use in other South Asian countries show similar results. A study of adults in Bangladesh found that male gender, older age, less education, and low SES were significant predictors of smoking.⁴⁶ A study of tobacco use in thirteen LMICs found that male gender was a significant predictor of tobacco use in every country, while age was a significant predictor of tobacco use in all but two countries.⁵⁷ Generally, prevalence of tobacco use

was higher among participants living in urban areas, those who were less educated, and those belonging to low economic groups.⁵⁷

While our study found that the odds of tobacco use were highest among participants in the lowest quintile of household wealth, the results were not statistically significant. Though our study benefitted from a large sample size, the sample size in the comparison studies ranged from 10,000 to 316,000 participants.^{46,57} Our ability to detect associations between wealth and tobacco use may have been limited by sample size; alternatively, these results may reflect true variation in the relationship between sociodemographic characteristics and tobacco use globally.

In this study, we found that wealth as indicated by household assets did not predict tobacco use after consideration of age, sex, and education. These findings contradict previous research from LMICs, including Nepal, that indicate wealth as a significant predictor of tobacco use.^{44–47} The method used to measure tobacco use in this study may have impacted the relationship between wealth and tobacco use. While this study did not differentiate between smoking and smokeless tobacco, other studies of tobacco use in Nepal suggest that the relationship between wealth and tobacco use may depend on the type of tobacco consumed. A study by Sreeramareddy et al. found that while individuals from the poorest wealth quintile were more likely than wealthier individuals to use all forms of tobacco, gradients of the prevalence rates of tobacco use according to wealth were less prominent for chewing tobacco than smoking.⁴⁵ While the type of tobacco used by each participant was not measured in this study, a study of tobacco consumption among Nepalese men found that chewable tobacco use was more prevalent than smoking.⁵⁸ Considering the high prevalence of smokeless tobacco

use and the potential for differing relationships by type of tobacco use, type of tobacco consumed should be considered in future studies of wealth and tobacco use in Nepal.

While our findings regarding the prevalence of tobacco use echo the results of earlier research in Nepal, the prevalence of physical inactivity in this study was much higher than recent national estimates. Compared to the 40% prevalence of physical inactivity found in our study, recent nationwide estimates reported that 3.5%-4% of Nepalis had low levels of physical activity; physical inactivity was more common among men than women.^{25,31}

Substantial geographic variation in physical activity in Nepal may explain the difference between our results and the results of other studies of physical activity in Nepal. While nationwide reports have estimated less than 5% physical inactivity, a study of a peri-urban community in the Bhaktapur district near Kathmandu showed a high prevalence of low physical activity (43%).^{25,31,33} Similar to our results, this study also reported greater prevalence of low physical activity among older, more educated respondents.³³ A study of an urban poor population in Kathmandu found that one third of the study population reported low physical activity. In contrast to national reports, the prevalence of physical inactivity was higher among women than men in both studies.^{33,50}

Rapid urbanization may contribute to the high prevalence of physical inactivity in urban and suburban areas of Nepal. Despite its status as the least urbanized country in South Asia, with 18% of the population living in urban areas, Nepal is also the fastest-urbanizing country in the region.^{51,52} Urbanization has been associated with decreased physical activity, unhealthy diet, hypertension and obesity.^{28,53-55} A study of Sherpa

women in urban and rural Nepal found that women living in urban areas had significantly higher BMI than women in rural areas; furthermore, the study found that prevalence of BMI was correlated with reduced energy expenditure, rather than an increase in consumed calories.⁵⁶

In addition to increased affluence and a decline in occupational physical activity, access to motorized transportation contributes to decreased physical activity in urban settings.^{55,56} The 2011 Nepal DHS reported that approximately 40% of households nationwide owned a bicycle or rickshaw, 11% of households owned a motorcycle or rickshaw, and 2.3% owned a car or truck.³⁷ In our study, 20% of households owned a bike or rickshaw, 35% owned a motorcycle or scooter, and 3.5% owned a car or truck. Greater access to motorized transportation in Dhulikhel may help explain the increased prevalence of physical inactivity reported in our study.

The prediction model for physical activity included age, education, wealth, ethnicity and work status in the past 12 months as significant predictors of physical activity. A review by Trost et al. found that age and gender were the two most consistent predictors of physical activity in adults; socioeconomic status, occupational status and education were also consistent determinants of physical activity.⁵⁹ A review by Bauman et al. found that males had a higher prevalence of physical activity than females in 17 of 20 studies reviewed.⁶⁰ Older age was associated with lower physical activity in males in about half of the studies; however, only three studies saw a similar trend in females. Importantly, the vast majority of studies included in both reviews were conducted in high-income countries. While many studies have examined the determinants of physical activity in high-income countries, research regarding the determinants of physical

activity in LMICs is limited.⁶⁰ The WHO estimates that nearly three quarters of NCDs deaths occur in LMICs.³² As physical activity is a key risk factor for NCDs, there is a critical need for more research regarding the determinants of physical activity in low-resource settings.

While wealth was not a predictor of tobacco use in this study, wealth, along with age, education, ethnicity, and work status, was a predictor of physical activity. In our study, the percent of participants who reported engaging in vigorous physical activity at work decreased as wealth increased: 51% of people in the lowest quintile of household wealth engaged in vigorous work, compared to 7% of people in the highest quintile. In addition to differences in physical activity at work, wealth may enable investments that reduce activity related to domestic life as well. For example, 65% of households in the highest wealth quintile had drinking water piped into their dwelling, compared to only 6% of households in the lowest wealth quintile. In our study, differences in work and domestic activities by people in different categories of household wealth may help explain the role of wealth as a predictor of physical activity. Future studies of physical activity should consider time spent in different domains of activity to inform strategies aimed at increasing healthy behaviors.

In order to test the ability of our predictive models to discriminate between participants who reported healthy behaviors (i.e. no tobacco use and sufficient physical) and those who reported unhealthy behaviors (i.e. tobacco use and physical inactivity), we determined the AUC of each model. The discriminatory ability of the model was considered acceptable if the AUC associated with the model was 0.70 or greater. While

the prediction model for tobacco use was deemed acceptable (AUC: 0.829), the AUC for the prediction model for physical activity was 0.649.

A possible explanation for the limited discriminatory ability of the model for physical activity is the distribution of the outcome in the population. While tobacco use was vastly more prevalent among certain groups, such as men compared to women, physical inactivity was highly prevalent among all sociodemographic categories. The high prevalence of physical inactivity in every category of the study population may limit the ability of the model to accurately discern physical activity status based on the sociodemographic characteristics included in this study. Furthermore, the use of a binary indicator to represent physical activity may have been too crude of a measure to detect variability across categories of socioeconomic status. The use of multiple categories or a continuous measure of physical activity may have improved our ability to detect underlying relationships between SES and physical activity.

The difficulty of measuring physical activity may have also impacted the performance of the prediction model. Previous research has found that measuring physical activity by self-report without objective measuring devices often results in inaccurate measurements of activity. Prince et al. found that correlations between self-report measures of physical activity and direct methods of assessment (e.g. accelerometry, doubly labeled water) were low to moderate. Furthermore, self-reported measures of physical activity were both higher and lower than directly measured activity, making it difficult to determine the impact of inaccurate measurements on outcomes.⁶¹ Misclassification of study participants' physical activity level may have contributed to the poor performance of the prediction model for physical activity.

This study has several limitations. Because this study uses cross-sectional data, we cannot make statements regarding causality in the relationship between SES and health behavior. The exposures and outcomes in the study are self-reported, which may have resulted in measurement error. As Dhulikhel is a suburban community with close proximity to healthcare provided by Dhulikhel Hospital, the results of this study may not be generalizable to other communities in Nepal, particularly those in rural areas where access to healthcare is limited. Additionally, researchers have criticized PCA as a subjective methodology because the procedure is reliant on data specific to each study and may not be replicated in other data sets. In addition, the variables included in the analysis are determined by the investigator. Despite these criticisms, previous research has found that asset indices constructed using PCA, like the DHS wealth index, produce results comparable to consumption or expenditure.^{14,16,19}

Despite these limitations, this study contributes to our understanding of socioeconomic status, behavior and health in Nepal. To our knowledge, this is the first study to develop prediction models of tobacco use and physical activity in a Nepalese population. This study also demonstrated the use of asset-based wealth indices in Nepal, a method of wealth measurement that requires fewer questions than either consumption expenditure or income, reducing the burden on both participants and researchers.¹⁶ The large sample size, random sampling technique and use of standardized questionnaires are additional strengths of this study.

This study further confirms that tobacco use and physical inactivity are significant behavioral health risks in Nepal. In 2013, Nepal developed a national action plan for NCDs; the plan aims to significantly reduce mortality from the four leading NCDs, the

prevalence of current tobacco use, and the prevalence of insufficient physical activity.⁶² While a national tobacco control program has been implemented, cessation programs for the treatment of tobacco dependence and taxation are two areas that require improvement in order to effectively address tobacco use in Nepal.⁴⁹ As highlighted by this study, efforts to increase physical activity should target urban and suburban areas, where the prevalence of inactivity is highest. It is especially important that future research is conducted to understand how increased wealth might affect health behaviors in the context of low-income countries. As LMICs continue to face a growing burden of NCDs, understanding the role of SES in the formation of health behaviors is critical to developing policies to reduce the burden of disease. Finally, improving surveillance to increase the volume and accuracy of information regarding NCDs and relevant risk factors is crucial to improving health in Nepal.

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Table 1-1. Household characteristics by wealth indicator (N=318)

Wealth indicator	N or mean	(% or SD)
Type of fuel used for cooking²		
Liquid petroleum gas	85	(26.7)
Wood	11	(3.5)
Cooks with improved stove	13	(4.1)
Type of toilet		
Flush to septic tank	192	(60.4)
Flush to piped sewerage system	107	(33.7)
Flush to pit latrine	11	(3.5)
Uses a shared toilet	69	(21.7)
Main source of drinking water²		
Drinking water piped into dwelling	90	(28.3)
Treats drinking water		
Water treatment method: Water filter	18	(5.7)
Water treatment method: Boil	16	(5.0)
Family type		
Nuclear	186	(58.5)
Joint	132	(41.5)
Owns agricultural land		
Amount of land owned (sq. ft) ¹	25555.8	(103125.2)
Owns livestock		
Number of buffalo owned ¹	0.2	(0.5)
Number of cows owned ¹	0.4	(0.88)
Number of goats owned ¹	1.2	(2.13)
Number of sheep owned ¹	0	(0.41)
Number of chickens owned ¹	1.4	(3.71)
Numbers of ducks owned ¹	0.2	(0.88)
Number of pigs owned ¹	0.1	(1.27)
Durable goods		
Owns a radio	290	(91.2)
Owns a TV	290	(91.2)
Owns a mobile phone	300	(94.3)
Owns a nonmobile phone	89	(28)
Owns a refrigerator	102	(32.1)
Owns a table	289	(90.9)
Owns a chair	293	(92.1)
Owns a sofa	194	(61)
Owns a cupboard	281	(88.4)
Owns a computer	115	(36.2)
Owns a clock	260	(81.8)
Owns a fan	139	(43.7)
Owns a dhiki or jaato	26	(8.2)

Owns watch	306	(96.2)
Owns bike or rickshaw	64	(20.1)
Owns motorcycle or scooter	111	(34.9)
Owns car or truck	11	(3.5)
Has internet	66	(20.8)
Has a bank account	277	(87.1)
Main material for the floor		
Earth or sand	170	(53.5)
Cement	137	(43.1)
Main material of the roof		
Galvanized sheet	165	(51.9)
Cement	136	(42.8)
Ceramic tiles	12	(3.8)
Main material for external walls²		
Bricks	48	(15.1)
Cement	23	(7.2)
Mud or sand	10	(3.1)
Number of people per sleeping room¹	2.0	(1.1)

¹Mean and standard deviation

²Missing for 221 households

Table 1-2. Score coefficients derived from principal components analysis of household characteristics

	Component
Wealth indicator	1
Type of fuel used for cooking	
Liquid petroleum gas	0.473
Wood	-0.166
Cooks with improved stove	-0.270
Type of toilet	
Flush to septic tank	-0.296
Flush to piped sewerage system	0.431
Flush to pit latrine	-0.151
Uses a shared toilet	-0.073
Main source of drinking water	
Drinking water piped into dwelling	0.440
Treats drinking water	
Water treatment method: Water filter	0.237
Water treatment method: Boil	0.225
	0.098
Family type	
Nuclear	-0.310
Joint	0.310
Owns agricultural land	
Amount of land owned (sq. ft)	0.028
	-0.043
Owns livestock	
Number of buffalo owned	-0.516
Number of cows owned	-0.301
Number of goats owned	-0.229
Number of sheep owned	-0.437
Number of chickens owned	-0.050
Numbers of ducks owned	-0.138
Number of pigs owned	-0.058
	-0.065
Durable goods	
Owns a radio	0.231
Owns a TV	0.453
Owns a mobile phone	0.269
Owns a nonmobile phone	0.574
Owns a refrigerator	0.712
Owns a table	0.441
Owns a chair	0.434
Owns a sofa	0.719
Owns a cupboard	0.469
Owns a computer	0.704
Owns a clock	0.547
Owns a fan	0.659
Owns a dhiki or jaato	0.068
Owns watch	0.206

