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Essays on Cancer Patients, Quality of Life, and Social Support: Evidence from Nepal

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ESSAYS ON CANCER PATIENTS, QUALITY OF LIFE, AND SOCIAL SUPPORT: EVIDENCE FROM NEPAL

by

MUHAMMAD ADNAN SHAHID

M.A., ECONOMICS, UNIVERSITY OF NEW MEXICO, 2016

DISSERTATION

Submitted in Partial Fulfillment of the
Requirements for the Degree of

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Dedication

To my parents

Acknowledgement

I am grateful to my parents, Fazal Karim and Shahida Perveen, who always supported me and encouraged me. Their few words gave me strength to continue my studies here. They enjoyed my achievements during my PhD program and previous academic career. I deeply appreciate their enthusiasm. I am grateful to my wife, Zahira Manzoor, for her moral and emotional support, and encouragement. She celebrated and enjoyed my achievements more than me. I am also thankful to all my siblings (six of them), particularly Memoona Fazal and Muhammad Usman Shahid, for their kind and supporting words during the time when I was overwhelmed and felt very low in the doctoral program.

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Essays on Cancer patients, Quality of Life, and Social Support: Evidence from Nepal

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Ph.D., Economics, University of New Mexico, 2022

Abstract

This dissertation is organized in five chapters. The **first chapter** provides a summary of the three research articles that are combined in this dissertation. It highlights the goals of each research paper, and outlines their contribution to the existing literature and the field of economics. **Chapters 2 and 3** are based on a field study that I conducted on cancer and non-cancer patients in various cancer hospitals in Nepal. **Chapter 4** uses data from field survey conducted by scholars of the Nepal Study Center, UNM, including me, in Sindhupalchok district of Nepal after the devastating earthquake of 2015. The **final chapter** summarizes major findings of the three chapters, and discusses policy options.

The **second chapter** focuses on cancer patients' quality of life. In particular, I focus on the utility that the patients attain from different attributes of quality of life, and their willingness to pay for improved quality of life. I use the Euro-QoL instrument for measuring quality of life and exploit the discrete choice experiment design. For the empirical analysis, I employ a random parameter logit model on field survey data collected from cancer and non-cancer patients in various hospitals in Nepal. I find that cancer patients derive utility from all attributes of quality of life, with the highest utility received from the most desirable level of

the “Usual Activities” attribute, followed by the most desirable level of the “Pain” attribute. Overall, cancer patients are willing to pay about NRS 2.6 million [about USD 26,000] for improving their quality of life from their current state to the one with the most desirable level of each attribute.

Moving forward, the **third chapter** explores factors that affect cancer and non-cancer patients’ quality of life, with a particular focus on social support. To put this in context, using the same field survey data as before, I analyze the relationship between social support, stress, access to health care services, and quality of life of Nepalese cancer and non-cancer patients. In addition to the EuroQoL five dimension three level instrument for measuring quality of life of patients, I also use the 11-item De Jong Gierveld Loneliness Scale for measuring social support and stress. I unpair the relationships and effects among variables by treating social support, stress, and quality of life as latent constructs in a general (mixed) structural equation modeling framework. The empirical results show that social support plays a positive role in determining quality of life only for cancer patients. However, stress and easy access to health care services have a positive relationship with the quality of life of both cancer and non-cancer patients. In addition, as expected, higher wealth and education display a positive association with patients’ quality of life.

Since social support was found to improve the quality of life of cancer patients, I divert my attention from cancer patients and examine the significance of social support in the recovery of disaster-affected people in the **fourth chapter**. In 2015, a 7.8 magnitude earthquake struck Nepal that claimed around 9000 lives and destroyed more than 800,000 homes. While a few systematic economic assessment studies of this disaster have been conducted, most do not provide a comprehensive analysis that encompasses economic as

well as non-economic dimensions. Using data from a 2017 field survey, this chapter examines the critical role of social support in post-disaster recovery, and highlights the fact that social infrastructure drives resilience. The empirical estimates from an ordered logit model show that of the financial support measures wealth positively affects only housing while borrowing affects all recovery measures except housing. Similarly, social support measures positively influence all recovery measures except housing; the effect is more pronounced for volunteering (bridging social support) than family status and number of friends (bonding social support). Combining individual measures to create two composite indices, I find that the social support index is at least as effective as the financial support index in post-earthquake recovery.

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Chapter 1: Introduction

Cancer is a major health problem worldwide. Each year tens of millions of people contract the disease around the globe, and more than half of the patients die from it, eventually. Presently, in many countries, cancer ranks as the second leading cause of death; the World Health Organization also reported it as a leading or second leading cause of death worldwide (WHO 2018; Bray *et al.* 2018). While much of cancer incidence and mortality is related to ageing and population growth, part of the risk is also related to human behavior, such as smoking, physical inactivity, etc. Scholars note that cancer is a disease of the elderly and, thus, more prevalent in more advanced countries where the average life expectancy is generally higher than in less developed economies. However, recently, cancer incidence rates have been surging in less developed countries owing to risky behaviors (Fitzmaurice *et al.* 2015; Torre *et al.* 2015). Being a global health problem, a life-threatening disease, and more importantly, requiring huge financial resources for remedy and treatment, it is exceedingly important to devise ways and policies aimed at enhancing the well-being of patients, especially in countries where the majority of population is poor and have scarce resources to cope with the adversity.

A life-threatening illness such as cancer affects patients' lives in many ways. Aside from inflicting pain and suffering, it drains their financial resources for treatment and other costs. One aspect that is much influenced by cancer is quality of life (QoL). For instance, it shatters future hopes of a young patient; confines older patients to bed; inflicts constant pain and suffering that disrupt daily life routines of patients of any age; all of which disrupt life and undoubtedly reduce the quality of life (Calman, 1984).

I focus on the quality of life of cancer and non-cancer patients from a less developed country perspective such as Nepal, in Chapters 2 and 3 of this dissertation. **Chapter 2** mainly focuses on cancer patients' QoL. Existing scholarship describes QoL as a multidimensional concept that comprises many elements. Based on this literature, I argue that patients derive utility from many life features at different points in time. The goals of the chapter are twofold. First, I focus on quantifying utility that cancer patients associate with different attributes of quality of life. Since cancer patients often suffer from extreme pain and anxiety, they might be willing to pay for improved quality of life. This idea leads to my second goal of estimating how much cancer patients are willing to pay for improved quality of life.

To fulfill the goals of this chapter, I borrow the idea of discrete choice experiments from environmental valuation studies and apply it to EuroQoL measures to capture patients' valuation of QoL and their willingness to pay for improved QoL. EuroQoL is a commonly used multidimensional measure, consisting of five dimensions: pain, depression, mobility, selfcare and usual activities, with three or five levels for each dimension. In this chapter, I use three dimensions for each attribute to estimate a random parameter logit model. As expected, the results display that cancer patients gain utility from all the attributes of QoL, although a ranking exists among these attributes. More specifically, the patients obtain the highest utility from the most desirable level of the *Usual Activities* attribute, *no problem in performing usual activities*, and the second highest utility from the most desirable level of the *Pain* attribute, *no pain*. This order is reversed for non-cancer patients in that they receive the highest utility from *no pain* and then from *no problem in performing usual activities.* Further, the estimates show that cancer patients are willing to pay approximately USD 26,000 for improving their QoL from the present state to a situation consisting of the most desirable levels of all attributes. Lastly, I incorporated patients' uncertainty about their responses in the estimation procedures to check whether patients' doubts are driving the results. After suitably accounting for uncertainty, the results remain unchanged.

The second chapter illuminates the fact that cancer is a deadly disease and the patients are willing to pay an ample amount of money out of their own or borrowed financial resources to improve their quality of life. Parting with monetary resources, I believe, is just one facet of raising QoL. There may be other complementary underlying factors, in addition to money, that play a vital role in enhancing QoL. I argue that social support, consisting mainly of friends and family support, is an important factor that helps in improving QoL.

In **Chapter 3**, I explore factors associated with the quality of life of both cancer and non-cancer patients, with a special focus on social support and access to health care services. I employ a holistic approach in this chapter by including many types of cancer patients, and non-cancer patients as well. Three aspects distinguish this research from previous studies in the context of Nepal. First, this sort of research is scant in Nepal; second, prior work uses only one type of cancer patients, such as lung or cervical cancer patients, at a time; and third, previous studies consider only cancer patients with no comparison group.

Like in Chapter 2, I use the same field survey data from Nepal and EuroQol as my primary outcome measure. Employing a general (mixed) structural equation modeling technique for the empirical analysis, the results show that social support is very important for improving quality of life of only cancer patients. Other factors such as stress and access to a health care facility are negatively and positively associated with cancer and non-cancer patients' quality of life, respectively.

Social support proves very promising in the improving quality of life of cancer patients. This augments my interest further in exploring the role of social support in distressing times. This is the premise of Chapter 4, where I shift my attention from health to investigate the effectiveness of social support in disaster resiliency.

Two deadly earthquakes of 7.8 and 7.3 magnitude devastated Nepal in April-May 2015, killing thousands of people and destroying property worth billions of dollars. The calamity displaced about three million people, and many were trapped in the rubble requiring relief and recovery. The rugged and mountainous terrain of Nepal poses great challenges for local and foreign governments and relief organizations to carry out relief and recovery operations. In such difficult times, disaster scholars argue that friends, family, and neighbors often are the actual first responders. (Aldrich, 2011; Horwich, 2000; Shaw and Goda, 2004).

While a few systematic studies explore the efficacy of social support after the 1934 and 2015 earthquakes in Nepal, many are limited in scope or speak to its effectiveness in a narrow context. Recognizing the limitations of previous studies, I attempt to quantitatively explore the benefits of social support in disaster recovery by examining different forms of social support, and also investigating its effects in the presence of financial support.