Owns bike or rickshaw	0.455
Owns motorcycle or scooter	0.612
Owns car or truck	0.283
Has internet	0.613
Has a bank account	0.429
Main material for the floor	
Earth or sand	-0.654
Cement	0.633
Main material of the roof	
Galvanized sheet	-0.655
Cement	0.707
Ceramic tiles	-0.158
Main material for external walls	
Bricks	0.227
Cement	0.325
Mud or sand	-0.049
Number of people per sleeping room	-0.143

Extraction method: Principal components analysis
Score coefficients > 0.4 are bold

Table 1-3. Percentage of households with specific wealth indicators by wealth quintile (N=318)

Indicator	Quintile (percent or number) ¹					Average
	Lowest	Second	Middle	Fourth	Highest	
Type of fuel used for cooking						
Liquid petroleum gas	3.1	9.4	30.2	26.6	65.1	26.9
Wood	7.8	7.8	1.6	0	0	3.4
Cooks with improved stove	14.1	3.1	3.2	0	0	4.1
Type of toilet						
Flush to septic tank	76.6	68.8	61.9	64.1	30.2	60.3
Flush to piped sewerage system	6.3	23.4	34.9	34.4	69.8	33.8
Flush to pit latrine	9.4	4.7	1.6	1.6	0	3.4
Uses a shared toilet	28.1	23.4	22.2	17.2	17.5	21.7
Main source of drinking water						
Drinking water piped into dwelling	6.3	14.1	30.2	26.6	65.1	28.4
Treats drinking water						
Water treatment method: Water filter	0	0	6.4	6.3	15.9	5.7
Water treatment method: Boil	3.1	1.6	4.8	7.8	7.9	5
Family type						
Nuclear	87.5	59.4	50.8	56.3	38.1	58.4
Joint	12.5	40.6	49.2	43.8	61.9	41.6
Owns agricultural land						
Amount of land owned (sq. ft) ²	41872.2	23765	17359.1	15949.9	28602.4	25509.7
Owns livestock						
Number of buffalo owned ²	0.4	0.3	0	0	0	0.2
Number of cows owned ²	0.6	0.6	0.5	0.2	0	0.4
Number of goats owned ²	2.8	2	0.7	0.5	0.1	1.2
Number of sheep owned ²	0	0.2	0.1	0	0	0
Number of chickens owned ²	2.1	1.7	1.8	0.9	0.3	1.4
Numbers of ducks owned ²	0.1	0.5	0	0	0.1	0.2
Number of pigs owned ²	0.3	0.3	0	0.1	0	0.1
Durable goods						
Owns a radio	76.6	93.8	93.7	96.9	95.2	91.2
Owns a TV	59.4	96.9	100	100	100	91.3
Owns a mobile phone	81.3	96.9	95.2	98.4	100	94.4
Owns a nonmobile phone	6.3	3.1	11.1	48.4	71.4	28.1
Owns a refrigerator	0	6.3	14.3	46.9	93.7	32.2
Owns a table	64.1	92.2	98.4	100	100	90.9
Owns a chair	67.2	95.3	98.4	100	100	92.2
Owns a sofa	6.3	37.5	68.3	93.8	100	61.2
Owns a cupboard	53.1	93.8	96.8	98.4	100	88.4
Owns a computer	0	7.8	23.8	59.4	90.5	36.3
Owns a clock	40.6	79.7	88.9	100	100	81.8
Owns a fan	0	20.3	33.3	78.1	87.3	43.8

Owns a dhiki or jaato	7.8	7.8	6.4	6.3	12.7	8.2
Owns watch	87.5	96.9	100	96.9	100	96.3
Owns bike or rickshaw	1.6	7.8	9.5	25	57.1	20.2
Owns motorcycle or scooter	0	15.6	20.6	56.3	82.5	35
Owns car or truck	0	0	0	0	17.5	3.5
Has internet	0	1.6	3.2	32.8	66.7	20.8
Has a bank account	57.8	89.1	90.5	100	98.4	87.2
Main material for the floor						
Earth or sand	92.2	90.6	46	32.8	4.8	53.3
Cement	3.1	9.4	50.8	67.2	85.7	43.2
Main material of the roof						
Galvanized sheet	89.1	89.1	52.4	18.8	9.5	51.8
Cement	0	4.7	44.4	76.6	88.9	42.9
Ceramic tiles	10.9	4.7	1.6	1.6	0	3.8
Main material for external walls						
Bricks	7.8	6.3	15.9	17.2	28.6	15.1
Cement	0	3.1	1.6	4.7	27	7.3
Mud or sand	3.1	4.7	4.8	3.1	0	3.1
Number of people per sleeping room ¹	2.2	2	2.1	1.9	1.8	2

¹Represents the percent of households within each quintile that own a particular indicator (i.e., of households in the highest wealth quintile, 65% used liquid petroleum gas for cooking)

²Mean

Table 2. Sociodemographic characteristics of study participants by health behavior

	Total (N=863)		Tobacco use (N=863)		p-value ^z	Meets physical activity recommendations (N=850)				p-value ^z
	n	(%)	No n	Yes n (%)		Yes n	%	No n	(%)	
Sex					<0.0001					0.11
Female	507	(58.8)	406	(80.1)		287	(57.6)	211	(42.4)	
Male	356	(41.3)	183	(51.4)		222	(63.1)	130	(36.9)	
Age^{1,3}	40.6	(16.4)	36.0	(14.8)	<0.0001	38.8	(15.1)	43.2	(18.1)	0.0001
Age (years)					<0.0001					<0.0001
18-27	245	(28.4)	220	(89.8)		155	(63.8)	88	(36.2)	
28-37	151	(17.5)	121	(80.1)		87	(58.0)	63	(42.0)	
38-47	182	(21.1)	123	(67.6)		123	(70.3)	52	(29.7)	
48-57	136	(15.8)	70	(51.5)		81	(60.5)	53	(39.6)	
58-67	89	(10.3)	35	(39.3)		41	(46.6)	47	(53.4)	
68+	60	(7.0)	20	(33.3)		22	(36.7)	38	(63.3)	
Household wealth quintile					0.0001					0.01
Q1	133	(15.4)	69	(51.1)		97	(74.6)	33	(25.4)	
Q2	161	(18.7)	109	(68.6)		99	(62.7)	59	(37.3)	
Q3	171	(19.8)	120	(71.0)		94	(56.3)	73	(43.7)	
Q4	190	(22.0)	132	(68.8)		98	(51.9)	91	(48.2)	
Q5	208	(24.1)	159	(76.4)		121	(58.7)	85	(41.3)	
Years of formal education^{1,3}	6.7	(5.6)	7.8	(0.2)	<0.0001	6.9	(5.6)	6.44	(5.6)	0.21
Education					<0.0001					0.21
No formal education	274	(31.8)	143	(52.2)		149	(55.8)	118	(44.2)	
Less than high school	375	(43.5)	261	(69.6)		225	(60.7)	146	(39.4)	
High school or more	214	(24.8)	185	(86.5)		135	(63.7)	77	(36.3)	
Ethnicity					0.0002					0.68
Newar	448	(51.9)	314	(70.1)		259	(58.9)	181	(41.1)	
Brahmin/Chettri/Thakuri/Sanyasi	231	(26.8)	171	(74.0)		136	(59.4)	93	(40.6)	
Other	184	(21.3)	104	(56.5)		114	(63.0)	67	(37)	
Religion					0.0034					0.21
Hindu	748	(86.7)	524	(70.1)		433	(58.8)	304	(41.3)	
Buddhist	95	(11.0)	53	(55.8)		61	(64.9)	33	(35.1)	
Other	20	(2.3)	12	(60.0)		15	(79.0)	4	(21.1)	

Marital status					<0.0001			0.01
Never married	183 (21.2)	160 (87.4)	23 (12.6)			121 (67.2)	59 (32.8)	
Currently married	631 (73.1)	407 (64.5)	224 (35.5)			367 (59.0)	255 (41)	
Separated or widowed	49 (5.7)	22 (44.9)	27 (55.1)			21 (43.8)	27 (56.3)	
Main lifetime occupation					<0.0001			0.002
Housewife	250 (29.0)	187 (74.8)	63 (25.2)			128 (52.9)	114 (47.1)	
Student	212 (24.6)	189 (89.2)	23 (10.9)			142 (67.6)	68 (32.4)	
Agriculture	141 (16.3)	73 (51.8)	68 (48.2)			96 (68.6)	44 (31.4)	
Sales and service	110 (12.8)	62 (56.4)	48 (43.6)			63 (58.3)	45 (41.7)	
Other	150 (17.4)	78 (52.0)	72 (48.0)			80 (53.3)	70 (46.7)	
Main work status (past 12 months)⁴					<0.0001			0.001
Unemployed	348 (40.6)	241 (69.3)	107 (30.8)			179 (52.5)	162 (47.5)	
Employed	381 (44.4)	231 (60.6)	150 (39.4)			238 (63.1)	139 (36.9)	
Student	129 (15.0)	115 (89.2)	14 (10.9)			88 (69.3)	39 (30.7)	

¹Mean and standard deviation

²Chi-squared test unless otherwise noted

³Unpaired t-test

⁴Missing for 5 participants

Table 3-1. Multivariate logistic regression analysis of tobacco use (N=863)

	n (%)	Univariate			Multivariate Model		
		OR	95% CI	p-value	OR	95% CI	p-value
Sex							
Female	507 (58.8)	ref			ref		
Male	356 (41.3)	3.80	(2.85-5.06)	<0.001	6.22	(3.70-10.45)	<0.001
Age (years)¹	40.6 (16.4)	1.06	(1.05-1.07)	<0.001	1.06	(1.03-1.08)	<0.001
Age categories (years)³							
18-27	245 (28.4)	ref			-	-	-
28-37	151 (17.5)	2.18	(1.20-3.98)	0.011	-	-	-
38-47	182 (21.1)	4.22	(2.38-7.49)	<0.001	-	-	-
48-57	136 (15.8)	8.30	(4.55-15.12)	<0.001	-	-	-
58-67	89 (10.3)	13.58	(7.08-26.04)	<0.001	-	-	-
68+	60 (7.0)	17.60	(7.87-39.34)	<0.001	-	-	-
Household wealth quintile							
Q1 (Lowest quintile)	133 (15.4)	ref			ref		
Q2	161 (18.7)	0.48	(0.30-0.76)	0.002	0.63	(0.35-1.17)	0.145
Q3	171 (19.8)	0.43	(0.27-0.66)	<0.001	0.46	(0.20-0.79)	0.018
Q4	190 (22.0)	0.48	(0.29-0.78)	0.003	0.62	(0.28-1.20)	0.177
Q5	208 (24.1)	0.32	(0.20-0.51)	<0.001	0.38	(0.16-0.77)	0.013
Years of formal education¹	6.7 (5.6)	0.89	(0.87-0.92)	<0.001	0.91	(0.86-0.96)	0.001
Education³							
No formal education	274 (31.8)	ref			-	-	-
Less than high school	375 (43.5)	0.48	(0.34-0.66)	<0.001	-	-	-
High school or more	214 (24.8)	0.17	(0.10-0.28)	<0.001	-	-	-
Ethnicity							
Newar	448 (51.9)	ref			ref		
Brahmin/Chettri/Thakuri/Sanyasi	231 (26.8)	0.82	(0.58-1.17)	0.28	0.68	(0.40-1.13)	0.133
Other	184 (21.3)	1.80	(1.29-2.52)	0.001	1.99	(1.17-3.41)	0.012
Religion							

Hindu	748 (86.7)	ref			ref		
Buddhist	95 (11.0)	1.85	(1.24-2.78)	0.003	0.85	(0.40-1.13)	0.598
Other	20 (2.3)	1.56	(0.77-3.17)	0.218	1.99	(1.17-3.41)	0.938
Marital status							
Never married	183 (21.2)	ref			ref		
Currently married	631 (73.1)	3.83	(2.28-6.43)	<0.001	0.94	(0.47-1.90)	0.865
Separated or widowed	49 (5.7)	8.54	(4.02-18.15)	<0.001	1.59	(0.59-4.32)	0.361
Main lifetime occupation							
Housewife	250 (29.0)	ref			ref		
Student	212 (24.6)	0.36	(0.20-0.65)	0.001	1.93	(0.74-5.02)	0.18
Agriculture	141 (16.3)	2.76	(1.79-4.28)	<0.001	1.26	(0.69-2.29)	0.453
Sales and service	110 (12.8)	2.30	(1.47-3.60)	<0.001	1.63	(0.73-3.62)	0.231
Other	150 (17.4)	2.74	(1.77-4.23)	<0.001	2.41	(1.20-4.86)	0.014
Main work status (past 12 months)²							
Unemployed	348 (40.6)	ref			ref		
Employed	381 (44.4)	1.46	(1.08-1.99)	0.015	0.97	(0.58-1.62)	0.899
Student	129 (15.0)	0.27	(0.13-0.56)	<0.001	0.84	(0.28-2.50)	0.756

¹Mean and standard deviation

²Missing for 5 participants

³Because this variable is included in the multivariate model as a continuous variable, no ORs are provided.

Table 3-2. Variables in the prediction model for tobacco use using backward stepwise logistic regression

	Training (N=431) ¹			Full (n=863) ²		
	OR (95% CI)		p-value	OR (95% CI)		p-value
Sex						
Female	ref	-	-	ref	-	-
Male	7.04	(3.93-12.62)	<0.001	8.36	(5.45-12.84)	<0.001
Age (per year increase)	1.04	(1.02-1.06)	<0.001	1.04	(1.03-1.06)	<0.001
Education (per year increase)	0.89	(0.84-0.95)	<0.001	0.88	(0.84-0.92)	<0.001

¹AUC (mean): 0.829

²AUC: 0.829 (95% CI: 0.80-0.86)

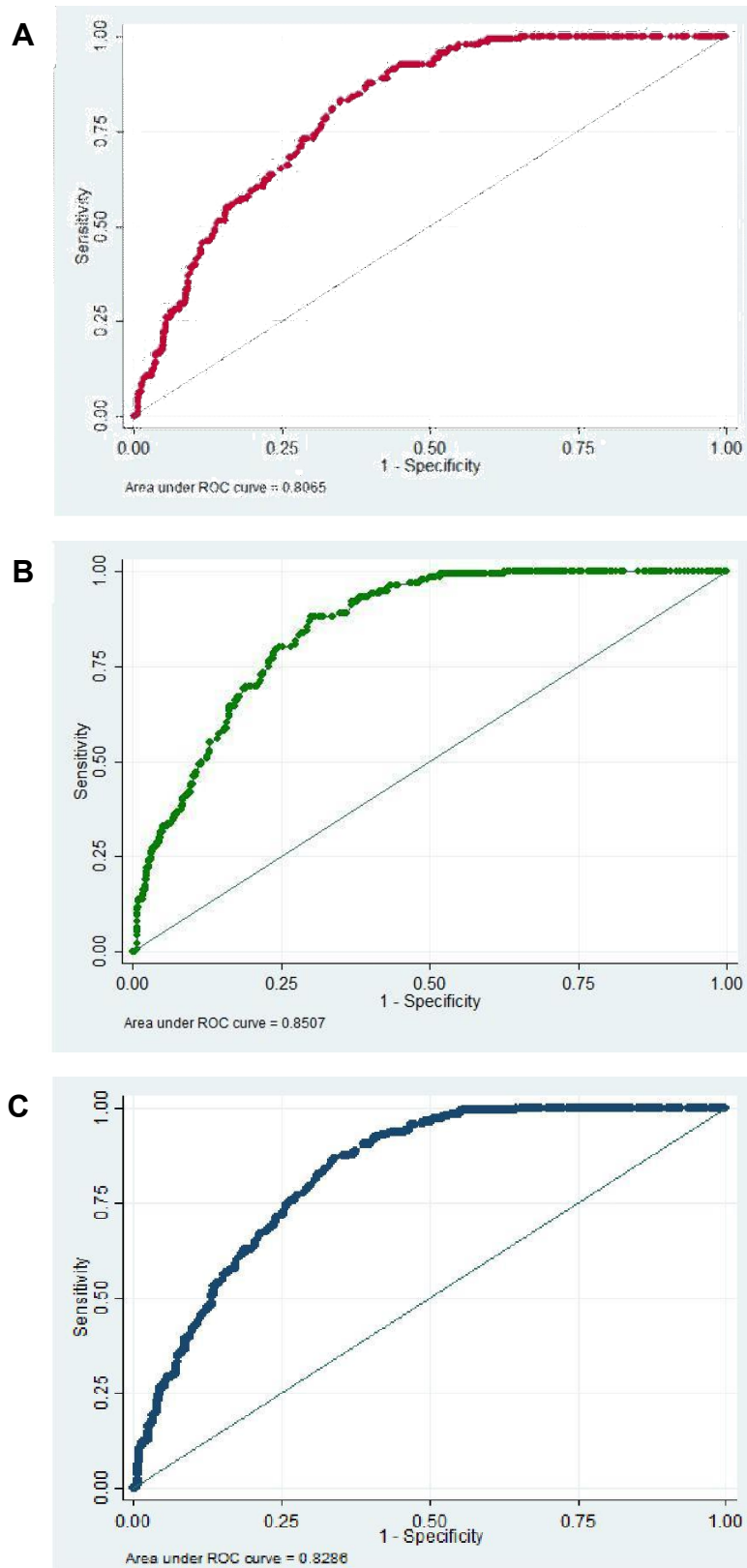


Figure 1-1. ROC curve of the model containing sex, age and education as predictors of tobacco use

- (A)** Training dataset (N=431); AUC=0.8065 (95% CI: 0.766-0.847)
- (B)** Validation dataset (N=432); AUC=0.8507 (95% CI: 0.816-0.886)
- (C)** Full dataset (N=863); AUC=0.8286 (95% CI: 0.802-0.855)

Table 4-1. Multivariate logistic regression analysis of physical inactivity (n=850)

	n (%)	Univariate			Multivariate model		
		OR	95% CI	p-value	OR	95% CI	p-value
Sex							
Female	498 (58.6)	ref			ref		
Male	352 (41.4)	0.80	(0.60-1.05)	0.11	0.82	(0.56-1.21)	0.325
Age (years)¹	40.6 (16.5)	1.02	(1.01-1.03)	<0.001	1.02	(1.00-1.03)	0.028
Age categories (years)³							
18-27	243 (28.6)	ref			-	-	-
28-37	150 (17.7)	1.28	(0.84-1.94)	0.26	-	-	-
38-47	175 (20.6)	0.74	(0.49-1.12)	0.16	-	-	-
48-57	134 (15.8)	1.15	(0.76-1.74)	0.50	-	-	-
58-67	88 (10.4)	2.02	(1.19-3.42)	0.01	-	-	-
68+	60 (7.1)	3.04	(1.64-5.63)	<0.001	-	-	-
Household wealth quintile							
Q1 (Lowest quintile)	130 (15.3)	ref			ref		
Q2	158 (18.6)	1.75	(0.97-3.18)	0.07	1.84	(0.98-3.48)	0.059
Q3	167 (19.7)	2.28	(1.26-4.12)	0.01	2.17	(1.14-4.13)	0.018
Q4	189 (22.2)	2.73	(1.55-4.82)	0.001	2.59	(1.37-4.91)	0.004
Q5	206 (24.2)	2.06	(1.15-3.71)	0.02	1.96	(0.95-4.04)	0.067
Years of formal education¹	6.7 (5.6)	0.98	(0.96-1.01)	0.23	1.02	(0.98-1.06)	0.407
Education³							
No formal education	267 (31.4)	ref			-	-	-
Less than high school	371 (43.7)	0.82	(0.59-1.14)	0.24	-	-	-
High school or more	212 (24.9)	0.72	(0.49-1.05)	0.09	-	-	-
Ethnicity							
Newar	440 (51.8)	ref			ref		
Brahmin/Chettri/Thakuri/Sanyasi	229 (26.9)	0.98	(0.68-1.41)	0.91	1.15	(0.76-1.74)	0.504
Other	181 (21.3)	0.84	(0.57-1.25)	0.39	1.49	(0.84-2.63)	0.169
Religion							
Hindu	737 (86.7)	ref			ref		
Buddhist	94 (11.1)	0.77	(0.47-1.25)	0.29	0.86	(0.43-1.71)	0.659
Other	19 (2.2)	0.38	(0.09-1.52)	0.17	0.37	(0.08-1.64)	0.189

Marital status								
Never married	180 (21.2)	ref				ref		
Currently married	622 (73.2)	1.42	(1.01-2.00)	0.041	0.98	(0.59-1.63)		0.94
Separated or widowed	48 (5.7)	2.64	(1.39-4.99)	0.003	1.33	(0.58-3.03)		0.502
Main lifetime occupation								
Housewife	242 (28.5)	ref				ref		
Student	210 (24.7)	0.54	(0.37-0.78)	0.001	1.00	(0.52-1.91)		0.996
Agriculture	140 (16.5)	0.51	(0.33-0.80)	0.003	0.69	(0.41-1.16)		0.165
Sales and service	108 (12.7)	0.80	(0.49-1.33)	0.388	1.24	(0.63-2.45)		0.539
Other	150 (17.7)	0.98	(0.67-1.43)	0.926	1.68	(0.95-2.98)		0.073
Main work status (past 12 months)²								
Unemployed	341 (40.4)	ref				ref		
Employed	377 (44.6)	0.65	(0.49-0.86)	0.003	0.61	(0.41-0.90)		0.014
Student	127 (15.0)	0.49	(0.32-0.76)	0.001	0.64	(0.33-1.23)		0.177

¹ Mean and standard deviation

² Missing for 5 participants

³ Because this variable is included in the multivariate model as a continuous variable, no ORs are provided.

Table 4-2. Variables in the prediction model for physical inactivity using backward stepwise logistic regression

	Training (n=422) ¹		Full (n=845) ²		p-value
	OR (95% CI)	p-value	OR (95% CI)	p-value	
Age (per year increase)	1.02 (1.00-1.04)	0.07	1.02 (1.00-1.03)	0.008	
Education (per year increase)	1.04 (0.98-1.10)	0.196	1.03 (0.99-1.07)	0.122	
Household wealth quintile					
Q1 (Lowest quintile)	ref -	-	ref -	-	
Q2	1.77 (0.81-3.88)	0.152	1.96 (1.06-3.61)	0.032	
Q3	3.05 (1.38-6.75)	0.006	2.47 (1.33-4.58)	0.004	
Q4	3.77 (1.68-8.47)	0.001	2.91 (1.56-5.41)	0.001	
Q5	3.04 (1.23-7.54)	0.016	2.20 (1.08-4.49)	0.03	
Ethnicity					
Newar	ref -	-	ref -	-	
Brahmin/Chettri/Thakuri/Sanyasi	1.45 (0.86-2.46)	0.165	1.12 (0.75-1.68)	0.573	
Other	1.68 (0.92-3.10)	0.093	1.37 (0.88-2.14)	0.162	
Work status (past 12 months)					
Unemployed	ref -	-	ref -	-	
Employed	0.40 (0.24-0.64)	<0.001	0.60 (0.44-0.83)	0.002	
Student	0.41 (0.18-0.93)	0.032	0.54 (0.32-0.93)	0.027	

¹ **AUC** (mean): 0.649

² **AUC**: 0.636 (95% CI: 0.60-0.67)

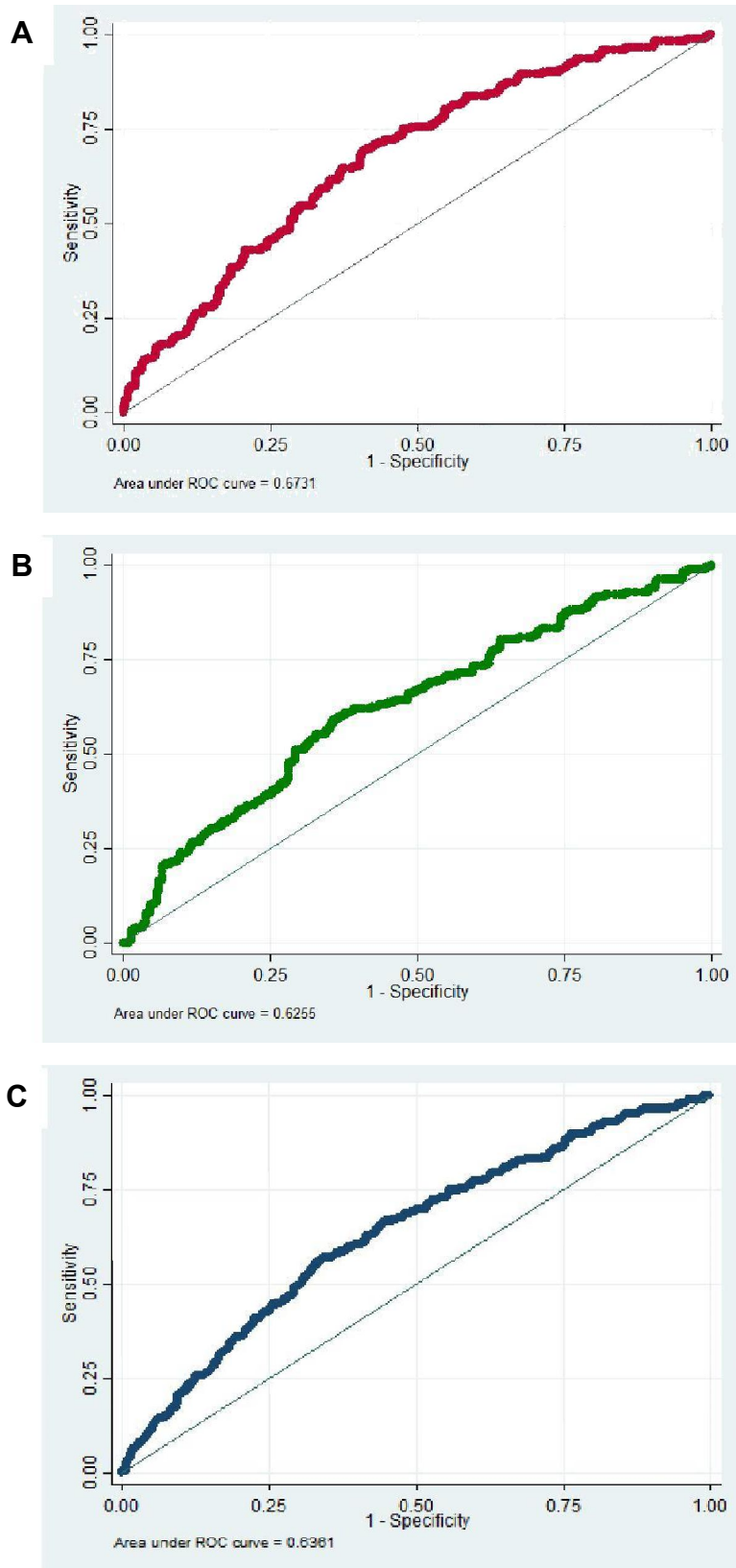


Figure 1-2. ROC curve of the model containing age, education, household wealth, ethnicity and work status in the past twelve months as predictors of physical inactivity