The survey data for this research was collected in May-August 2017 by a team of researchers from the Nepal Study Center, UNM, in the Sindhupalchok district of Nepal and includes information about social support, as well as other resiliency and recovery measures after the massive 2015 earthquake. Using this information, I explore the effects of both social and financial support on four post-disaster recovery measures (housing, food, water, and income). Using a system of ordered logit equations, I find that, collectively, financial support measures affect all four recovery measures while social support measures affect only food, water, and income. Overall, the results show that social support is equally effective as financial support.

Chapter 2: Eliciting Cancer Patients' Willingness to Pay for Improved Quality of Life: Evidence from Nepal

2.1. Introduction

Cancer is the leading or second leading cause of mortality worldwide. (WHO 2018; Bray *et al.* 2018). About 18 million new cancer cases and about 9.6 million deaths due to cancer occurred globally in 2018.[1] Predictions by the International Agency for Research on Cancer (IARC) present a more alarming picture since, by 2040, the number of new cancer cases and deaths as a percentage of total population is expected to increase by 29 percent and 46 percent, respectively. While the disease is more prevalent in developed economies, developing economies are closing the gap very rapidly (Torre *et al.* 2015). Despite its low prevalence, death rates from cancer are the highest in developing economies, with approximately 70 percent of total deaths from cancer occurring in low and middle income countries (WHO 2018). This disparity can be attributed to aging of the population, since it is a major factor in global cancer trends, and early detection and prevention. More advanced economies have made strides in prevention of some cancer types, and early detection and access to advanced diagnostic modalities and therapies have led to declines in the incidence and mortality. On the other hand, increased cancer mortality in developing economies is attributable to lack of prevention, late detection, or inadequate treatment facilities. Due to this, about 80 percent of patients in developing countries already have incurable cancer when first diagnosed (Kanavos 2006).

Nepal, a low income country of 27 million people, used to have a higher prevalence of communicable than non-communicable diseases (NCDs), but the pattern changed over the last few years. Presently, the country has a higher age-standardized death rate from non-

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[1] https://www.who.int/cancer/PRGlobocanFinal.pdf (accessed Sep 7, 2019)

communicable diseases. Cancer is one of the four most common NCDs in the country. The 2018 WHO Nepal statistics show that 14,300 individuals, in total, died of different types of cancer, and total deaths among females (7400) are higher than males (6900). The country lacks a population-based cancer registry (Pun *et al.* 2015) and no population estimates on incidence and prevalence of cancer are available. However, based on a national hospital-based cancer registry data, approximately 8,000 to 10,000 new cancer cases are registered every year in Nepal (Subedi and Sharma 2012). These numbers are expected to increase in the future (Poudel *et al.* 2017a). Following global patterns, the most common type of cancer among Nepali males is lung cancer while among Nepali females is cervix/uteri cancer (Poudel *et al.* 2017). Besides higher levels of tobacco and alcohol use, change in dietary patterns and rapid urbanization are some of the known factors that contribute to contracting and developing the disease (Awang *et al.* 2018).

Cancer exerts a heavy toll on the socio-economic life of cancer patients (Chowdhury and Bohara 2016). The disease also has negative consequences for the patient's quality of life (QoL). For instance, the economic burden of cancer is tremendous. In Nepal, patients have to bear the costs of treatment out of their pockets, and high out-of-pocket payments create barriers to accessing health care services (Khatiwoda *et al.* 2019). This has ramifications for quality of life. The disease also can lead to hospitalization, long-term disability, and death (Raghupathi and Raghupathi 2018). Mostly, hospitalizations result in decreased mobility which also affects quality of life. Patients suffer from moderate to extreme pain depending on the stage of the disease that interferes significantly with their daily functioning (Fallon *et al.* 2018). In addition to physical pain and suffering, the anxiety and mental depression from the knowledge of having a life-threatening disease impairs the patient's quality of life. Besides anxiety and depression, a fear of getting necessary treatment and resultant side effects, often, compounds the problem further (Fallowfield 2002). Aging is one of the main factors in developing cancer partly because it progresses very slowly, and most of the time it manifests itself in later years of life. Therefore, it is mostly regarded as a disease of the elderly (Nerenz *et al.* 1986). An elderly person has already lost some quality of life due to aging, which affects some of their physical and mental competence, social support from family and friends, and economic resources. Further, illness and aging combined restrict overall mobility. Yet, the quality of life can be improved by focusing on other dimensions of life such as social, psychological, emotional, and mental (Calman 1984; Nerenz *et al.* 1986).

Conceptually, quality of life is a subjective term. Due to its subjective nature, the literature offers different definitions and ways of measuring quality of life. In general, these definitions and measures use a multidimensional concept that encapsulates different dimensions of life (Schwimmer *et al.* 2003). Good health-related quality of life is essentially a complex amalgam of satisfactory functioning of four core domains-physical, psychological/emotional, social, and occupational wellbeing (Fallowfield 2002). Most generic quality of life instruments, such as SF36 and EuroQol, that are currently used include items that fall within these domains.

In this chapter, I focus on the quality of life of cancer patients. The literature suggests that the patients gain utility from different aspects of life at different points in time. The utility may vary depending on the attribute. The goal of this chapter is to estimate cancer patients' willingness to pay for improved quality of life. Cancer patients suffer from pain, anxiety, depression, and the disease also affects their mobility and the ability to perform selfcare activities. All these fall under the purview of four core dimensions of quality of life measures. I utilize these quality of life attributes in our experimental setup to assess patients' quality of life and their willingness to pay for improved quality of life. The improved quality of life includes the best level of each attribute. This chapter innovatively uses a quality of life measure in a discrete choice experiment survey to elicit cancer patients' willingness to pay. Depending on the cancer type and stage of the disease, patients' preference and willingness to pay for QoL attributes may differ from each other. Therefore, I also estimate marginal willingness to pay (MWTP) for each attribute level.

I use data collected through a field survey of Nepalese cancer and non-cancer patients. I use the EuroQol quality of life attributes in a discrete choice experiment survey. EuroQol is a multi-dimensional construct used by many studies in different countries to measure general quality of life. It consists of five dimensions: pain, depression, mobility, selfcare, and usual activities (Brazier *et al.* 1993). Our discrete choice experiment consists of these five attributes with three levels for each attribute. We also added an additional measure of cost with 12 levels to get monetary estimates of MWTP.

I employ a random parameter logit model to get utility estimates and to detect possible preference heterogeneity that may exist among cancer patients. The results show that cancer patients have preferences for all attributes of quality of life. They prefer the lowest level of pain [no pain] and the highest level of performing usual activities [no problem in performing usual activities]. I also find that they have a positive willingness to pay for each dimension of the quality of life measure. Overall, I find that cancer patients are willing to pay a total amount of about NRS 2.6 million [about USD 26,000] for improved quality of life. The attribute level MWTP estimates show that the patients are willing to pay about NRS 707,086 [USD 7,071] for improving usual activities from the present situation to the "no problem in performing usual activities.” Similarly, the patients are willing to pay about NRS 639,670 [USD 6,394] for reducing pain to the “no pain” level. In comparison, non-cancer patients are willing to pay about NRS 2.1 million [about USD 21,000] for improving their quality of life. By attribute, they are willing to pay the most, about NRS 587,631 [USD 5,876] for reducing pain to the “no pain.” The analysis also shows that preference heterogeneity exists among cancer patients, and presence of uncertainty in the preferences of the patients does not affect the results.

The rest of the chapter is divided into different sections. Section 2.2 briefly discusses chronic illnesses, quality of life measures, and valuation techniques. Section 2.3 discusses data and the sample, experiment design, and survey administration. Section 2.4 explains the empirical methodology. Section 2.5 presents and discusses the results. Section 2.6 discusses sensitivity of the estimates after incorporating uncertainty. Section 2.7 concludes the chapter.

2.2. Chronic Illness and Quality of Life

Many instruments have been developed to measure the health-related quality of life. The most commonly used quality of life instruments include the Medical Outcomes Study 36-Item Short Form (SF-36) Health Survey, the Nottingham Health Profile (NGP), Quality of Well-Being (QWB) scale, the Health Utilities Index (HUI), and the EuroQol Instrument (EQ-5D). All these are generic instruments that are applicable across a wide range of disease and population demographics (Coons *et al.* 2000; Patrick and Deyo 1989). EuroQol, our measure of quality of life, was developed by the EuroQol Group, a multidisciplinary team of researchers (Group 1990). The Group developed the measure in five different languages: Dutch, UK English, Finnish, Norwegian and Swedish, simultaneously. Later on, several studies reviewed and tested the construct on a number of dimensions for its validity. The instrument was scrutinized by researchers for its measurement and conceptual model, its reliability, its validity, the respondent and administrative burden it exerts, for its alternative forms, and its cultural and language adaptations (Coast *et al.* 1997; De Charro and Rabin 2000; Dorman *et al.* 1998; Brazier *et al.* 1993; Essink *et al.* 1997; Hurst *et al.* 1997; Hurst *et al.* 1994; Johnson and Coons 1998; Van Agt *et al.* 1994). The studies established that the measure performs well on the required dimensions and is a valid measure to ascertain quality of life. We used EuroQol in our survey because it is short and user friendly. It has less respondent and administrative burden. We administered the survey to cancer patients who may be reluctant to answer due to their physical condition. Recognizing their physical condition, we tried to keep things simple as much as possible without compromising our foremost priority of extracting enough quality information.

In many low- and middle-income countries, unlimited public demand coupled with scarce resources put enormous strain on publicly provided health care systems. This requires decisions that effectively allocate the available scarce resources (Ryan 2004). Since health care markets do not exist in these countries, economic evaluation techniques must be used to inform decision in public health care (Ryan 2004). The existing literature listed many valuation techniques such as cost-effectiveness analysis, cost-utility analysis, and cost-benefit analysis. These techniques have some deficiencies as discussed by Bridges (2003). Stated preference methods such as contingent valuation (CV) and discrete choice experiment (DCE) have been developed to overcome these deficiencies (Bridges 2003). In recent years, these techniques, especially DCE, have been increasingly used in health economics (Alpizar *et al.* 2001; Ryan and Gerard 2003; Ryan *et al.* 2007; Mahieu *et al.* 2014). The extant literature has primarily used contingent valuation method while examining cancer related health programs. Most studies focused on only one type of cancer patients, such as lung cancer or cervical cancer patients. Lang (2010) applied the CV method to lung cancer patients to estimate their willingness to pay for a hypothetical new drug that cures lung cancer. Romé *et al.* (2010) used CV to estimate the willingness to pay for improvements in health through different health improvement programs such as Physical Activity on Prescription. Similarly, Lang *et al.* (2012) employed the CV technique to estimate cervical cancer patients' willingness to pay for full remission of the disease. Like these, many other studies have applied the CV method for cancer research. DCE, as defined by a number of studies, is an attribute-based measure of benefit, where the intervention, service, or policy is described by the attributes.[2] The individual or decision maker chooses the alternative presented based on the levels of those attributes. Many studies have applied DCE to value some non-market good. For instance, Bryan *et al.* (1998) use DCE to measure preferences for magnetic resonance imaging against arthroscopy. Similarly, Sculpher *et al.* (2004) use DCE to find out the attributes of conservative treatment for prostate cancer that patients prefer.

Since my foremost priority was to capture patients' preference for different attributes of quality of life, and to estimate their willingness to pay for improving their quality of life, we used the discrete choice experiment methodology. Our study is innovative in that we used cost as an additional attribute along with five other attributes of EuroQol. As DCEs allow us to calculate the marginal rate of substitution between any two attributes, adding cost allows us to calculate the welfare measures such as willingness to pay.

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[2] Ryan *et al.* (2007) discussed in detail the steps involved in the design, implementation, and analysis of discrete choice experiment.

In this chapter, I focus on Nepal. The incidence of cancer and deaths from cancer are increasing gradually in the country.[3] Many socio-economic factors such as income and availability of basic necessities of life contribute to the progression of the disease, and the demographics show that Nepalese are lacking such necessities. For instance, the statistics show that about 42 percent of the population are living below the poverty line; about 53 percent have no access to improved sanitation facilities, and about 20 percent have no access to drinking water.[4] Besides these, other risk factors include tobacco smoking, excessive alcohol consumption, household solid fuel, physical inactivity, obesity, environmental pollution, and excessive pesticides in fruits and vegetables (Poudel *et al.* 2017). In addition to these factors, patients are often unaware of the disease when they contract it, due to lack of education. They continue to work and the disease graduates from one stage to the next. Furthermore, lack of sufficient financial resources and cancer treatment facilities further exacerbate the problem (Subedi and Sharma 2012).

In this chapter, we apply a novel idea to ascertain cancer patients' willingness to pay for different attributes of quality of life. Evidence on the quality of life of cancer patients and especially their willingness to pay for improving quality of life is sparse, or even non-existent. Unlike existing studies, such as Manandhar *et al.* (2016), Bhandari *et al.* (2017), Maharjan *et al.* (2018), that researched only one type of cancer, we focus on all types of cancer.

I explore the following research questions in the study:

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[3] The WHO statistics show that due to cancer approximately 14,880 (about 0.05 percent of total population) people died in 2014 and approximately 16,470 (about 0.06 percent of total population) died in 2016. As the country lacks a population based cancer registry, anecdotal evidence, (eg. https://thehimalayantimes.com/kathmandu/cases-of-cancer-increasing-alarmingly/), shows that the number of new cancer cases are increasing in the country every year.

[4] https://thewaterproject.org/water-crisis/water-in-crisis-nepal (accessed Apr 4, 2019).

Research question 1: Do patients value different aspects of life differently? EuroQol succinctly captures different avenues of quality of life of the patients. My first question focuses on ascertaining the preferences for different quality of life attributes of cancer patients.

Research question 2: Are cancer patients willing to pay more than non-cancer patients for improved quality of life? As cancer is a life-threatening disease and highly feared, I hypothesize that cancer patients are willing to pay more than non-cancer patients for the same improved quality of life. In addition, I also focus on the willingness to pay of different types of cancer patients. The male cancer patients in Nepal and around the world predominantly suffer from lung cancer, while female cancer patients suffer from either breast cancer, and/or cervical/uteri cancer. Lung cancer is common among females, too. Therefore, in my analysis, I focus on how changing cancer profiles affect the patients' willingness to pay.

Research question 3: Does respondents' uncertainty about choices affect the results? This question primarily focuses on the sensitivity of results. Respondents may feel uncertain about the choices they make, which may create bias in the results (Lundhede *et al.* 2009). I incorporate respondents' uncertainty about choices in the models and see if it makes any significant dent in the results.

2.3. Data and Methods

2.3.a. Context and Data Collection

This study uses primary data collected through a field survey conducted in four different hospitals of Nepal. Seven major hospitals in Nepal provide cancer services (Subedi and Sharma 2012), three of which receive the largest load of patients every year.[5] I, as a supervisor and student investigator, along with other team members, administered the survey in these three hospitals and a general hospital, Dhulikhel Hospital, Dhulikhel. Two of the four hospitals (B. P. Koirala Memorial Cancer Hospital and Bhaktapur Cancer Hospital) only receive and treat cancer patients, while the other two (Bir Hospital and Dhulikhel Hospital) treat both cancer and non-cancer patients. Table 2.1 shows the distribution of patients across different cancer hospitals. 58 percent of the interviewed patients were from B. P. Koirala Memorial Cancer Hospital, 26 percent from Bir Hospital, while 8 percent each came from Bhaktapur Cancer Hospital and Dhulikhel Hospital.

[Insert Table 2.1 here…]

While this paper primarily focuses on cancer patients, for comparison, I also consider non-cancer patients. The cancer patients include Lung, Breast, Stomach and Esophageal, Head and Neck and Brain, Cervix Uteri, Trachea, Colon and Rectal, Prostate, Bladder, Oral and Nasopharynx, and Others. The non-cancer patients include patients that are suffering from other chronic illnesses that are as deadly as cancer such as Diabetes and Chronic Obstructive Pulmonary Disease (COPD). We administered the survey to both inpatient and outpatient cancer and non-cancer patients who are 18 years of age or older.

The questionnaire consists of several sections including the quality of life section used in this paper. In addition to the discrete choice experiment questions, we also asked respondents about their domestic and social life as well as their demographics. We pre-tested the questionnaire among cancer patients of Bhaktapur Cancer Hospital to assess its length

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[5] **Major cancer hospitals in Nepal**: (1) B. P. Koirala Memorial Cancer Hospital, Bharatpur; (2) Bir Hospital/National Academy of Medical Sciences (NAMS), Kathmandu; (3) Teaching Hospital, Tribhuvan University, Kathmandu; (4) Kanti Children’s Hospital, Kathmandu; (5) Bhaktapur Cancer Hospital, Bhaktapur; (6) Teaching Hospital, B. P. Koirala Memorial Institute of Health Sciences; (7) Teaching Hospital, Manipal College of Medical Sciences, Pokhara. The largest patients load is received by (1), (2), and (5).

and transparency. The suggestions[6] from pilot testing were included in the final version of the questionnaire. The survey was designed in English, but subsequently translated and administered in Nepali. An interviewer administered the questionnaire and s/he only proceeded if the patient agreed to participate in the survey. The information was collected at the individual level. The choice experiment section of the survey was answered by all 1310 interviewees, including 910 cancer patients (70 percent) and 400 non-cancer patients (30 percent). Each respondent answered three choice tasks; therefore, the total number of observations for the analysis is 3930.

2.3.b. Discrete Choice Experiment Design

A number of studies in environmental and health economics use Discrete Choice Experiment (DCE) methodology for non-market valuation (Kamara *et al.* 2018). This study also uses DCE methodology to estimate patient's willingness to pay for different attributes of quality of life. DCE relies on the idea that individuals derive utility not from the good presented but from the underlying attributes of the good (Lancaster 1966). In this context, individuals are presented with different alternatives. Each alternative consists of different levels of the pre-selected attributes. The levels of the attributes vary in each alternative. Individuals are then asked to choose their preferred alternative. The DCEs also assume that each choice made by an individual provides him/her a higher utility than the one rejected. This allows me to model the probability of the chosen alternative in terms of the attribute levels (Kamara *et al.* 2018).

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[6] The doctors and the cancer patients provided suggestions about the cost attribute of the discrete choice experiment, and the length of the survey.

2.3.b.i. Attributes and Levels Selection

Three alternatives in each choice set were presented to the patients, and we asked respondents to choose one of the alternatives presented. Two of the alternatives were different from each other depending on the level of the attributes. The third alternative was simply the status-quo. I used EuroQol (EQ-5D) dimensions in the DCE survey. EQ-5D[7] is a pre-tested and well-established instrument for assessing quality of life that consists of five dimensions: *Pain, Depression, Mobility, Self-Care, and Usual Activities*. Self-care includes activities such as eating, drinking, dressing, and washing. Usual activities involve performing activities such as outside work (bringing groceries, etc.), house work (cleaning, etc.), and leisure activities. I used all five attributes in my discrete choice design, but made some adjustments to the levels. I used only two of the desired levels for each attribute described by EuroQol, and changed the definition and interpretation of the third one. For instance, I used the levels: "no pain" and "moderate pain," for the *Pain* attribute and changed the level "extreme pain" to "no change in pain." Additionally, I used *Cost* which is an essential attribute in discrete choice experiments. Cost refers to the amount the individuals would pay, in terms of a fee, for the alternative selected. While the first five attributes have three levels each, *Cost* has 13 levels. Table 2.2 presents the six attributes with their levels and descriptions.

[Insert Table 2.2 here…]

2.3.b.ii. Experiment Design

After identifying attributes and attribute levels, I generated choice sets using different combinations of attribute levels. Due to non-feasibility of the full factorial design, I used a

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[7] https://euroqol.org/wp-content/uploads/2018/12/EQ-5D-3L-User-Guide_version-6.0.pdf.

fractional factorial design[8] to generate 12 versions of the survey. Each version consists of 3 choice sets. Each choice set contains two alternatives and a status-quo option. Since I had several versions of the survey, I randomized the surveys before implementing.