- (A)** Training dataset (N=422); AUC=0.6731 (95% CI: 0.622-0.725)
- (B)** Validation dataset (N=423); AUC=0.6255 (95% CI: 0.571-0.680)
- (C)** Full dataset (N=845); AUC=0.6361 (95% CI: 0.598-0.674)

Appendix

DHULIKHEL HEART STUDY
HOUSEHOLD QUESTIONNAIRE

Interviewer code: ____

GEOGRAPHICAL INFORMATION

District: KAVREPALANCHWOK

Municipality: DHULIKHEL

Ward no: _____

Tole name: _____

Household number: _____

RESPONDENT INFORMATION

1. Name of the respondent: _____
2. Name of Household Head: _____
3. Interview Language: (a) Nepal ____ (b) Newari ____
4. Date of interview: ____/____/____ Interview start time: ____ | ____
- 4.1 Total number of visits: (a.) First time ____ (b) Second time ____ (c) Third time ____

RESULT OF INTERVIEW

- (a) Started ____ (b) Absent at time of visit ____ [Next visit date ____/____/____]
 (c) Absent for extended time ____ (d) Postponed ____ [Next visit date ____/____/____] (e) Refused ____

CONSENT (Enumerator reads the consent sheet, makes sure the participants understand)

- (a) Agree ____ (b) Disagree ____ → The interview ends

HOUSEHOLD INFORMATION

5. Number family members in the household
 (a) Less than 18 years ____ (b) 18 years or above ____ (c) Total ____ Phone number _____

6. Details of the household members

S n	Na me	Relati onship with head of household	Se x	Da te of birth	Ag e	Physi cal disabili ty (Y/N)	Fall ill in last 6 months (Y/N)	If yes, name the illness	How long the illness last	Visited doctor (Y/N)	Visited shama ns (Y/N)

(Write 'Self' in the relationship if the respondent is the head of the household)

MIGRATION

- 7.1. Are there any members of your household who lived here in the past 10 years but who has since moved away (at least six months ago)? (a) Yes ____ (b) No ____ → Go to 8

- 7.2 How many family members have migrated? ____

7.3. Detail information of the migrants

Sn	Name of the migrant	Relation to the head of the household	Sex	Age when migrated (if age less than 1 year write 00)	Main reason	Country of migration	Name of the city in case of Nepal and India

- 7.4 Does your household receive remittances? (a) Yes ____ (b) No ____ → Go to 8

7.5 What are the remittance primarily spent on?

- (a) Daily consumption ____ (b) Education ____ (c) Health ____ (d) Household asset ____
 (e) Saving ____ (f) Repay loan ____ (g) Other (Specify) _____

MORTALITY

- 8.1 Has anyone in your family died in the last year? (a) Yes ____ (b) No ____ → Go to 9

8.2 Detail information of the deceased member (Be sensitive)

SN	Name of the deceased	Sex	Date when died (DD/MM/YYYY)	Completed age when died	Cause of death	If does not know the reason, write the symptoms before dying

ENVIRONMENT

- 9 What type of fuel does your household mainly use for cooking?
 (a) Electricity __ (b) LPG __ (c) Natural gas __ (d) Biogas __ (e) Kerosene __
 (f) Coal, lignite __ (g) Wood __ (h) Straw __ (i) Crop __ (j) Animal dung __
- 10 Do you use improved stove to cook? (a) Yes __ (b) No __
- 11 Is cooking usually done in the house, in separate building or outdoors? (Outside the house)
 (a) In the house __ (b) Separate building __ (c) Outdoors __
- 12 What type of toilet does your household have?
 (a) Flushed to piped sewerage __ (b) Flush to septic tank __ (c) Flush to pit latrine __
 (d) Flush to somewhere else __ (e) Flush, unknown __ (f) Ventilated improved pit latrine __
 (g) Pit latrine with slab __ (h) Pit latrine without slab __ (i) Composting toilet __
 (j) Bucket toilet __ (k) No facility/ bush/ field __
- 13 Do you share this toilet with other household? (a) Yes __ (b) No __
- 14 What is the main source of drinking water?
 (a) Piped into dwelling __ (b) Piped to yard __ (c) Public tap __ (d) Tube well __
 (e) Protected dug well __ (f) Unprotected dug well __ (g) Rain water __ (h) Tanker __
 (i) Protected spring __ (j) Unprotected spring __ (k) Surface water __ (l) Bottle __
- 15 Do you treat drinking water? (a) Yes __ (b) No __ → Go to 17
- 16 If yes, how do you treat drinking water?
 (a) Boil __ (b) Add bleach/chlorine __ (c) Strain through cloth __ (d) Water filter __
 (e) Solar disinfection __ (f) Let it stand and settle __ (g) Don't know __

SOCIO ECONOMIC STATUS

17. What type of family do you live with? (a) Nuclear __ (b) Joint __
- 18 Does any member of this household own following? (Y/N)
 (a) A watch __ (b) A bicycle/rickshaw __ (c) A motor cycle/scooter __
 (d) A three wheel tampo __ (e) A car/truck __ (f) A tractor __
- 19 Does any member of this household own any agricultural land? (a) Yes __ (b) No __ → Go to 21
20. How much of Agriculture land do members of this household own? __ __ (unit _____) → Go to 23
21. Does this household own any livestock, herds, other farm animals or poultry? (a) Yes __ (b) No __
22. If yes, how many of following livestock do you own?
 (a) Buffalo __ (b) Cow __ (c) Goats __ (d) Sheep __ (e) Chicken __ (f) Ducks __ (g) Pigs __
23. Does any member or this household have a bank account/cooperative/or other savings account ?
 (a) Yes __ (b) No __
24. What is the head of house's income per month (NRs)?
 (a) No income __ (b) Less than 5000 __ (c) 5001-10000 __ (d) 10001-20000 __
 (e) 20001-30000 __ (f) 30001-40000 __ (g) 40001-50000 __ (h) 50001-60000 __
 (i) 60001-70000 __ (j) 70001-100000 __ (k) more than 100000 __
 (l) Do not know __ (m) Refused __

HOUSEHOLD OBSERVATION

25. Main material for the floor
 (a) Earth/ sand __ (b) Dung __ (c) Wood planks __ (d) Cement __ (e) Wood __ (f) Carpet __
 (h) Vinyl or asphalt strips __ (i) Ceramic tiles __ (h) Palm/bamboo __ (h) Others(Specify) _____
26. Main Material on the Roof

- (a) No roof ___ (b) thatch/palm leaf ___ (c) rustic mat ___ (d) palm/bamboo ___
(e) Woodplanks ___ (f) Cardboard ___ (g) Ceramic tiles ___ (h) Cement ___
(i) Galvanized sheet ___ (j) Others (Specify) _____

27. Main Material on the external wall

- (a) No walls ___ (b) Mud/Sand ___ (c) Bamboo with mud ___ (d) Stone with mud ___
(e) Ply wood ___ (f) Cardboard ___ (g) Cement ___ (h) Stone with cement ___
(i) Bricks ___ (j) Cement blocks ___ (k) Wood planks/ Shinles ___ (l) Others (Specify) _____

28. How many rooms does the house has? (Do not count the toilet and the rented rooms) ___

29. How many rooms in the house are used for sleeping? ___

DHULIKHEL HEART STUDY
Personal questionnaire

Interviewer code : ___

A. ELIGIBILITY CRITERIA

1. Are you resident of Dhulikhel ? (a) Yes ___ (b) No ___
2. Have you been living in Dhulikhel for past 6 months? (a) Yes ___ (b) No ___
3. Are you 18 years or above (a) Yes ___ (b) No ___
4. (If female), are you currently pregnant? (a) Yes ___ (b) No ___
5. Does participant appear to be cognitively able to conduct the interview?
6. (Enumerator will observe the condition of the respondent) (a) Yes ___ (Specify) _____ (b) No ___

CONSENT

(a) Agree ___ (b) Disagree ___ → Interview ends
Interview start time..... Date of interview (DD/MM/YYYY).....

B. PARTICIPANT'S INTERVIEW

1. Ward number: ___ 2. Tole Name _____ 3. Household number _____
4. Family number: ___ 5. Serial Number of the person from form1 ___
6. Identification Number: _____ (DH-ward no.-household no.-family no.-personal serial no in the family.)

C. DEMOGRAPHIC CHARACTERISTICS

1. What is your full name ? _____
 2. Sex (Observe): (a) Male ___ (b) Female ___ (c) Third gender ___
 3. What is your mobile number? _____
 4. What is your email address? (If not available write NA) _____@_____.com
 5. What is your age? (Completed years) ___ years
 6. What is your birth date ? ___ / ___ / _____
 7. What is your citizenship number? _____
 8. What is your ethnic group?
(a) Brahmin ___ (b) Chettri/Thakuri/Sanyasi ___ (c) Newar ___
(d) Magar/Tamang/Rai/Limbu ___ (e) Sherpa/Bhote ___ (f) Kami/Damai/Sarki/Gaaine/Baadi ___
 9. What is your mother tongue? (a) Nepali ___ (b) Newari ___
 10. What is your marital status?
(a) Never married ___ (b) Currently married ___ (c) Separated ___
(d) Widowed ___ (e) Cohabiting ___ (f) Refused ___
 11. What was your age when you got married? ___ years
 12. What was age of your spouse when you got married? ___ years
 13. What is your religion?
(a) Hindu ___ (b) Buddhist ___ (c) Muslim ___ (d) Kirat ___ (e) Christian
 14. What is the highest grade or year of school you have ever completed, including college? ___ years
 15. For How long did you have Vocational Training? ___ months
 16. Which one best describes the kind of work you have done most of your life?
(a) Professional ___ (b) Clerical ___ (c) Sales and services ___ (d) Skilled manual ___
(e) Unskilled manual ___ (f) Agriculture ___ (g) Student ___ (h) Housewife ___
(i) Military / Police ___
 17. Which of the following describes your main status over the past 12 months?
(a) Government employee ___ (b) Non-government employee ___ (c) Self-employed ___
(d) Non-paid ___ (e) Home maker ___ (f) Unemployed ___ (g) Student ___
 18. Talking about the past year, what was your average earning? _____ (per day / per month / per year)
 19. Give me the name and contact number of three people with who you expect to be in close contact in future
- | SN | Name | Relation | Phone number | Email ID |
|-----|-------|----------|--------------|----------|
| ___ | _____ | _____ | _____ | _____ |
| ___ | _____ | _____ | _____ | _____ |
| ___ | _____ | _____ | _____ | _____ |

D. WOMEN EMPOWERMENT

20. Does the wife own property under her own name? (a) Yes ___ (b) No ___

21. Does the wife have her own bank account? (a) Yes ___ (b) No ___

E. SMOKING

Now I will ask you some smoking related questions, okay?

22. Have you ever used tobacco such as cigarettes, bidi, pipe, cigars, khaini, surti, jarda paan, hukka, chilim, tamakhu?
(a) Yes ___ (b) No ___
23. At what age did you start tobacco use? ___ years
24. Have you used tobacco in the last month? (a) Yes ___ (b) No ___
25. At what age did you stop tobacco use? ___ years
26. Have you ever smoked cigarettes? (a) Yes ___ (b) No ___
27. How many days do you smoke in a typical month? ___ days
28. The day when you smoke, on an average how many cigarettes do you smoke?.....(number of cigarettes smoked per day)
29. Do you usually smoke filter cigarettes or non-filter cigarettes? ((Show Card; Picture Number) filter cigarettes have filter i.e. a small sponge at the end of the cigarettes)
(a) Filter cigarettes ___ (b) Non-filter cigarettes ___ (c) Don't know ___
30. Have you ever smoked bidi? (Asking about only bidi) (a) Yes ___ (b) No ___
31. How many days do you smoke in a typical month? ___ days
32. The day when you smoke, on an average how many cigarettes do you smoke? ___
33. Have you ever smoked pipe or cigar? (a) Yes ___ (b) No ___
34. How many days do you smoke in a typical month? ___ days
35. The day when you smoke, on an average how many cigarettes do you smoke? ___

Smoking quit

36. Have you ever tried to quit smoking? (a) Yes ___ (b) No ___
37. How many times did you try to quit smoking? ___
38. What was the longest duration you didn't smoke after you attempted quitting? ___
39. Would you be interested in quitting smoking if we could help you with quitting? (a) Yes ___ (b) No ___
40. Have you ever used khaini, surti, jarda paan? (Asking about only khaini, surti jarda paan) (a) Yes ___ (b) No ___
41. How many days do you use in a typical month? ___ days /weeks/months/year
42. The day when you use Khaini Surti, Jarda, Paan, on an average how many amount of these do you use? ___
43. Have you ever smoked hukka, chilim or tamakhu? (asking about only hukka, chilim, tamakhu) (a) Yes ___ (b) No ___
44. How many days do you smoke in a typical month? ___ days/weeks/months/year
45. The day when you smoke, on an average how many cigarettes do you smoke? ___

Second hand smoking

46. Does anyone living with you smoke cigarettes,/bidi/cigar/pipe/hukka/ chilim when you are present?
(a) Yes ___ (b) No ___
47. During past 7 days, on how many days did someone in your home smoke when you were present? ___
48. During past 7 days, on how many days did someone smoked in close areas in your workplace such as building, work area or specific office when you were present? ___