2.3.c. Survey Administration

We selected enumerators for survey administration. The enumerators underwent thorough training to ensure that all the enumerators were uniform in their understanding of the questions and in their language while communicating with the patients. For data collection, we conducted one-to-one interviews with the patients. During the process of the survey, the enumerators showed and/or explained the choice set to the patient and asked him/her to choose one alternative. A sample choice experiment is shown in Figure 2.1.

[Insert Figure 2.1 here…]

2.3.d. Summary Statistics

Table 2.3 summarizes socio-demographics of the patients. Seventy percent of the patients in my sample are cancer patients. The majority of patients are outpatients, only 16 percent are inpatients. Among cancer patients, 15 percent are inpatients, while among non-cancer patients, about 20 percent are inpatients. Overall and in cancer/non-cancer categories, most of the patients are female (52 %) and married (80 %) with an average age around 52 years and no schooling. Mostly, the patients belong to either the Brahmin or Chhetri or Janajati ethnic group and have income ranging from NRS 10,000 to NRS 30,000. Among cancer patients, the major types of cancer are Lung, Breast, Stomach and Esophageal, Head

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[8] A full factorial design consists of all possible combinations of the levels of the attributes. For instance, if there are five attributes, say A(3), B(3), C(3), D(2), E(5), with the associated number of levels in the parentheses, the full factorial combinations are 3 x 3 x 3 x 2 x 5 = 270. I refer to this number (270) as a full factorial design. Typically, the number of full factorial combinations is too many and difficult to implement in a discrete choice experiment, and in most practical applications, it is a tedious task to have subjects rate all the possible combinations. Therefore, to reduce the size of the design, researchers resort to fractional factorial design which is a subset of the full factorial design that retains the main properties of the full factorial, so that the main effects can be estimated as efficiently as possible (Louviere *et al.* 2000; Carson and Louviere 2010).

and Neck and Brain, and Cervix. Figure 2.2 displays the overall distribution of cancer types among cancer patients. The Others category include all other types of patients not reported in the figure such as Trachea, Colon and Rectal, Prostate, Bladder, and Oral and Nasopharynx. Most of the patients are suffering from breast or cervical cancer (36 %) followed by lung, head and neck and brain, and stomach and esophageal cancer. Among female patients, the most common occurrence is breast cancer (31.0%) and cervical cancer (28.0%), while the majority of male patients suffer from lung cancer (17.0%) followed by head, neck, and brain cancer (15.0%), and oral and nasopharynx cancer (10.0%).[9]

[Insert Table 2.3 here…]
[Insert Figure 2.2 here…]

2.4. Empirical Strategy

2.4.a. Random Utility Model

The empirical model is based on the Random Utility Model (RUM). It posits that the utility of a consumer is a latent construct which cannot be directly observed by the researcher. However, a significant portion of the utility can be observed by using valid preference elicitation procedures (Louviere 2001). In equation form, RUM can be represented as: $U_{nj} = V\left(Z_{nj}, X_n\right) + \varepsilon_{nj}, j = 1 \dots \dots J$, where U_{nj} is a latent construct representing unobserved utility an individual n gets from choice alternative j from J alternatives, V is an observable or systematic or explainable component of unobserved utility, while ε_{nj} is a random or unexplainable component. The systematic component of unobserved

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[9] My figures correspond to the numbers reported by some international and local organizations such as the World Health Organization (WHO) and the Central Bureau of Statistics, Nepal (CBS). The WHO and a few other studies such as Poudel *et al.* (2017) report that cancer incidence among female patients is higher than male patients. Similarly, they report that, among males, lung cancer incidence is the highest followed by lip and oral cancer; and among females, cervix/uteri cancer has the highest occurrence followed by breast cancer. My figures show the same trend.

utility depends on Z_{nj} and X_n, which are attributes of the choice alternative and the individual's socio-economic characteristics. Due to the random component in unobserved utility, the researcher cannot perfectly understand and predict individual preferences. When presented with different alternatives in a choice set, the individual chooses the alternative that provides the highest utility. For instance, $U_{nj} > U_{nk}$, the individual n chooses alternative j as the utility from this alternative is greater than alternative k. Because of the random component in the utility equation above, the decision maker can make probabilistic statements about the individual's choice (Train 2009). The choice probability of an individual is given by: $P_{ni} = Prob(V_{ni} + \varepsilon_{ni} > V_{nj} + \varepsilon_{nj}\ \forall j \neq i\ \&\ j \in J)$, where J represents a complete set of alternatives available to an individual in a choice set. For instance, in this study we have three alternatives including status-quo, thus $J = 3$. In order to estimate choice probabilities, we assume that errors are independent and identically distributed extreme value (Louviere 2001; Train 2009).

2.4.b. Econometric Model

Drawing on the previous literature, our basic random utility model can be shown as:

$$\begin{aligned} U_{njt} = {} & \beta_0 + \beta_1 Pain_{Moderate_{njt}} + \beta_2 Pain_{No_{njt}} \\ & + \beta_3 Depression_{Moderate_{njt}} + \beta_4 Depression_{No_{njt}} \\ & + \beta_5 Mobility_{Moderateproblem_{njt}} + \beta_6 Mobility_{Noproblem_{njt}} \\ & + \beta_7 Selfcare_{Moderateproblem_{njt}} + \beta_8 Selfcare_{Noproblem_{njt}} \\ & + \beta_9 Usualactivities_{Moderateproblem_{njt}} \\ & + \beta_{10} Usualactivities_{Noproblem_{njt}} + \beta_{11} Cost_{njt} + \varepsilon_{njt} \end{aligned} \tag{2.1}$$

The subscripts n, j and t refer to individual, choice set alternative and choice set, respectively. $Pain_{Moderate}$ and $Pain_{No}$ refer to moderate pain and no pain; $Depression_{Moderate}$ and $Depression_{No}$ mean moderate depression and no depression; $Mobility_{Moderateproblem}$ and $Mobility_{Noproblem}$ show moderate problem in mobility and no problem in mobility; $Selfcare_{Moderateproblem}$ and $Selfcare_{Noproblem}$ refer to moderate problem and no problem in selfcare activities; and $Usualactivities_{Moderateproblem}$ and $Usualactivities_{Noproblem}$ show moderate problem and no problem in performing usual activities, respectively. The coefficient β_0, the intercept or alternative specific constant (ASC), represents the utility of the status-quo. ASC, in technical terms, is a way to capture the utility of all factors that are not included in the model (Train 2009). It is also associated with the behavior of the individual which shows the utility of the status-quo alternative (Adamowicz *et al.* 1998). In my case, status-quo is different for each individual as it represents their current quality of life. While doing the survey, we also asked patients about their current levels of pain, depression, mobility, selfcare, and usual activities. The levels of these attributes are the same as the ones used in the DCE choice set. While doing the analysis, I use the current levels of the five attributes as the status-quo. The rest of the coefficients, β_1 to β_{10}, are the marginal utilities of the different levels of the five attributes of quality of life.

Equation 2.1 above is first estimated using the conditional logit model (CL). In the CL model, the expected utility of an individual is a function of the attributes of the choice alternative. The underlying assumptions of the CL model include Independence from Irrelevant Alternative (IIA)[10], independence of error terms, and preference homogeneity (McFadden 1974; Train 2009). The CL model accounts for taste variation of a decision maker with respect to observed variables. However, it does not represent random taste

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[10] The literature defined IIA as: the ratio of the choice probabilities of two alternatives, $\frac{P_{ni}}{P_{nk}}$, does not depend on any alternative other than i and k. This means that the relative odds of choosing i over k are the same irrespective of the presence of other alternatives. Because the ratio of the choice probabilities is independent of the presence of other alternatives, it is said to be independent from *irrelevant alternatives* (Train 2009, p. 49-50).

variation (Train 2009). Due to the IIA property, the CL model represents restrictive substitution patterns, which means the probability of choosing one alternative over another remains the same no matter what other alternatives are available or what other attributes of the alternatives are (Train 2009). In certain settings, the choice probabilities that manifest the IIA property may represent the reality accurately, but in most cases it is inappropriate. In my case, I present patients with three choice sets, each consisting of two alternatives and a status-quo. In a choice set, each alternative is different from the other in terms of attributes levels. Intuitively, if patients are presented with a mix of more desirable attributes levels in an alternative, their probability of choosing the alternative changes. Therefore, we do not have restrictive substitution patterns, and the IIA property does not hold. We also formally test the presence of this property after the conditional logit analysis using the test described by Hausman and McFadden (1984).

Recognizing the limitations of the conditional logit model, we apply the random parameters (or mixed) logit model (RPL).[11] It is more flexible than the conditional logit model. It allows for random taste variation, unrestricted substitution patterns, and correlation in unobserved factors over time (Train 2009). After estimating Equation 2.1 using the mixed logit model, I use *t*-statistics for selecting the random parameters (Mariel *et al.* 2013).

2.4.c. Welfare Measure

The betas in Equation 2.1 provide the marginal utilities of the respective attributes ($\frac{\partial U}{\partial X_k} = \beta_k$). The ratio of any two attribute coefficients gives the marginal rate of substitution (MRS). This shows how the respondents give up one attribute for an improvement in another

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[11] Train (2009) provide the details of the mixed logit probabilities and the estimation procedure.

attribute. Mathematically, the MRS can be written as : $MRS_{i,j} = -\frac{MU_{x_i}}{MU_{x_j}}$, where MU represents marginal utility, and i and j are two attributes. My goal is to calculate the marginal willingness to pay (MWTP) of cancer and non-cancer patients for different quality of life dimensions. I can calculate the MWTP by using the coefficient of the cost attribute in the MRS equation above. This represents how much the individual is willing to pay for an improvement in another attribute. More formally, MWTP is the amount of income that compensates for a marginal increase in quality of the non-market good. Mathematically, $MWTP = -\frac{\beta_{attribute}}{\beta_{cost}}$ (Kamara *et al.* 2018; Varian 2016). I can also calculate the combined willingness to pay for a number of attributes by summing all the attribute coefficients and dividing by the cost coefficient (Ryan and Gerard 2003).