F. ALCOHOL DRINKING

49. Do you ever drunk any alcoholic drink such as beer, wine, jaad, chhyang, tongba, ningaar, raksi, soltyang, whiskey, brandy, rum, vodka, sherry, champagne? (a) Yes ___ (b) No ___ (c) Refused ___
50. At what age did you start drinking alcoholic drink? ___ years
51. Do you ever drink beer? (Currently or in the past, ask only of beer) (a) Yes ___ (b) No ___
52. How many days do you drink beer in a typical month? ___(Week/ Month)
53. The days when you drink, how many bottles (650 ml) of beer do you normally drink in one day? ___ml
54. What is the maximum number of drinks in one occasion you had in the past month? ___
55. Do you ever drink jaad, chhyang, tongba or nigaar? (a) Yes ___ (b) No ___ (9) Refused
56. How many days do you drink jaad, chhyang, tongba or nigaar in a typical month? ___(Week/ Month)
57. The days when you drink, how many glassess of jaad, chhyang, tongba or ningaar do you normally drink in one day? (Show picture of glasses and write in ml from the booklet) ___ml
58. What is the maximum number of drinks in one occassion you had in the past month? (Show picture of glasses and write in ml from the booklet) ___ml
59. Do you ever drink wine, sheery or champagne? (a) Yes ___ (b) No ___ (c) Refused
60. How many days do you drink wine in a typical month? (Week/ Month)

61. The days when you drink, how many glasses of or champagne do you normally drink in one day? (Show picture of glasses -picture number 28) _____ml
62. What is the maximum number of drinks in one occasion you had in the past month? (Show picture of glasses -picture number 28) _____ml
63. Do you ever drink raksi, aila or soltyang (hard liquor)? (a) Yes ___ (b) No ___ (c) Refused ___
64. How many days do you drink raksi, aila or soltyang in a typical month? ___(Week/ Month)
65. The days when you drink, how many glasses of rakshi, aila or soltyang do you normally drink in one day? ? (Show picture of glasses -picture number 28)_____ml
66. What is the maximum number of drinks in one occasion you had in the past month? Show picture of glasses -picture number 28) _____ml
67. Do you ever drink whisky, scotch, brandy, rum or vodka? (a) Yes ___ (b) No ___ (c) Refused
68. How many days do you drink whisky, scotch, brandy, rum or vodka in a typical month? ___(Week/ Month)
69. The days when you drink, how many glasses of whisky, scotch, brandy, rum or vodka do you normally drink in one day? _____ml
70. What is the maximum number of drinks in one occasion you had in the past month? _____ ml
71. In the past five years, has your alcohol intake increased, decreased or remained the same?
(a) No ___ (b) Increased intake ___ (c) Decreased intake ___
72. If you do not drink alcohol now, did you ever drink alcohol regularly? (for former drinker)(a) Yes ___ (b) No ___
73. At what age did you start drinking? _____ years
74. At what age did you stop drinking alcohol regularly? _____years
75. How many drinks per week did you usually drink? _____
76. What is the maximum number of drinks that you ever had on one occasion? _____

F. MEDICAL HISTORY

Cardiovascular health

(Now I am going to ask you about diseases or procedures that you may have had in the past. If you do not know the answer, just say 'don't know')

77. Has your doctor ever told you had a myocardial infarction or heart attack? (a) Yes ___ (b) No ___ (c) Don't know ___
78. Where was it diagnosed? (Name of the hospital/ nursing home/ clinic) _____
79. Were you hospitalized for your myocardial infarction or heart attack? (a) Yes ___ (b) No ___ (c) Don't know ___
80. Has your doctor ever told you that you had congestive heart failure? (a) Yes ___ (b) No ___ (c) Don't know ___
81. Where was it diagnosed? (Name of the hospital/ nursing home/ clinic) _____
82. Were you hospitalized for your congestive heart failure? (a) Yes ___ (b) No ___ (c) Don't know ___
83. Has your doctor ever told you that you had rheumatic heart or valve problems? (a) Yes ___ (b) No ___ (c) Don't know ___
84. Has your doctor ever told you that you had atrial fibrillation? (a) Yes ___ (b) No ___ (c) Don't know ___
85. Has your doctor ever told you that you had deep venous thrombosis or blood clots in your leg?
Yes ___ (b) No ___ (c) Don't know ___
86. Has your doctor ever told you that you had pulmonary embolus or blood clots in your lungs (fokso ma ragat jameko)?
a) Yes ___ (b) No ___ (c) Don't know ___
87. Has your doctor ever told you that you had other heart or circulatory problems? a) Yes ___ (b) No ___ (c) Don't
88. Please specify which heart or circulatory problems you had _____
89. Have you ever had cardiac bypass surgery? (a) Yes ___ (b) No ___ (c) Don't know ___
90. Have you ever had any other heart surgery? (a) Yes ___ (b) No ___ (c) Don't know ___
91. Have you ever had surgery on the blood vessels in your neck (carotid arteries)?
(a) Yes ___ (b) No ___ (c) Don't know ___
92. What side did you have the surgery on ? (a) Right ___ (b) Left ___ (c) Both ___
93. Have you ever had surgery on the blood vessels in your legs?
(a) Yes ___ (b) No ___ (c) Don't know ___
94. What side did you have the surgery on? (a) Right ___ (b) Left ___ (c) Both ___
95. Have you ever had a repair of an aortic aneurysm ? (a) Right ___ (b) Left ___ (c) Both ___
96. Have you ever had a pacemaker implant ? (a) Yes ___ (b) No ___ (c) Don't know ___
97. Have you ever had an angioplasty of the coronary arteries, which is a dilation of the arteries of the heart with a balloon?
(a) Yes ___ (b) No ___ (c) Don't know ___
98. Have you ever had angioplasty of the lower extremity arteries, which is a dilation of the arteries of the leg with a balloon?
(a) Yes ___ (b) No ___ (c) Don't know ___

Rose Angina

87. Have you ever had a pain or discomfort in your chest ? (a) Yes ___ (b) No ___

88. Do you get it when you walk uphill or hurry? (a) Yes ___ (b) No ___
89. Do you get it when you walk at an ordinary pace on the level? (a) Yes ___ (b) No ___
90. What do you do if you get it while you are walking? (Probe)
(a) Stop or slow down, or continue at same pace after taking nitroglycerine ___ (b) Continue at same pace ___
91. If you stand still, what happens to it? (Probe) (a) Relieved ___ (b) Not relieved ___
92. How soon is it relieved? (a) 10 minutes or less ___ (b) More than 10 minutes ___
93. Where do you get this pain or discomfort? (Write the code of the region)
(a) A ___ (b) B ___ (c) C ___ (d) D ___ (e) E ___ (f) F ___
94. Have you ever had a severe pain across the front of your chest lasting for half an hour or more?
(a) Yes ___ (b) No ___
95. If you answered yes, did you see a doctor because of this pain? (a) Yes ___ (b) No ___
96. If you saw a doctor, what did your doctor say it was? (a) Angina ___ (b) Heart Attack ___
97. Have you ever had to sleep on 2 or more pillows to help you breathe? (a) Yes ___ (b) No ___
98. Have you ever had been awakened at night by trouble breathing? (a) Yes ___ (b) No ___
99. Have you ever had swelling of your feet or ankles? (Excluding during pregnancy)? (a) Yes ___ (b) No ___
100. If you answered yes, did it tend to come on during the day and go down overnight? (a) Yes ___ (b) No ___
101. Do you get pain in either leg on walking? (a) Yes ___ (b) No ___
102. Do you get this pain in your calf or calves? (a) Yes ___ (b) No ___
103. Do you get it when you walk uphill or hurry? (a) Yes ___ (b) No ___ (c) Never hurry or walk uphill ___
104. Do you get it when you walk at an ordinary pace on the level? (a) Yes ___ (b) No ___
105. Does this pain ever disappear while you are walking? (a) Yes ___ (b) No ___
106. What do you do if you get it while you are walking? (a) stop or slow down ___ (b) Continue at same pace ___
107. If you stand still, what happens to it? (a) Relieved ___ (b) Not relieved ___
108. Have you ever had pneumonia? (a) Yes ___ (b) No ___ (c) Do not know ___
109. Have you ever had emphysema (fokso fulne)? (a) Yes ___ (b) No ___ (c) Do not know ___
110. Have you ever had asthma? (a) Yes ___ (b) No ___ (c) Do not know ___
111. Have you ever had chronic bronchitis? (a) Yes ___ (b) No ___ (c) Do not know ___
112. Are you troubled by shortness of breath when hurrying on level or walking up a slight hill?
(a) Yes ___ (b) No ___ (c) Do not know ___
113. Do you have to walk slower than people of your age on the level because of breathlessness?
(a) Yes ___ (b) No ___
114. Do you ever have to stop for breath when walking at your own pace on the level? (a) Yes ___ (b) No ___
115. Do you ever have to stop for breath after walking about 100 yards or 91 meters (or after a few minutes) on the level? (a) Yes ___ (b) No ___
116. Have you ever had Chronic Obstructive Pulmonary Disease (COPD)? (a) Yes ___ (b) No ___ (c) Don't know

Stroke related questions

117. Have you ever had sudden painless weakness on one side of your body?
(a) Yes ___ (b) No ___ (c) Do not know ___
118. Have you ever had sudden numbness or a dead feeling on one side of your body?
(a) Yes ___ (b) No ___ (c) Do not know ___
119. Have you ever had sudden painless loss of vision in one or both eyes?
(a) Yes ___ (b) No ___ (c) Do not know ___
120. Have you ever suddenly lost the ability to understand what people are saying?
(a) Yes ___ (b) No ___ (c) Do not know ___
121. Have you ever suddenly lost the ability to express yourself verbally or in writing?
(a) Yes ___ (b) No ___ (c) Do not know ___

High blood pressure

122. Have you ever had your Blood Pressure checked? (a) Yes ___ (b) No ___ (c) Do not know ___
123. If yes, why did you have your blood pressure checked?
a) I had some symptoms, which I thought were related to high blood pressure ___
b) Blood pressure was checked as a part of a regular check up ___
c) Because there was an opportunity for a free check up ___
d) My family advised me ___
e) My friends/relatives advised me ___
f) It was checked while I had gone in for some other health problems ___
124. Were you ever diagnosed or told by a doctor/health official that you had high blood pressure or hypertension?

- (a) Yes ___ (b) No ___ (c) Do not know ___
125. If yes, when was it diagnosed? _____
126. Are you currently receiving any of the following advice for hypertension by a doctor or other health worker?
 (a) Special prescribed diet ___ (b) Advice or treatment to lose weight ___
 (c) Advice or treatment to stop smoking ___ (d) Advice to start to do more exercise ___
 (e) Have you ever seen a traditional healer for hypertension? ___
 (f) Are you currently taking any herbal or traditional remedy for your hypertension? ___
127. Were you advised to start medicine to reduce high blood pressure? (a) Yes ___ (b) No ___
128. When were you first advised to take medicine for High Blood Pressure? ___/___/____
129. If yes, Did you start taking medicine for high blood pressure? (a) Yes ___ (b) No ___
130. If not started to take medicines, what is the main reason that you decided not to start your medicine? (Do not read the list to the respondent and do not prompt. Check all that he/she mentions)
- My doctor advised me to stop the medicine because I didn't need them any longer. ___
 - I did not know (I was not told) that I had to continue the medicine. ___
 - I could not afford (the medicine). ___
 - I got side effects (from the medicine). ___
 - The medicine didn't control my blood pressure and so I decided to stop taking them. ___
 - I was afraid that I might be dependent on the medicines and would need to take it life-long. ___
 - I did not have any symptoms of the disease and hence did not feel like I needed the medicine. ___
 - I do not believe that the medicine will help to control my high blood pressure. ___
 - My friends or family members suggested stopping the medicine. ___
 - I started alternative medicines (e.g., herbal, homeopathy, etc) and decided to stop the medicine. ___
 - I started alternative approaches like yoga, regular exercise, etc. and thus decided to stop the medicines. ___
 - The medicines were not easily available. ___
 - I was too sick to continue taking medicine and there was nobody to help me with that. ___
 - The number of medicines and timing was too confusing ___
 - The regimens were changed very frequently which really upset me. ___
 - I lost trust on my health care provider and thus stopped the medicine. ___
131. Now I am going to read a list of reasons that may have played a part in your stopping to take your high blood pressure medicine. Which of the following are related to your decision to stop taking your medicine?
- I could not afford (the medicine). ___
 - I got side effects (from the medicine). ___
 - The medicine didn't control my blood pressure and so I decided to stop taking them. ___
 - I was afraid that I might be dependent on the medicines and would need to take it life-long. ___
 - I did not have any symptoms of the disease and hence did not feel like I needed the medicine. ___
 - My friends or family members suggested stopping the medicine. ___
 - I started alternative medicines (e.g., herbal, homeopathy, yoga, regular exercise etc) and decided to stop the medicine. ___
 - The number of medicines and timing was too confusing ___
 - Is there any other reason for which you stopped medicine? ___
 - What alternative medicine did you start?
 (a) Herbal ___ (b) Homeopathy ___ (c) Yoga ___ (d) Ayurvedic ___ (e) Regular exercise ___

Morisky Medication Adherence Scale (Eight Item) for hypertension

132. Do you sometimes forget to take your [hypertension] pills? ___
133. People sometimes miss taking their medications for reasons other than forgetting. Thinking over the past two weeks, were there any days when you did not take your [hypertension] medicine? ___
134. Have you ever cut back or stopped taking your medication without telling your doctor, because you felt worse when you took it? ___
135. When you travel or leave home, do you sometimes forget to bring along your [hypertension] medication? ___
136. Did you take your [hypertension] medicine yesterday? ___
137. When you feel like your [hypertension] is under control, do you sometimes stop taking your medicine? ___
138. Taking medication everyday is a real inconvenience for some people. Do you ever feel hassled about sticking to your [hypertension] treatment plan? ___
139. How often do you have difficulty remembering to take all your blood pressure medication? ___
140. If forget to take medicine, what is the main reason that you miss taking your medicines? _____
- I simply forget. ___