2.5. Results and Discussion

Tables 2.4 and 2.5 show the utility and marginal willingness to pay estimates of the quality of life attributes. I performed the analysis using the conditional logit and random parameters logit model. The first column of Table 2.4 shows results of the conditional logit model, while the second and third column of the table displays results of the random parameters logit model.

The utility estimates obtained from the conditional logit model, as shown in Column 1 of Table 2.4, show that the patients derive utility from all of the attributes. The least desirable level of each attribute is my base category such as no change in pain, no change in depression, confined to bed, unable to do selfcare, and unable to perform usual activities for pain, depression, mobility, selfcare, and usual activities, respectively. Intuitively and rationally, the utility from the most desirable level of each category is higher than the middle category. For instance, in the case of pain, the utility from no pain is expected to be higher than moderate pain, as the method that reduces pain completely is desired more than the one that reduces it a little bit. The direction of estimates, as shown by the sign of the coefficient, is according to my expectation. The alternative specific constant (ASC) shows the utility obtained from the status-quo level. The cancer patients are in a dreadful condition and no one wants to stay in that situation. I expect a negative sign on ASC as it represents a worst case scenario, and I offered an improvement in different alternatives. The utility of the patients from the status-quo (alternative) is negative, which means they dislike the present situation. No pain, no depression, no problem in mobility, no problem in doing selfcare, and no problem in performing usual activities have a higher utility than moderate pain, moderate depression, moderate problem in mobility, moderate problem in performing selfcare activities, and moderate problem in performing usual activities. I expected a negative sign on the cost attribute; as I increase the cost the utility must go down. The results show an inverse relationship between utility and cost, which is evident from the negative sign on the cost coefficient. Among the quality of life attributes, the patients are deriving the highest utility from the most desirable level of usual activities and pain followed by mobility and selfcare. Although the fear of cancer distresses patients, sometimes they won’t notice their depression and only care about the physical aspects of life. This situation is reflected in our estimates, too. The magnitude of the depression coefficient shows that the patients are deriving the least utility from reducing depression.

The conditional logit estimates must fulfill the IIA property, as discussed earlier. I can perform the Likelihood Ratio test, the Hausman and McFadden test, and the Small and Hsiao test to test the property (Cheng and Long 2007). The most common tests are the Hausman and McFadden and the Small and Hsiao. I use the Hausman and McFadden test to test the IIA property. I first estimate the complete model with all the three alternatives, and then estimate the same model again leaving one alternative out. The chi-squared values that I get after performing the test are very high[12] and the probability values associated with the chi-squared values are very low[13]. This indicates that I reject the null hypothesis of model equivalence and conclude that the property does not hold. This leads to my application of random parameters logit model, which does not assume that the alternatives are independent from each other.

Column 2 of Table 2.4 shows the results of the random parameter logit model with the associated standard deviations for cancer patients. I assume a normal distribution for the coefficients. Regardless of the signs, significant standard deviations indicate randomness of the parameter or taste variation among the patients. The signs of RPL estimates are similar to CL estimates; however, the magnitude of all coefficients increased. The utility estimates follow the expected trend, which was discussed in the previous paragraph. I have significant standard deviations on the alternative specific constant, moderate pain, no depression, moderate problem in doing selfcare, and moderate problem in performing usual activities. This shows heterogeneity across people. Significantly, more than half of the patients (about 80 percent)[14] disliked the status-quo alternative as shown by the negative sign on alternative specific constant; however, the significant standard deviation shows that there are some patients (about 20 percent) who liked their present situation. These may be the people who

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[12] If I leave out the first alternative, I get a chi-squared value of 356.28, and if I leave out the second alternative, I get a chi-squared value of 393.51.

[13] P-value=0.000 for both chi-squared values.

[14] With a significant standard deviation, I can actually calculate the percentage of patients who liked or disliked the status-quo alternative using the Z-score formula (Train 2009). For instance, the percentage of cancer patients who liked the status-quo is calculated as: Share > 0 =$\Phi(0-(-2.50)/2.96)=0.2005$, where Φ represents cumulative normal distribution, -2.50 is the coefficient mean, and 2.96 is the coefficient standard deviation. The 0.2005 value shows that 20 percent of the patients liked status-quo.

are diagnosed with cancer very recently and are receiving treatment or they have cancer at a very early stage, when it is treatable. One thing to notice here is that no one differs in their preferences regarding the highly desirable outcome of each attribute, as I do not have any significant standard deviations associated with the highest attribute levels except for no depression. Like the conditional logit estimates, the RPL estimates show that the patients derive highest utility from self-performing usual activities followed by mobility, pain, and self-care activities.

Column 3 of Table 2.4 displays the results for non-cancer patients. The coefficient signs and magnitudes correspond to my expectations. Like cancer patients, non-cancer patients also prefer highly desirable outcome over moderate and least desirable outcomes. Non-cancer patients also dislike the status-quo alternative as evident by the negative coefficient on ASC; however, a large standard deviation on ASC indicates that about 35 percent of the patients prefer their present situation. The patients are deriving utility from all attributes as shown by the positive and significant estimates. Non-cancer patients derive the highest utility from the two levels: no problem in performing usual activities and no pain. However, unlike cancer patients, significant heterogeneity exists in the estimates of the “no problem in performing usual activities”.

[Insert Table 2.4 here…]

Table 2.5 presents the econometric results by major types of cancer in Nepal: Lung, Breast, and Cervical cancer. In the split analysis, the cancer patients are gaining utility from fewer attributes. The magnitude and sign of coefficients are in line with my expectations: higher preference is given to the best outcome followed by moderate and least desirable. The points to notice are: lung cancer patients dislike the present situation and only care about reducing pain and increasing the level of performing usual activities; among breast and cervical cancer patients, significant heterogeneity exists as to the preference for the status-quo alternative. As evidenced by significant standard deviations, the highest utility for breast and cervical cancer patients comes from “no problem performing in usual activities” followed by pain, mobility, and selfcare.

My analysis of cancer, and different types of cancer patients reveals that there is no fundamental difference between all types of cancer regarding the utility estimates. The foremost priority for different types of cancer patients, except lung cancer patients, is performing selfcare and usual activities, while for non-cancer patients, reducing pain is of utmost importance. Cancer patients suffer from extreme to moderate pain which hinders their day to day work. In my sample, the majority of the cancer patients are females; they have to perform daily household chores, and they also work in agricultural fields. Cancer pain hampers their progress; they have difficulty performing their work, which is why their highest utility comes from performing daily activities and reducing pain, and the statistics corroborate the fact. During pre-testing, we also did “cheap talk” with cancer patients, who were under treatment either as an outpatient or admitted in the hospital. We experienced that patients mostly focused on pain and selfcare activities. Few of the outpatient females said, “please give us something to reduce pain, so that we can work at home and in the fields.” Outpatients generally do not have many problems with mobility; therefore, they did not talk about that. However, inpatients who are totally confined to bed emphasized mobility along with pain and usual activities.

[Insert Table 2.5 here…]

2.5.a. Marginal Willingness to Pay

As described above, the discrete choice experiment method allows me to calculate marginal willingness to pay when cost is one of the attributes in the alternative. This involves calculating the marginal rate of substitution (MRS), which is the rate at which an individual is willing to substitute one attribute for another. We use the cost coefficient as a denominator in the MRS formula, which allows me to calculate and interpret MRS in monetary terms. I use the delta method to generate MWTP confidence intervals (Greene 2003). The MWTP for improving quality of life is the amount of money an individual is willing to pay in order to attain an improvement in one of the attributes. Table 2.6 presents MWTP estimates for different QoL attributes for cancer and non-cancer patients; and Table 2.7 shows MWTP estimates by the type of cancer.

Intuitively, I expect that patients would pay more for the most desirable outcome of each alternative. For instance, in the case of pain, patients would be willing to pay more for “no pain” than “moderate pain”. Except for selfcare with lung cancer patients, all the MWTP estimates of Tables 2.6 and 2.7 correspond to my hypothesis. Cancer patients are willing to pay about NRS 445,105 for reducing pain to moderate pain from their current level, however, they are willing to pay about NRS 639,670 to get rid of pain completely. Among all attributes, the highest willingness to pay is for the “no problem performing selfcare activities” level of selfcare activities attribute. This is followed by the “no pain” and the “no problem in mobility.” For non-cancer patients, the highest willingness to pay is for the “no pain” followed by the “no problem performing selfcare activities.” Due to the fear and suffering associated with cancer, we expect that cancer patients are willing to pay more than non-cancer patients. Except “moderate depression” and “moderate problem in doing selfcare,” the estimates show that cancer patients are willing to pay at least NRS 50,000 more than non-cancer patients depending on the attribute. Overall, cancer patients are willing to pay about NRS 2,610,853[15] for the alternative that contains the following attributes levels: “no pain,” “no depression,” “no problem in mobility,” “no problem in doing selfcare,” and “no problem in performing usual activities.” This combination of attributes presents the best alternative that improves their quality of life to the level of a healthy individual. I can also interpret this amount [NRS 2,610,853] as the maximum amount that cancer patients are willing to pay for QoL improvement. I also estimate an overall willingness to pay for the best alternative, and non-cancer patients are willing to pay about NRS 2,054,838[16] for this alternative.

[Insert Table 2.6 here…]

The estimates of willingness to pay by major types of cancer, as presented in Table 2.7, follow more or less the same trend as for all cancer patients.

[Insert Table 2.7 here…]

The World Bank data[17] shows that Nepal has an average per-capita annual income of USD 1,155 [about NPR 115,000] in 2020. Compared to their income, Nepali cancer patients are willing to pay huge amount of money to get rid of the disease. Not all patients were average patients, a few have had sufficient financial resources to bear the financial cost of the treatment, however, majority belonged to an average income household. Anecdotal evidence suggests that cancer patients would utilize personal and borrowed financial resources to get rid of the disease. During survey, we asked patients, *how do you pay for the treatment*? Many said they will use formal and informal sources to provide for the treatment.

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[15] 95% Confidence Interval: 2,159,590 – 3,062,117.0

[16] 95% Confidence Interval: 1,434,160.0 – 2,675,516.0

[17] https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=NP (accessed: Jan 18, 2022)

2.6. Sensitivity Analysis: Dealing with Uncertainty

It is usually assumed in stated preference methods that respondents assess the utility they may derive from a good presented to them without any error. Based on the derived utility, they can answer any valuation question with absolute certainty (Hanemann 1984; Lundhede *et al.* 2009). Respondents can be uncertain about their answers, which is reasonable. However, failing to accommodate respondents' choice uncertainty in modeling may bias the estimates (Lundhede *et al.* 2009). We use two different data recoding approaches to handle respondents' uncertainty. The approaches are: (i) eliminating uncertain choices from the sample, and (ii) asymmetrically recoding the data, which means that the uncertain choice is recoded as a choice of the status-quo alternative. In this survey, after every choice set we asked respondents, "how certain are you of your choice" and the respondents were required to answer on a five-point Likert scale ranging from "very certain" to "very uncertain." While doing the recoding, I combined "very certain" and "somewhat certain" answers to be one category showing certain choices of individuals, and "neither certain nor uncertain," "somewhat certain," and "very uncertain" to be one category representing uncertain choices.

Tables 2.8 and 2.9 display the random parameter logit estimates of the quality of life attributes for cancer and non-cancer patients after adjusting the data for uncertainty. Columns 1 and 2 in the respective tables show the results after the elimination method and the asymmetric recoding method, respectively. The results from the two methods do not differ from each other. The utility estimates follow the same trend as my previous without uncertainty estimates. This shows that although uncertainty exists among the individual's choice of alternatives, it does not affect the results. Table 2.10 displays MWTP estimates after adjusting for uncertainty for cancer and non-cancer patients. For the purpose of brevity, I only employ the elimination method to estimate MWTP. Also, the information criteria-AIC and BIC, listed in Tables 2.8 and 2.9 for uncertainty models show that elimination model is preferred. Incorporating uncertainty does not really change the willingness to pay estimates, as shown by the results in Table 2.10.

[Insert Tables 2.8, 2.9, and 2.10 here…]

2.7. Conclusion

The primary objective of this study was two-fold: first, ascertaining cancer patients' preferences associated with different attributes of quality of life, and second, estimating their willingness to pay for improved quality of life. Using an individual level dataset from Nepal, and employing a random utility model, I found that cancer patients prefer the usual activities attribute the most. The second attribute that they value highly after usual activities is mobility. The rest of the attributes come afterwards. These utility estimates get translated into willingness to pay values. Overall, cancer patients are willing to pay about NRS 2.6 million [about USD 26,000] for improving their quality of life. The individual estimates show that they are willing to pay highly for the "no problem in performing usual activities" followed by the "no pain." This shows that, among the quality of life attributes, daily activities, and pain are the principal priorities for cancer patients.

Further analyses show that unlike cancer patients, non-cancer patients' foremost priority is reducing pain, and they are willing to pay about NRS 1.8 million [about USD 18,000] for bringing their quality of life to par with the QoL of a healthy person. The presence of uncertainty can affect the results, and perhaps create bias (Lundhede *et al.* 2009);

however, this situation did not arise in our case. I used two different methods to incorporate uncertainty in the data and the results remained stable.

Table 2.1: Distribution of Cancer Patients across Cancer Hospitals

Sr. #	Name of the hospital	Number of patients (%)
1.	Bhaktapur Cancer Hospital, Bhaktapur	103 (8.0)
2.	Bir Hospital, Kathmandu	343 (26.0)
3.	B.P. Koirala Memorial Cancer Hospital, Bharatpur	759 (58.0)
4.	Dhulikhel Hospital, Dhulikhel	105 (8.0)

Table 2.2: Attributes and Levels Used in the Study

Attributes	Description	Levels
Pain	Patients suffer from pain. It can affect their enjoyment of life from moderate to severe extent.	-No pain -Moderate pain -Extreme pain
Depression	Patients suffer from mental anxiety and depression. It does influence patient's quality of life.	-No depression -Moderate depression -Extreme depression
Mobility	Medical condition affects the mobility of the person. Sometimes, it affects the mobility to a moderate extent and patients can walk with some support; however, sometimes, patients are totally confined to bed and they can't even walk.	-No problem in mobility -Moderate problem in mobility -Confined to bed
Self-care	Self-care involves patients performing activities, such as eating, drinking, dressing, washing, etc. by themselves. In some cases, cancer patients can perform self-care activities with difficulty, while in other cases, patients can't perform such activities and need outside assistance.	-No problem in self-care -Moderate problem in self-care -Unable to do self-care
Usual activities	Usual-activities involves performing activities, such as outside work (bringing groceries, etc.), study, housework (cleaning, etc.), family or leisure activities. As medical condition affects the quality of life of patients, they may not be able to perform usual activities.	-No problem in performing usual activities -Moderate problem in performing usual activities -Unable to perform usual activities
Cost	The patient or the relatives of the patient have to pay some additional cost for the treatment. The cost is expressed in the Nepal Rupees (NRS).	0; 1000; 25000; 100,000; 175,000; 300,000; 500,000; 900,000; 1,200,000; 1,700,000; 2,500,000; 3,500,000

Table 2.3: Descriptive Statistics Associated with Cancer and Non-Cancer Patients

	Average	Cancer patients	Non-cancer patients
Age (in years)	52.0	52.0	53.0
	%	%	%
Patients		70	30
Inpatients (=1)	16.0	15.0	20.0
Gender (Female=1)	58.0	61.0	52.0
Married	80.0	82.0	76.0
Education			
No Schooling (=1)	53.0	56.0	46.0
Bachelors (=1)	2.0	1.0	4.5
Ethnicity			
Brahmin/Chhetri/Janajati	75.0	69.0	89.0
Income (monthly)			
< NRS 10,000	20.0	24.0	12.0
NRS 10,001 to NRS 30,000	55.0	55.0	54.0
> NRS 30,000	10.0	7.0	15.0
Sample Size (*N*)	1310	910	400

Table 2.4: Utility Estimates of Quality of Life Attributes for Cancer and Non-Cancer Patients

Variable	CL (1)	RPL			
		Cancer (2)		Non-cancer (3)	
	choice	Mean	SD	Mean	SD
ASC	-1.21***	-2.50***	2.96***	-1.59***	4.13***
	(0.10)	(0.23)	(0.27)	(0.34)	(0.54)
No change in pain	ref.	ref.	ref.	ref.	ref.
Moderate pain	0.55***	1.08***	0.62*	1.72***	0.17
	(0.08)	(0.15)	(0.35)	(0.31)	(0.15)
No pain	0.92***	1.56***	0.00	2.73***	-0.59
	(0.09)	(0.15)	(0.04)	(0.39)	(0.66)
No change in depression	ref.	ref.	ref.	ref.	ref.
Moderate depression	0.19**	0.30**	0.29	0.67***	0.37
	(0.08)	(0.13)	(0.39)	(0.26)	(0.38)
No depression	0.60***	0.83***	-1.07***	1.20***	1.31***
	(0.08)	(0.13)	(0.24)	(0.28)	(0.37)
Confined to bed	ref.	ref.	ref.	ref.	ref.
Moderate problem in mobility	0.43***	0.79***	-0.01	0.96***	1.67***
	(0.09)	(0.13)	(0.09)	(0.30)	(0.41)
No problem in mobility	0.70***	1.30***	-0.05	1.34***	-0.10
	(0.09)	(0.16)	(0.03)	(0.32)	(0.29)
Unable to do selfcare	ref.	ref.	ref.	ref.	ref.
Moderate problem in doing selfcare	0.52***	0.75***	-0.58**	1.51***	0.19
	(0.09)	(0.15)	(0.28)	(0.34)	(0.12)
No problem in doing selfcare	0.73***	0.95***	-0.05	1.56***	0.16
	(0.08)	(0.13)	(0.07)	(0.33)	(0.17)
Unable to perform usual activities	ref.	ref.	ref.	ref.	ref.
Moderate problem in performing usual activities	0.59***	1.29***	-1.10***	1.67***	-0.22
	(0.07)	(0.16)	(0.33)	(0.29)	(0.26)
No problem in performing usual activities	0.92***	1.72***	-0.54	2.73***	2.41***
	(0.09)	(0.18)	(0.42)	(0.49)	(0.57)
Cost	-0.15***	-0.24***		-0.46***	
	(0.02)	(0.02)		(0.08)	
N	2730	2730		1173	
AIC	4661.7	4214.5		1555.6	
BIC	4745.8	4375.7		1697.5	

Data source: Nepal Study Center, UNM

Notes: *, **, *** denotes statistical significance at the 0.10, 0.05, and 0.01 level, respectively. *N* and SD represents number of observations and standard deviation, respectively. Clustered standard errors are in parentheses. ASC represents alternative specific constant which is equal to 1 if the decision maker has chosen the status-quo alternative. Cost is scaled by 100,000. CL and RPL are Conditional Logit and Random Parameters Logit estimates of cancer patients, respectively. The non-desirable level or the worst category of each of the five attributes is the base category.