- b. I did not know (I was not told) that I had to take medicine regularly. ___
- c. It is too expensive to take it regularly. ___
- d. I get side effects (from the medicine) if I take regularly. ___
- e. I am afraid that if I take it regularly I might be dependent on the medicine and would need to take life. ___
- f. I do not have any symptoms of the disease and hence do not feel like I need to take it every day. I take it only when I get symptoms (like headache, dizziness) ___
- g. I do not believe that the medicine will help to control my disease. So, I don't mind taking it irregularly. ___
- h. My friends or family members suggested not to take it regularly. ___
- i. I started alternative medicines (e.g., herbal, homeopathy, etc) and decided to be irregular with the medicine. ___
- j. I started alternative approaches like yoga, regular exercise, etc. and thus decided to be irregular with the medicine. ___
- k. The medicines are not easily available. ___
- l. I am too sick to remember taking the medicine regularly and there is nobody to help me with it. ___
- m. The number of medicines and timing is too confusing. ___
- n. The regimens were changed very frequently which really upset me. ___
- o. I lost trust on my health care provider and thus miss taking the medicine. ___

141. Now I am going to read a list of reasons that may have played a part in your missing your medications. Which of the following are related to missing your medicine? Reasons
- a. It is too expensive to take it regularly. ___
 - b. I get side effects (from the medicine) if I take regularly. ___
 - c. I am afraid that if I take it regularly I might be dependent on the medicine and would need to take life ___
 - d. I do not have any symptoms of the disease and hence do not feel like I need to take it every day ___
 - e. My friends or family members suggested not to take it regularly ___
 - f. I started alternative medicines (e.g., herbal, homeopathy, etc) and decided to be irregular with the medicine ___
142. What alternative medicine did you start?
 (a) Herbal ___ (b) Homeopathy ___ (c) Yoga ___ (d) Ayurveda ___ (e) Regular exercise ___

Knowledge on high blood pressure (Now I am going to ask you some questions about high blood pressure)

143. Please tell me what you think are the reasons we develop high blood pressure. (Do not read the list to the respondent and do not prompt. Check all that he/she mentions)
- (a) From family (heredity) ___ (b) Unknown reasons ___ (c) High salt intake ___
 - (d) Smoking ___ (e) Excess alcohol consumption ___ (f) High fat diet ___
 - (g) Obesity ___ (h) Lack of exercise ___ (i) Stress ___ (j) Don't know ___
144. Please tell me what you think might happen if our blood pressure is not properly controlled?
 (a) Stroke ___ (b) Heart Disease ___ (c) Kidney problem ___ (d) Eye problem ___ (e) Diabetes ___ (f) Don't know ___
145. Please tell me what you think are the ways we can control our blood pressure.
- (a) Reduce salt intake ___ (b) Reduce weight ___ (c) Exercise regularly ___
 - (e) Reduce intake of fatty food ___ (f) Start medicine ___ (g) Stop smoking ___
 - (h) Stop/Reduce alcohol consumption ___ (i) Follow up for check up every three months ___ (j) Don't know ___
146. Which of the following is the most desirable blood pressure reading?
 (a) 130/90 ___ (b) 180/110 ___ (c) 140/80 ___ (d) 120/80 ___ (e) Lower than 120/80 ___ (f) Don't know ___
147. The main cause of high blood pressure is:
 (a) Stress ___ (b) Obesity ___ (c) Unknown ___ (d) Aging ___ (e) Don't know ___
148. A person with high blood pressure has:
 (a) High cholesterol ___ (b) High risk of heart attack and stroke ___ (c) Nervous condition ___ (e) Don't know ___
149. High blood pressure medication is usually prescribed to be taken under:
 (a) under stressful situation ___ (b) as a lifelong way to manage high blood pressure ___
- (c) When activities require physical exertion ___ (d) whenever a patient feels bad ___ (e) Don't know ___
150. Which of the following is more likely to contribute to your high blood pressure?
 (a) Physical Activity ___ (b) Salt/sodium intake ___ (c) High cholesterol level ___ (d) Icecream ___ (e) Don't know ___
151. Major risk factors other than high blood pressure for heart disease and stroke is
 (a) High cholesterol ___ (b) Smoking ___ (c) Family history of heart disease ___ (d) All of above ___ (e) Don't know ___
152. Has your doctor ever told you that you had diabetes (chini-roog/ sugar)? (a) Yes ___ (b) No ___
 If yes, when was it diagnosed? ___ / ___ / ___
153. Are you currently receiving any of the following treatments/advice for diabetes prescribed by a doctor or other health worker?

Treatment or Advices

154. What advices have you received?
 (a) Insulin injection ___ (b) Drugs (medication) that you have taken in the past two weeks ___
 (c) Special prescribed diet ___ (d) Advice or treatment to lose weight ___
 (e) Advice or treatment to stop smoking ___ (f) Advice to start or do more exercise ___
155. Have you ever seen a traditional healer for diabetes or raised blood sugar? ___
156. Are you currently taking any herbal or traditional remedy for your diabetes? ___
157. When the medicines were first prescribed? ___ / ___ / ___
158. Have you been taking the medicines regularly? (a) Yes ___ (b) No ___ (c) Refused ___
159. If you have not been taking medicines regularly, how often do you miss the doses?
 (a) Daily ___ (b) Every 2 to 3 days ___ (c) Once a week ___ (d) Every 15 days ___
160. What are the main reasons for not taking the medicines? (list top 3)
 1 _____ 2 _____ 3 _____

FOOD FREQUENCY

161. How many times do you usually eat in a day? (Times of eating) ___
162. Do you regularly take any vitamin supplementation? (Vitamin supplement) (a) Yes ___ (b) No ___
163. If yes, which vitamins do you take? _____
164. How many months ago did you start taking vitamin supplementation? _____ Months
165. Do you take calcium supplementation? (a) Yes ___ (b) No ___
166. How many months ago did you start taking calcium supplementation? _____ Months
167. Do you take iron supplementation? (a) Yes ___ (b) No ___
168. How many months ago did you start taking iron supplementation? _____ Months
169. Do you take fish oil or omega-3 supplementation? (a) Yes ___ (b) No ___
170. How many month ago did you start taking fish oil or omega-3 supplementation? _____ Months
171. Do you usually add table salt to food or fruit before eating? (Add table salt) (a) Yes ___ (b) No ___
172. Do you usually add sugar to your tea or coffee? (Add sugar) (a) Yes ___ (b) No ___
173. Do you use artificial sugar instead of sugar? (Artificial sweetener) (a) Yes ___ (b) No ___
174. Have you changed your eating pattern/food due to any disease? (a) Yes ___ (b) No ___
175. If yes, Name the disease _____
176. How many times in a week do you eat out of home? (in a restaurant or hotel)? _____
177. Do you usually eat animal fats with meat? (eat boso) (a) Yes ___ (b) No ___
178. Last year, what did you eat and how often (Show portion size picture)

Frequency of eatin	Unit					Portion size				
	Never	Day	Week	Mont h	Year	A	B	C	D	None
Rice	0	1	2	3	4	1	2	3	4	0
Beaten rice	0	1	2	3	4	1	2	3	4	0
Wheat	0	1	2	3	4	1	2	3	4	0
Choumin	0	1	2	3	4	1	2	3	4	0
pasta macaroni spaghetti	0	1	2	3	4	1	2	3	4	0
Sooji	0	1	2	3	4	1	2	3	4	0
atta roti	0	1	2	3	4	1	2	3	4	0
bhuteko maize	0	1	2	3	4	1	2	3	4	0
white bread	0	1	2	3	4	1	2	3	4	0
brown bread	0	1	2	3	4	1	2	3	4	0
kodo fapar bajra	0	1	2	3	4	1	2	3	4	0
whole pulse	0	1	2	3	4	1	2	3	4	0
Washed pulse	0	1	2	3	4	1	2	3	4	0
Sprout	0	1	2	3	4	1	2	3	4	0
Cheakpeas dry peas beans	0	1	2	3	4	1	2	3	4	0
Soyabean	0	1	2	3	4	1	2	3	4	0
Broccoli Cauliflower	0	1	2	3	4	1	2	3	4	0
cabbage kohlrabi	0	1	2	3	4	1	2	3	4	0
Pumpkin	0	1	2	3	4	1	2	3	4	0
Potato	0	1	2	3	4	1	2	3	4	0

Greenveg	0	1	2	3	4	1	2	3	4	0
Radish Turnip	0	1	2	3	4	1	2	3	4	0
Parwal	0	1	2	3	4	1	2	3	4	0
Green Beans Peas	0	1	2	3	4	1	2	3	4	0
Karela	0	1	2	3	4	1	2	3	4	0
Egg Plant	0	1	2	3	4	1	2	3	4	0
Tomato	0	1	2	3	4	1	2	3	4	0
Lauka	0	1	2	3	4	1	2	3	4	0
Schoos	0	1	2	3	4	1	2	3	4	0
lady's finger	0	1	2	3	4	1	2	3	4	0
Ghiraula	0	1	2	3	4	1	2	3	4	0
Rukhkatahar	0	1	2	3	4	1	2	3	4	0
YAM	0	1	2	3	4	1	2	3	4	0
Sweet Potato	0	1	2	3	4	1	2	3	4	0
Taamaa	0	1	2	3	4	1	2	3	4	0
Gundruk	0	1	2	3	4	1	2	3	4	0
Mushroom	0	1	2	3	4	1	2	3	4	0
Garlic	0	1	2	3	4	1	2	3	4	0
onion_shallot	0	1	2	3	4	1	2	3	4	0
Carrot	0	1	2	3	4	1	2	3	4	0
Cucumber	0	1	2	3	4	1	2	3	4	0
Orange	0	1	2	3	4	1	2	3	4	0
grape fruti	0	1	2	3	4	1	2	3	4	0
pine apple freq	0	1	2	3	4	1	2	3	4	0
jujube aaru	0	1	2	3	4	1	2	3	4	0
apple_pear	0	1	2	3	4	1	2	3	4	0
Guava	0	1	2	3	4	1	2	3	4	0
Alubakhada	0	1	2	3	4	1	2	3	4	0
Lychee	0	1	2	3	4	1	2	3	4	0
Grapes	0	1	2	3	4	1	2	3	4	0
Lemon	0	1	2	3	4	1	2	3	4	0
Banana	0	1	2	3	4	1	2	3	4	0
Mango	0	1	2	3	4	1	2	3	4	0
Pomegranate	0	1	2	3	4	1	2	3	4	0
Watermelon	0	1	2	3	4	1	2	3	4	0
Papaya	0	1	2	3	4	1	2	3	4	0
Mutton	0	1	2	3	4	1	2	3	4	0
chicken with skin	0	1	2	3	4	1	2	3	4	0
chicken without skin	0	1	2	3	4	1	2	3	4	0
chicken_mo_mo	0	1	2	3	4	1	2	3	4	0
Sausage	0	1	2	3	4	1	2	3	4	0
Buff	0	1	2	3	4	1	2	3	4	0
buff mo mo	0	1	2	3	4	1	2	3	4	0
buff_sausage	0	1	2	3	4	1	2	3	4	0
Pork	0	1	2	3	4	1	2	3	4	0
pork_mo_mo	0	1	2	3	4	1	2	3	4	0
fried fish	0	1	2	3	4	1	2	3	4	0
nonfried_fish	0	1	2	3	4	1	2	3	4	0
Egg	0	1	2	3	4	1	2	3	4	0
whole_milk	0	1	2	3	4	1	2	3	4	0
low_fat_milk	0	1	2	3	4	1	2	3	4	0
Yogurt	0	1	2	3	4	1	2	3	4	0
milk_tea	0	1	2	3	4	1	2	3	4	0
black_tea	0	1	2	3	4	1	2	3	4	0
milk_coffee	0	1	2	3	4	1	2	3	4	0
black_coffee	0	1	2	3	4	1	2	3	4	0

coke_pepsi_mountain_dew	0	1	2	3	4	1	2	3	4	0
fanta_sprite	0	1	2	3	4	1	2	3	4	0
fruit_juice	0	1	2	3	4	1	2	3	4	0
canned_juice	0	1	2	3	4	1	2	3	4	0
Paneer	0	1	2	3	4	1	2	3	4	0
Pizza	0	1	2	3	4	1	2	3	4	0
Cheese	0	1	2	3	4	1	2	3	4	0
Biscuit	0	1	2	3	4	1	2	3	4	0
Noodles	0	1	2	3	4	1	2	3	4	0
canned_food	0	1	2	3	4	1	2	3	4	0
Peanut	0	1	2	3	4	1	2	3	4	0
Cashew	0	1	2	3	4	1	2	3	4	0
Almonds	0	1	2	3	4	1	2	3	4	0
Walnut	0	1	2	3	4	1	2	3	4	0
Pistachio	0	1	2	3	4	1	2	3	4	0
Dried fruit	0	1	2	3	4	1	2	3	4	0
Bhujia	0	1	2	3	4	1	2	3	4	0
veg_burger	0	1	2	3	4	1	2	3	4	0
chicken_burger	0	1	2	3	4	1	2	3	4	0
Potato chips	0	1	2	3	4	1	2	3	4	0
Donought	0	1	2	3	4	1	2	3	4	0
ice_cream	0	1	2	3	4	1	2	3	4	0
Chocolate	0	1	2	3	4	1	2	3	4	0
Sweets	0	1	2	3	4	1	2	3	4	0
Malpa	0	1	2	3	4	1	2	3	4	0
Swaari	0	1	2	3	4	1	2	3	4	0
Pakauda	0	1	2	3	4	1	2	3	4	0
french_fries	0	1	2	3	4	1	2	3	4	0
mustard_oil	0	1	2	3	4	1	2	3	4	0
sunflower_oil	0	1	2	3	4	1	2	3	4	0
soyabean_oil	0	1	2	3	4	1	2	3	4	0
Butter	0	1	2	3	4	1	2	3	4	0
Ghee	0	1	2	3	4	1	2	3	4	0
Sugar	0	1	2	3	4	1	2	3	4	0
Jaggary	0	1	2	3	4	1	2	3	4	0
Jam	0	1	2	3	4	1	2	3	4	0
Pickels	0	1	2	3	4	1	2	3	4	0

PHYSICAL ACTIVITY

(In answering the following questions 'vigorous-intensity activities' are activities that require hard physical effort and cause large increases in breathing or heart rate, 'moderate-intensity activities' are activities that require moderate physical effort and cause small increases in breathing or heart rate.)