Table 2.5: Random Parameters Logit Estimates of Quality of Life Attributes for Lung, Breast, and Cervical Cancer Patients

Variable	Lung		Breast		Cervical	
	Mean	SD	Mean	SD	Mean	SD
ASC	-1.87	3.77	-2.43***	2.31***	-2.80***	3.56***
	(1.83)	(2.99)	(0.44)	(0.45)	(0.81)	(1.12)
No change in pain	ref.	ref.	ref.	ref.	ref.	ref.
Moderate pain	1.15	-2.01	1.16***	0.60	1.63***	1.27
	(0.74)	(2.44)	(0.30)	(0.63)	(0.57)	(0.95)
No pain	2.19*	0.02	1.53***	0.19	1.79***	0.11
	(1.24)	(0.97)	(0.32)	(0.59)	(0.55)	(0.17)
No change in depression	ref.	ref.	ref.	ref.	ref.	ref.
Moderate depression	0.10	0.28	0.51**	-0.08	0.37	-1.74
	(0.65)	(3.46)	(0.25)	(0.16)	(0.42)	(1.21)
No depression	1.13	-1.38	1.06***	1.16**	1.13**	-1.38
	(0.80)	(1.90)	(0.31)	(0.49)	(0.45)	(0.89)
Confined to bed	ref.	ref.	ref.	ref.	ref.	ref.
Moderate problem in mobility	0.61	1.46	1.01***	-0.02	0.93**	-0.42
	(0.87)	(2.08)	(0.29)	(0.11)	(0.47)	(0.55)
No problem in mobility	1.64	-0.37	1.57***	-0.01	1.18**	-0.12
	(1.48)	(1.49)	(0.34)	(0.10)	(0.54)	(0.54)
Unable to do selfcare	ref.	ref.	ref.	ref.	ref.	ref.
Moderate problem in doing selfcare	1.35	-1.33	0.96***	-0.15	0.96*	-1.36*
	(0.99)	(1.19)	(0.33)	(0.56)	(0.52)	(0.76)
No problem in doing selfcare	1.23	-0.21	1.11***	0.14	1.15***	-0.13
	(1.07)	(0.83)	(0.28)	(0.12)	(0.41)	(0.20)
Unable to perform usual activities	ref.	ref.	ref.	ref.	ref.	ref.
Moderate problem in performing usual activities	1.58*	-0.91	1.12***	1.32	1.80***	-1.27
	(0.94)	(0.98)	(0.30)	(0.81)	(0.60)	(0.93)
No problem in performing usual activities	2.62	-0.74	1.62***	0.05	2.16***	-0.60
	(1.69)	(2.41)	(0.29)	(0.67)	(0.65)	(0.86)
Cost	-0.21*		-0.25***		-0.26***	
	(0.12)		(0.06)		(0.08)	
N	909		1566		1404	
AIC	494.20		833.49		783.55	
BIC	604.89		956.69		904.24	

Data source: Nepal Study Center, UNM

Notes: *, **, *** denotes statistical significance at the 0.10, 0.05, and 0.01 level respectively. *N* and SD represents number of observations and standard deviation respectively. Robust standard errors are in parentheses. ASC represents alternative specific constant which is equal to 1 if the decision maker has chosen the status-quo alternative. Cost is scaled by 100,000. The three columns represent random parameter logit estimates of lung cancer, breast cancer, and cervical cancer patients. The non-desirable level or the worst category of each of the five attributes is the base category.

Table 2.6: Marginal Willingness to Pay Estimates of Quality of Life Attributes for Cancer and Non-Cancer Patients

Attribute	Cancer	Non-cancer
Moderate pain	445,105 (315,083 - 575,127)	369,246 (221,942-516,549)
No pain	639,670 (500,291 - 779,048)	587,631 (405,651-769,610)
Moderate depression	121,540 (18,954 - 224,126)	144,660 (29,409- 259,910)
No depression	342,072 (232,074 - 452,070)	257,745 (120,485- 395,005)
Moderate problem in mobility	323,782 (209,111 - 438,453)	207,256 (58,227- 356,285)
No problem in mobility	532,864 (390,298 - 675,430)	287,531 (125,227- 449,834)
Moderate problem in doing selfcare	307,240 (187,138 - 427,341)	326,065 (180,603- 471,528)
No problem in doing selfcare	389,159 (279,284 - 499,035)	334,831 (189,941- 479,721)
Moderate problem in performing usual activities	528,620 (393,334 - 663,907)	358,767 (215,243- 502,291)
No problem in performing usual activities	707,086 (560,442 - 853,730)	587,100 (375,214- 798,986)

Data source: Nepal Study Center, UNM

Notes: Confidence intervals in parentheses. Estimates obtained from random parameter logit model

Table 2.7: Marginal Willingness to Pay Estimates of Quality of Life Attributes for Lung, Breast, and Cervical Cancer Patients

Attribute	Lung	Breast	Cervical
Moderate pain	534,555 (-114,032-1,183,142)	467,333 (186,809-747,858)	628,594 (224,446-1,032,742)
No pain	1,021,799 (379,209-1,664,389)	619,694 (294,183-945,205)	690,726 (325,409-1,056,044)
Moderate depression	48,636 (-547,083-644,356)	205,406 (-5,400-416,214)	143,988 (-183,886-471,863)
No depression	525,612 (41,600-1,009,624)	430,434 (164,492-696,376)	435,774 (132,647-738,901)
Moderate problem in mobility	283,031 (-356,116-922,179)	407,328 (105,953-708,704)	359,097 (28,622-689,573)
No problem in mobility	762,694 (-3,071-1,528,461)	634,320 (241,464-1,027,177)	454,314 (91,141-817,487)
Moderate problem in doing selfcare	627,404 (71,450-1,183,359)	387,429 (85,524-689,334)	369,966 (33,713-706,219)
No problem in doing selfcare	572,603 (-9,603-1,154,811)	449,351 (189,967-708,735)	442,592 (136,488-748,695)
Moderate problem in performing usual activities	734,224 (300,808-1,167,640)	451,322 (181,688-720,956)	693,657 (336,932-1,050,383)
No problem in performing usual activities	1,220,521 (525,728-1,915,314)	653,307 (334,660-971,955)	830,703 (432,401-1,229,004)

Data source: Nepal Study Center, UNM

Notes: Confidence intervals in parentheses. Estimates obtained from random parameter logit model.

Table 2.8: Random Parameters Logit Estimates of Quality of Life Attributes for Cancer Patients after Incorporating Uncertainty

Variable	Elimination (1)		Asymmetric Recoding (2)	
	Mean	SD	Mean	SD
ASC	-3.19***	3.57***	-1.90***	2.99***
	(0.35)	(0.40)	(0.17)	(0.20)
No change in pain	ref.	ref.	ref.	
Moderate pain	1.26***	0.84**	1.00***	
	(0.19)	(0.38)	(0.12)	
No pain	1.69***	-0.10	1.46***	
	(0.20)	(0.11)	(0.13)	
No change in depression	ref.	ref.	ref.	
Moderate depression	0.21	0.63	0.26**	
	(0.16)	(0.52)	(0.11)	
No depression	0.87***	1.14***	0.78***	0.98***
	(0.16)	(0.25)	(0.12)	(0.22)
Confined to bed	ref.	ref.	ref.	
Moderate problem in mobility	0.82***	-0.17	0.78***	
	(0.16)	(0.24)	(0.12)	
No problem in mobility	1.53***	0.03	1.26***	
	(0.21)	(0.05)	(0.14)	
Unable to do selfcare	ref.	ref.	ref.	
Moderate problem in doing selfcare	0.86***	0.91***	0.72***	
	(0.19)	(0.28)	(0.12)	
No problem in doing selfcare	1.18***	-0.01	0.88***	
	(0.17)	(0.06)	(0.11)	
Unable to perform usual activities	ref.	ref.	ref.	ref.
Moderate problem in performing usual activities	1.60***	1.25***	1.17***	0.99***
	(0.22)	(0.33)	(0.12)	(0.22)
No problem in performing usual activities	2.11***	0.66	1.61***	-0.50
	(0.24)	(0.52)	(0.13)	(0.40)
Cost	-0.25***		-0.22***	
	(0.03)		(0.01)	
N	2160		2730	
AIC	3244.1		4250.3	
BIC	3400.0		4362.5	

Data source: Nepal Study Center, UNM

Notes: *, **, *** denotes statistical significance at the 0.10, 0.05, and 0.01 level respectively. *N* and SD represents number of observations and standard deviation, respectively. Clustered standard errors are in parentheses. ASC represents alternative specific constant which is equal to 1 if the decision maker has chosen the status-quo alternative. Cost is scaled by 100,000. The non-desirable level or the worst category of each of the five attributes is the base category.

Table 2.9: Random Parameters Logit Estimates of Quality of Life Attributes for Non-Cancer Patients after Incorporating Uncertainty

Variable	Elimination (1)		Asymmetric Recoding (2)	
	Mean	SD	Mean	SD
ASC	-2.11***	4.80***	-1.30***	4.10***
	(0.47)	(0.93)	(0.31)	(0.54)
No change in pain	ref.	ref.	ref.	
Moderate pain	1.86***	0.53	1.57***	
	(0.41)	(0.75)	(0.28)	
No pain	3.20***	1.33*	2.43***	
	(0.61)	(0.75)	(0.30)	
No change in depression	ref.	ref.	ref.	
Moderate depression	0.61**	-0.13	0.63***	
	(0.31)	(0.27)	(0.24)	
No depression	1.14***	1.49**	1.11***	-1.10***
	(0.38)	(0.66)	(0.25)	(0.37)
Confined to bed	ref.	ref.	ref.	
Moderate problem in mobility	1.09**	1.57**	0.91***	
	(0.45)	(0.64)	(0.25)	
No problem in mobility	1.72***	0.99	1.20***	
	(0.58)	(0.63)	(0.28)	
Unable to do selfcare	ref.	ref.	ref.	
Moderate problem in doing selfcare	1.29***	-0.19	1.17***	
	(0.41)	(0.16)	(0.26)	
No problem in doing selfcare	1.46***	-0.14	1.23***	
	(0.40)	(0.26)	(0.22)	
Unable to perform usual activities	ref.	ref.	ref.	ref.
Moderate problem in performing usual activities	1.88***	0.51	1.54***	-0.34
	(0.50)	(0.47)	(0.24)	(0.67)
No problem in performing usual activities	3.17***	2.90***	2.39***	2.03***
	(0.76)	(0.79)	(0.36)	(0.42)
Cost	-0.49***		-0.42***	
	(0.08)		(0.05)	
N	963		1173	
AIC	1294.0		1552.0	
BIC	1431.3		1651.3	

Data source: Nepal Study Center, UNM

Notes: *, **, *** denotes statistical significance at the 0.10, 0.05, and 0.01 level respectively. *N* and SD represents number of observations and standard deviation, respectively. Clustered standard errors are in parentheses. ASC represents alternative specific constant which is equal to 1 if the decision maker has chosen the status-quo alternative. Cost is scaled by 100,000. The non-desirable level or the worst category of each of the five attributes is the base category.