Activity at work

179. Does your work involve vigorous-intensity activity that causes large increase in breathing or heart rate like carrying or lifting heavy loads, digging or construction work, etc.. for at least 10 minutes continuously?
(a) Yes _ (b) No
180. If Yes, In a typical week, on how many days do you do vigorous- intensity activities as part of your work? (no.of days) _____ (days/ month/year)
181. How much time do you spend doing vigorous-intensity activities at work on a typical day? _____ (minutes/ hour)
182. In a typical year, how many months are you involved in this activity? _____ months
183. Does your work involve moderate-intensity activity that causes small increases in breathing or heart rate such as brisk walking [or carrying light loads] for at least 10 minutes continuously? (a) Yes ___ (b) No ___
184. In a typical week, on how many days do you do moderate- intensity activities as part of your work? _____ (days/month/year)
185. How much time do you spend doing moderate-intensity activities at work on a typical day? ___ (mins/ hour)
186. In a typical year, how many months are you involved in this activity? _____

Travel to and from places (The next questions exclude the physical activities at work that you have already mentioned. Now I would like to ask you about the usual way you travel to and from places. For example to work, for shopping, to market, to place of worship)

187. Do you walk or use a bicycle (pedal cycle) for at least 10 minutes continuously to get to and from places?
(a) Yes ___ (b) No ___
188. If yes, 10. In a typical week, on how many days do you walk or bicycle for at least 10 minutes continuously to get to and from places? _____ (days/ month/year)
189. How much time do you spend walking or bicycling for travel on a typical day? ___ (minutes/ hour)

Recreational activities

190. Do you do any vigorous-intensity sports, fitness or recreational (leisure) activities that cause large increases in breathing or heart rate like [running or football,] for at least 10 minutes continuously? (a) Yes ___ (b) No ___
191. If yes, 13. In a typical week, on how many days do you do vigorous-intensity sports, fitness or recreational (leisure) activities? (number of days) _____ (days/ month/year)
192. How much time do you spend during vigorous-intensity sports, fitness or recreational activities on a typical day? ___ (minutes/ hour)
193. In a typical year, how many months do you do vigorous-intensity sports, fitness or recreational activities? ___ months
194. Do you do any moderate-intensity sports, fitness or recreational (leisure) activities that causes a small increase in breathing or heart rate such as brisk walking, (cycling, swimming, volleyball) for at least 10 minutes continuously?
(a) Yes ___ (b) No ___
195. If yes, 17 In a typical week, on how many days do you do moderate-intensity sports, fitness or recreational (leisure) activities? (Number of days) _____ (days/ month/year)
196. 18 How much time do you spend doing moderate-intensity sports, fitness or recreational (leisure) activities on a typical day? ___ (minutes/ hour)
197. In a typical year, how many months do you do moderate-intensity sports, fitness or recreational activities? ___ months

Sedentary behavior

198. 20 How much time do you usually spend sitting or reclining on a typical day? ___ (minutes/ hour)

SF8

199. Overall, how would you rate your health in the past 4 weeks?
(a) excellent ___ (b) Very good ___ (c) good ___ (d) fair ___ (e) poor ___ (f) Very poor ___
200. During the past 4 weeks, how much did physical health problems limit your usual physical activities (such as walking or climbing stairs)?
(a) Not at all ___ (b) Very little ___ (c) Somewhat ___ (d) Quite a lot ___ (e) Could not do physical activities ___
201. During the past 4 weeks, how much difficulty did you have doing your daily work, both at home and away from home, because of your physical health? (give options)
(a) Not at all ___ (b) Very little ___ (c) Somewhat ___ (d) Quite a lot ___ (e) Could not do physical activities ___
202. How much bodily pain have you had in the past 4 weeks?
(a) None ___ (b) Very mild ___ (c) Mild ___ (d) Moderate ___ (e) Severe ___ (f) Very severe
203. During the past 4 weeks, how much energy did you have?
(a) Very much ___ (b) Quite a lot ___ (c) Some ___ (d) A little ___ (e) None ___
204. During the past 4 weeks, how much did your physical health or emotional problems limit your usual social activities with family or friends?
(a) Not at all ___ (b) Very little ___ (c) Somewhat ___ (d) Quite a lot ___ (e) Could not do physical activities ___
205. During the past 4 weeks, how much have you been bothered by emotional problems (such as feeling anxious, depressed or irritable)?
(a) Not at all ___ (b) Very little ___ (c) Somewhat ___ (d) Quite a lot ___ (e) Could not do physical activities ___
206. During the past 4 weeks, how much did personal or emotional problems keep you from doing your usual work, school or other daily activities?
(a) Not at all ___ (b) Very little ___ (c) Somewhat ___ (d) Quite a lot ___ (e) Could not do physical activities ___

PHYSICAL FUNCTION

Physical Functions	I can do	I can do with help or assistance	I cannot do	Refused/ Unknown
208. Do you have difficulty walking 1 kilometer?	1	2	0	9
209. Do you have difficulty walking inside your home?	1	2	0	9
210. Do you have difficulty getting out of a bed or chair?	1	2	0	9
211. Do you have difficulty walking up 10 steps?	1	2	0	9
212. Because of health or physical problems, do you have any difficulty or are you unable to.....				
a...do heavy housework like scrubbing floors or washing windows, or yard	1	2	0	9
b...do light housework, for example:- wiping table, clear dish, dusting, brooming etc	1	2	0	9
c... shop for personal items like toothpaste, soap, brush etc?	1	2	0	9
d...eat including feeding yourself?	1	2	0	9
e...dress yourself	1	2	0	9
f...bathe or shower?	1	2	0	9
g...use the toilet including walking to the toilet?	1	2	0	9
h...lifting or carrying something about 5 kg?	1	2	0	9
i...reaching out (stretch upper arm) ?	1	2	0	9
j...gripping with your hands?	1	2	0	9

DEPRESSION

213. Below is the list of the ways you might have felt or behaved. Please tell me how often you have felt this way during the past week)

Labels	Rarely (less than 1 day)	Some (1-2 days)	Occasionally (3-4 days)
a. I was bothered by things that usually don't bother me.	0	1	2
b. I did not feel like eating; my appetite was poor.	0	1	2
c. I felt that I could not shake off the blues even with help from my family or friends.	0	1	2
d. I felt I was just as good as other people.	0	1	2
e. I had trouble keeping my mind on what I was doing.	0	1	2
f. I felt depressed.	0	1	2
g. I felt that everything I did was an effort.	0	1	2
h. I felt hopeful about the future.	0	1	2
i. I thought my life had been a failure.	0	1	2
j. I felt fearful.	0	1	2
k. My sleep was restless.	0	1	2
l. I was happy.	0	1	2
m. I talked less than usual.	0	1	2
n. I felt lonely.	0	1	2
o. People were unfriendly.	0	1	2
p. I enjoyed life.	0	1	2
q. I had crying spells.	0	1	2
r. I felt sad.	0	1	2
s. I felt that people dislike me.	0	1	2
t. I could not get "going."	0	1	2

STRESS

Many people experience ongoing problems in their everyday lives. Please tell us whether any of the following has been a problem for you:

214. Do you have serious ongoing health problem (yourself)? (a) Yes ___ (b) No ___ (c) Refused ___
 215. Has this been a problem for six months or more? (a) Yes ___ (b) No ___ (c) Refused ___
 216. Would you say this problem has been: (a) Not very stressful ___ (b) Moderately stressful ___ (c) Very stressful ___
 217. Does someone close to you have serious ongoing health problem? (a) Yes ___ (b) No ___ (c) Refused ___
 218. Has this been a problem for six months or more? (a) Yes ___ (b) No ___ (c) Refused ___
 219. Would you say this problem has been (a) Not very stressful ___ (b) Moderately stressful ___ (c) Very stressful ___
 220. Do you have ongoing difficulties with your job or ability to work ? (a) Yes ___ (b) No ___ (c) Refused ___
 221. Has this been a problem for six months or more? (a) Yes ___ (b) No ___
 222. Would you say this problem has been (a) Not very stressful ___ (b) Moderately stressful ___ (c) Very stressful ___
 223. Do you have ongoing financial strain? (a) Yes ___ (b) No ___ (c) Refused ___
 224. Has this been a problem for six months or more? (a) Yes ___ (b) No ___ (c) Refused ___
 225. Would you say this problem has been (a) Not very stressful ___ (b) Moderately stressful ___ (c) Very stressful ___
 226. Do you have ongoing difficulties in a relationship with someone close to you? (a) Yes ___ (b) No ___ (c) Refused ___
 227. Has this been a problem for six months or more? (a) Yes ___ (b) No ___ (c) Refused ___
 228. Would you say this problem has been (a) Not very stressful ___ (b) Moderately stressful ___ (c) Very stressful ___

MMSE

229. What is the year ? _____
 230. What is the date (yyyy-mm-dd) ? _____ / _____ / _____
 231. What is the day ? _____
 232. What is the month? _____
 233. Where are we? Name of the country (a) Nepal ___ (b) Don't know ___
 234. Zone (a) Bagmati ___ (b) Don't know ___
 235. District (a) Kavrepalanchok ___ (b) Don't know ___
 236. Municipality/Village Development Committee (a) Dhulikhel ___ (b) Don't know ___
 237. Tole : _____
(I am going to name 3 objects. There will be 1 second interval to name each object. Please repeat the names of the objects after I have said them: (Give one point for each correct answer. Then repeat them until the participant learns all three.) (Y/N)
 238. Repeat the names: (a) Ball ___ (b) Car ___ (c) Comb ___ (d) Times taken to say all 3 objects ___
 239. Please spell this word backwards: "DHU-LI-KHE-LA" _____
 240. I had named 3 objects to you. Can you please repeat the names of the three objects?
 (a) Ball ___ (b) Car ___ (c) Comb ___ (d) Times taken to say all 3 objects ___
 241. I am going to show two objects to you. Can you please name them? (a) Pen ___ (b) Other ___
 242. Can you name it please? (notebook) (a) Notebook ___ (b) Other ___
 243. Please repeat the following: "No ifs, ands or buts" (a) Repeat ___ (b) Can not repeat ___
 244. I am going to give you a three stage command. Please follow it. Here is the command:
 245. Take a paper in your hand (a) Yes ___ (b) No ___
 246. Fold it in half (a) Yes ___ (b) No ___
 247. Put it on the floor (a) Yes ___ (b) No ___
 248. There is a command written here. Please read it and obey the following: "Close your eyes."
 (a) Closed eyes ___ (b) Did not close eyes ___ (c) Can not read ___
 249. *Please write a sentence. (Give one point if the sentence has a subject and a verb and can be understood. Spelling mistakes are permissible)*
 (a) can write a sentence ___ (b) cannot write a sentence ___ (c) cannot write (illiterate) ___
 250. Show a picture of pentagon. Please copy the design given below (Give one point if the design has two figures with five sides and five angles each and shows a four sided intersection.).
 (a) Correct design ___ (b) Incorrect design ___ (c) Refused ___
 251. Digit Span Substitution task
Place the task sheet before the participant and pointing to the task say: Look at these boxes across the top of the page. On the top of each box are number one through nine. On the bottom part of each box there is a symbol. Each symbol is paired with a number. Point to the four rows of the boxes. Down here are boxes with numbers on the top, but the bottom part is blank. I want you to put the correct symbol in each box like this. Fill in the first three sample boxes. Now I want you to fill in all boxes up to this line. After demonstration and practice is complete, point to the first box following the sample items and say. When I tell you to begin, start here and fill in the boxes in these four rows. Do them in order and don't skip any, please try to work as quickly as possible. Let's begin. If the participant

has difficulty completing the ten sample items or does not grasp the task, help him complete the sample items. If the participant still has difficulty, discontinue the task. If participants do the task, stop the participants after 90 seconds. Say that's good. This complete this set of tasks

252. Test result- test items
 (a) Done ___ (b) unable to do -physical disability___ (c) unable to do - vision/hearing___ (d) Refused___
253. Number of Symbols Correctly Coded: _____
254. Number of symbols incorrectly Coded: _____

DIGIT SPAN TEST

Digit Span Test Forward

255. I am going to say some numbers. Listen carefully, and when I am through say right after me. For example, if I say 7-1-9, what would you say? If the participant succeeds, say- That's right. If the participants, fails the example, say - No, you would say 7-1-9. I said 9-1-9, so to say it forwards you would say 7-1-9. Now try these numbers. Remember, you are to say them forwards, 3-4-8. Whether the participant succeeds or fails with the second example (3-4-8), proceeds to item 1. Give no help to second example or any of the items. Only discontinue test if the participant has failed both trials of same span length eg 5a and 5b

Item	Pass	Fail	Does not know number	Refused
1a. 1—7	1	0	2	9
1b. 6—3	1	0	2	9
2a. 5--8—2	1	0	2	9
2b. 6--9—4	1	0	2	9
3a. 6--4--3—9	1	0	2	9
3b. 7--2--8—6	1	0	2	9
4a. 4-2-7-3-1	1	0	2	9
4b. 7-5-8-3-6	1	0	2	9
5a. 6-1-9-4-7-3	1	0	2	9
5b. 3-9-2-4-8-7	1	0	2	9
6a. 5-9-1-7-4-2-8	1	0	2	9
6b. 4-1-7-9-3-8-6	1	0	2	9
7a. 5-8-1-9-2-6-4-7	1	0	2	9
7b. 3-8-2-9-5-1-7-4	1	0	2	9
8a. 2-7-5-8-6-2-5-8-4	1	0	2	9
8b. 7-1-3-9-4-2-5-6-8	1	0	2	9

Digit Span Test Backward

256. (Proceed this step as the Digit span Test Forward has been done but here the only one different step is that the say the digits as it is mentioned below and the respondent will say from the backward. For eg: if you say 1-2 then the respondent has to say 2-1.

Item	Pass	Fail	Does not know number	Refused
1a. 2--6	1	0	2	9
1b. 5--7	1	0	2	9
2a. 6—2—9	1	0	2	9
2b. 4—1—5	1	0	2	9
3a. 3-2-7-9	1	0	2	9
3b. 4-9-6-8	1	0	2	9
4a. 1-5-2-8-6	1	0	2	9
4b. 6-1-8-4-3	1	0	2	9
5a. 5-3-9-4-1-8	1	0	2	9
5b. 7-2-4-8-5-5	1	0	2	9
6a. 8-1-2-9-3-6-5	1	0	2	9
6b. 4-7-3-9-1-2-8	1	0	2	9
7a. 1-4-3-7-6-2-5-8	1	0	2	9

HEALTH KNOWLEDGE, ATTITUDE AND BEHAVIOR

- 257. What does birth control pill not do?
 (a) Prevent unplanned pregnancy__ (b) Regulate a women's menstrual cycle__
 (c) Prevent STD and HIV transmission (d) Planned for number of children you want __
 (e) Don't know__ (f) Refused __
- 258. Which of the following is not the way that HIV is transmitted?
 (a) Sexual contact or intercourse __ (b) Injection drug use __
 (c) Pregnancy__ (d) Planned for number of children you want __
 (e) Don't know__ (f) Refused __
- 259. Which is not the risk factor of diabetes?
 (a) Family member has diabetes __ (b) Being overweight __ (c) Eating too many sweets __
 (d) Walking everyday __ (e) Don't know__ (f) Refused __
- 260. 16_4 Which of the following is not the way to get diarrhea?
 (a) Contact from friend __ (b) Untreated water __ (c) Food __
 (d) Washing hands __ (e) Don't know__ (f) Refused __
- 261. On the past 30 days, do you hear or see a health related (family planning, HIV, diarrhea, etc) public service announcement on? (a) Radio __ (b) TV __ (c) Newspaper __
- 262. How many times in the past six months have you been hospitalized? _____
- 263. How many times in the past six months have you personally visited a doctor or a nurse for a health issue? ____

GEOGRAPHICAL ASSESIBILITY

- 264. What is the nearest health center, Dhulikhel Hospital or a different one? (a) Dhulikhel hospital __ (b) PHCC __
- 265. How do you normally travel to nearest health center? (a) On foot __ (b) Bicycle __ (c) Mortor __
- 266. How long does it take you to travel to the health center in minutes for your typical mode of transport? ____
- 267. How do you normally travel to Dhulikhel hospital? a) On foot __ (b) Bicycle __ (c) Mortor __
- 268. How long does it take you to travel to Dhulikhel Hospital in minutes for your typical mode of transport? ____

SOCIAL NETWORK

- 269. In the past month, how many times have you visited a family members and a friend's house? _____
- 270. Do you participate in an organization or cooperative in your community? For instance, a water committee, women's group, forest group, or NGO. (a) Yes __ (b) No __

HEALTH INSURANCE

Let me give you some brief information about health insurance. Health insurance is a product that you can purchase for yourself or someone in your family that will reduce the payments you would make to the doctor and/or health center/hospital when it is visited. The insurance covers some but not all illnesses and payments associated with treatment. Which services are covered depends on the insurance plan.

- 271. Have you heard of health insurance before today? (a) Yes __ (b) No __
Possible costs of insurance include a:-Premium: This is a set amount of money you have to pay every month. Even if you do not get sick or go to the health center/hospital during that month you will still have to pay the fee regularly and you will not get your money back. A family premium covers five members in your family of your choosing. If you have more than five members, not all five people can be covered and the insurance cannot switch between insured and uninsured members. Copayment: Some health insurance plans will require the member to pay part of their own fees in addition to the monthly premium.
- 272. Who is covered by the health insurance? Mark all that apply. (If whole family is selected, proceed to the next question)
 (a) Whole family __ (b) head of the household __ (c) Husband __ (d) Wife __ (e) Father __
 (f) Mother __ (g) Son __ (h) Daughter __ (i) Grand father (j) Grand mother __
 (k) Brother __ (l) Sister __

Dhulikhel Hospital is considering establishing the Dhulikhel Hospital Health Insurance Program. They are interested in learning how many people would participate in such a program. We will describe this program and ask whether you would be willing to pay the required fees to participate in this program. For this health insurance plan it covers your family, up to 5 selected individuals. In addition to paying the premium, every time that you or your dependent gets a basic drug, you would have to pay a 20% co-payment. Please mention the bid amount that you just asked

273. Would you be willing to pay [fill in randomly chosen bid amount: (.....Rupee) a month for family (five person) premium health insurance with a 20% co-payment that covered the following health-related treatments and/or services that are currently available at Dhulikhel Hospital? (Y/N)
- (a) Emergency service __ (b) Laboratory __ (c) Radiology__ (d) In-patient __
 (e) Dental __ (f) Physiotherapy __ (g) ICU __ (h) Surgery __
 (i) Dialysis __ (j) CCU __
 (k) Medication (except dermatological, some orthopedic medication like bandage or arm splint etc),__

This is a follow up question to f3 and should be asked casually. If the respondent answered yes to their given bid value, they should be asked if they would pay the next higher bid amount. Or if the respondent answered no to their given bid value, they should be asked to pay the next lower bid amount. Here are the bid amounts: 1, 10, 50, 100, 150, 200, 300, 400, 500, 700, 900, and 1200. For example: The respondent was asked if they would pay 50 Nrs for the insurance, they said yes. You would ask if they would pay 100 Nrs for the insurance (the next higher amount). The respondent was asked if they would pay 300 Nrs for the insurance, they said no. You would ask if they would pay 200 Nrs for the insurance (the next lower amount). Please mention the second bid amount

274. What if you were instead asked pay _____ Nrs for the insurance. Would you buy the health insurance?
 275. If you had to select only five people in your family to insure, who would, they be (relationship with household head)?
 (a) _____ (b) _____ (c) _____ (d) _____ (e) _____

276. Please tell us how important to you that the following services be covered by the health insurance? Tell us how important to you that the following

Services	extremely important	somewhat important	not that important	not at all important
1. Prescription Drugs	4	3	2	1
2. Laboratory Tests	4	3	2	1
3. Hospital Stays	4	3	2	1
4. Surgery Expenses	4	3	2	1
5. X-Rays	4	3	2	1
6. Doctor Fees	4	3	2	1
7. Hospital Fees	4	3	2	1

277. Please tell us how important to you that the following illness/health issues be covered by the health insurance?

Health Issues	extremely important	somewhat important	not that important	not at all important
1. Prenatal Care	4	3	2	1
2. Uterine Prolapse	4	3	2	1
3. Child Delivery	4	3	2	1
4. Heart Problem	4	3	2	1
5. Eye problem	4	3	2	1
6. Asthma/Breathing problem	4	3	2	1
7. Diabetes	4	3	2	1
8. Flu/ Fever	4	3	2	1
9. Dental problem	4	3	2	1

278. Were you hospitalized in Dhulikhel hospital for any health problem in the past year? (a) Yes __ (b) No __

279. Do you have the Hospital Card? (a) Yes ___ (b) No ___
 280. Card number(Hospital ID) _____

WOMEN'S HEALTH

Now I would like to ask you about all the menstruation, pregnancies and hormonal contraceptive use during your life

281. At what age did you begin having your menstruation period? _____
 282. Have you ever been pregnant? (a) Yes _____ (b) No _____
 283. If yes, How many pregnancies have you had (Please include miscarriage) ? _____
 284. How many children that you have been given birth to ? _____
 285. How many children that you have given birth to are alive? _____
 286. How old were you when you were pregnant for the first time? _____ years

Now I would like to talk about family planning- the various was or methods that a couple can use to delay or avoid a pregnancy.

287. Have you ever used contraceptive oral pills? (a) Yes _____ (b) No _____
 288. At what age, did you first used pills?(in years) _____ years
 289. What is the brand name of the pills that you used?
 (a) Nilocon White ___ (b) Sunaulo Gulab ___ (c) Feminyl ___ (d) Femicon ___ (e) OK pills ___
 290. How long did you use each of the pills (count all period even if you discontinued in between)? (If less than 1 month, write 00. Please note down the months, if years, weeks or days are mentioned then convert it into months)
 (a) Nilocon White ___ (b) Sunaulo Gulab ___ (c) Feminyl ___ (d) Femicon ___ (e) OK pills ___ 291.

Did you ever use injectable (sangini 3 monthly injection) ? (a) Yes ___ (b) No ___

292. At what age, did you first use injectables? _____ years
 293. How long did you use injectables _____
 294. Have you ever used implants (Norplant)? (a) Yes ___ (b) No ___
 295. At what age, did you start using implants (in years) ? _____
 296. How long did you use implants (in months, if less than a month wirt 00) ?.....
 297. Have you ever used IUD? Yes ___ (b) No ___
 298. At what age, did you start using IUD? _____years
 299. How long did you use IUD (count all period even if you discontinued in between)? _____months
 300. Are you still having your menstrual period?
 (a) No ___ (b) Yes, regularly ___ (c) Yes, as usual ___ (d) Refused ___
 301. How old were you when your periods stopped completely / Irregular? _____
 302. Have you ever used Hormone Replacement Therapy (menopause medicine) when you suffered from hot flashes and sweating at night? (a) Yes ___ (b) No ___
 303. How old were you when you first used HRT? _____
 304. Are you still using HRT? (a) Yes ___ (b) No ___
 305. How old were you when you stopped using HRT? _____

MEDICINE INTAKE HISTORY

306. Are you taking any medicine in the last 15 days? (a) Yes _____ (b) No _____
 307. If yes, please bring me all the medicines or packages.
 308. Which of them are prescribed by doctor or health worker?

S.N	Name of the medicine	Yes/No	Dose	Dose unit	Frequency (per day)	Reason for taking	When started taking medicine
1	Atenolol						
2	Aforpaital						
3	Aspirin						
4	Clopidogrel						
5	Digoxin						
6	Ennlapril						
7	Frusemide						
8	Glibenclamide						
9	Hydrochlorothiazide						
10	Glipizide						
11	Hydrochloriazide						
12	Insulin						

13	Losartan					
14	Metformin					
15	Metoprolol					
16	Ramipril					
17	Spironolactone					
18	Telmisartan					

309. What side effects you had, if any?
 (a) Depressin __ (b) Dizziness __ (c) Dry cough __ (d) Headache __ (e) Impotence __
 (f) Nausea __ (g) Vomiting __ (h) Vomiting __ (i) No side effects __
310. In the past 15 days, did you take any herbal, ayurvedic medicine or homemade medicine?
 (a) Yes __ (b) No __
311. If yes, what are they ?

S.N	Name of the medicine	Dose	Dose unit	Frequency (per day)	Reason for taking	When started taking medicine (yyyy/mm/dd)

312. What side effects you had, if any?
 (a) Depressin __ (b) Dizziness __ (c) Dry cough __ (d) Headache __ (e) Impotence __
 (f) Nausea __ (g) Vomiting __ (h) Vomiting __ (i) No side effects __
313. (f) Nausea __ (g) Vomiting __ (h) Vomiting __ (i) No side effects __

MEASUREMENT

Now we are going to take some measurements

314. Blood Pressure (three measurements)
 Systolic blood pressure (1st) __ Systolic blood pressure (2nd) __ Systolic blood pressure (3rd) __
 Diastolic blood pressure (1st) __ Diastolic blood pressure (2nd) __ Diastolic blood pressure (3rd) __
 Pulse (1st) __ Pulse (2nd) __ __ Pulse (3rd) __
315. Anthropometry
 (a) Height : __ cm (b) Weight : __ pounds (c)Waist : __ cm (d) Hip: __ cm
 (e) Neck to middle finger: __ cm
316. Interview end time: _____

Thank you.
 This is the end of the interview.