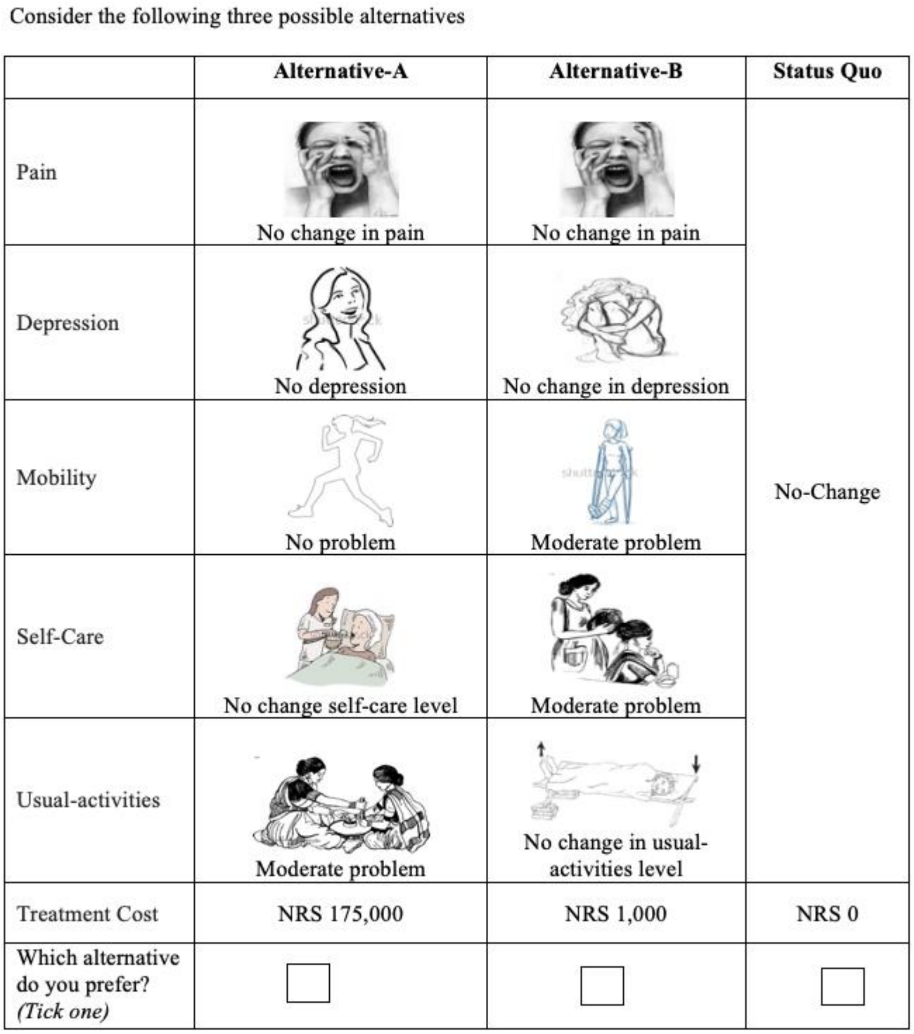
Table 2.10: Marginal Willingness to Pay Estimates for Cancer and Non-Cancer Patients after Incorporating Uncertainty

Attribute	Cancer	Non-cancer
Moderate pain	511,638 (347,312 - 675,964)	377,682 (210,051 – 545,313)
No pain	687,772 (512,626 - 862,918)	650,980 (427,536 – 874,424)
Moderate depression	87,452 (-42,090 – 216,994)	123,517 (872 – 246,162)
No depression	355,479 (228,542 – 482,417)	232,430 (76,949 – 387,911)
Moderate problem in mobility	332,064 (194,716 – 469,411)	221,492 (45,220 – 397,765)
No problem in mobility	624,035 (447,914 – 800,156)	350,402 (130,259 – 570,545)
Moderate problem in doing selfcare	348,519 (192,128 – 504,910)	262,985 (116,250 – 409,719)
No problem in doing selfcare	480,203 (328,858 – 631,548)	297,016 (155,777 – 438,254)
Moderate problem in performing usual activities	652,358 (480,758 – 823,958)	382,118 (199,250 – 564,987)
No problem in performing usual activities	858,330 (666,303 – 1,050,358)	645,678 (399,537 – 891,819)

Data source: Nepal Study Center, UNM

Notes: Confidence intervals in parentheses. Estimates obtained from random parameter logit model.

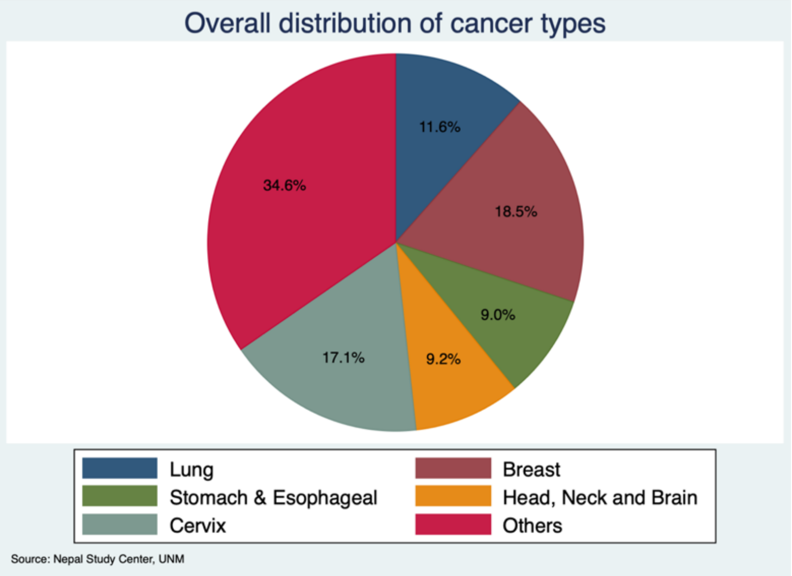
Figure 2.1: Sample Choice Set



Consider the following three possible alternatives

	Alternative-A	Alternative-B	Status Quo
Pain	No change in pain	No change in pain	No-Change
Depression	No depression	No change in depression	
Mobility	No problem	Moderate problem	
Self-Care	No change self-care level	Moderate problem	
Usual-activities	Moderate problem	No change in usual-activities level	
Treatment Cost	NRS 175,000	NRS 1,000	NRS 0
Which alternative do you prefer? *(Tick one)*	☐	☐	☐

Figure 2.2: Major Types of Cancer Patients



Source: Nepal Study Center, UNM

Chapter 3: Social Support, Stress, Access to Health Care Services, and Quality of Life of Nepalese Cancer and Non-Cancer Patients

3.1. Introduction

Cancer is a significant health problem both in developed and developing countries. Despite being a preventable and treatable chronic disease, every year many people die due to cancer. A substantial proportion of cancers could be prevented by a mix of strategies such as proper and timely vaccination, and life-style or behavioral changes. Recent statistics show that about 17 million new cancer cases, about 0.23 percent of the total world population, and about 9.5 million cancer deaths, about 0.13 percent of the total world population, occurred globally in 2018 alone; by 2040, the global burden is expected to grow to about 27.5 million new cancer cases, about 0.31 percent of the total world population, and about 16.3 million cancer deaths, about 0.19 percent of the total world population[18] (WHO 2018; Bray *et al.* 2018). Although the incidence of cancer is high in developed economies, about 70 percent of deaths due to cancer occur in developing countries. The disease prevalence is rapidly increasing in low and middle income countries, and if the trend continues, the incidence rate will surpass that of developed countries. The changing epidemiology of the disease is attributable to several factors such as aging, diet, tobacco, substance use, and infectious agents.[19] Due to the low socio-economic profile of developing countries, we usually expect

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[18] The 2040 population projections are gathered from the U.S. Census Bureau (https://www.census.gov/prod/2004pubs/wp02-1.pdf) (accessed Nov 24, 2019)

[19] Tobacco is the single greatest avoidable risk factor, that kills approximately 6 million people each year, from cancer or other related diseases. The WHO states that about 80 percent of the 1 billion smokers live in low- and middle-income countries. Similarly, physical inactivity and dietary factors are associated with many types of cancer such as esophagus, colorectum, breast, endometrium, and kidney; alcohol use causes oral cavity, pharynx, larynx, colorectum, liver, and breast cancer. Additionally, infectious agent, such as human papilloma virus (HPV), environmental pollution including indoor air pollution, occupational carcinogens, and exposure to radiation are among the factors that cause cancer. (https://www.who.int/cancer/prevention/en/) (accessed: Jan 13, 2020)

infection-related and poverty-related factors to be more prevalent in such countries. The WHO states that about two-thirds of infection-related cancers occur in less developed countries. However, the trend is changing overtime. The types of cancer that are more frequent in advanced countries are also becoming frequent in developing countries. Since these countries often lack advanced diagnostic modalities and prevention mechanisms, cancer death rates keep rising.

Cancer has manifold ramifications for patients including physical, economic, and social. Besides inflicting bodily pain and mental stress that negatively affect the quality of life (QoL) of patients, it disrupts their social life as well (Fischhoff *et al.* 1978; Ng *et al.* 2015). Moreover, the treatment associated with the disease also affects QoL. For example, treatment-related effects such as urinary, gastrointestinal, sexual, and neurologic side effects disrupt short term and long term quality of life (Pfaendler *et al.* 2015). In addition to treatment, a number of socio-economic factors contribute to the patient's well-being.

Over the years, quality of life has become a significant outcome measure to assess individuals' well-being. Since individual well-being is affected by the disease directly or indirectly in many ways, identifying factors associated with it might help in improving the quality of life, and advancing measures that help respective authorities in formulating policies aimed at improving well-being of the patients. In doing so, this study attempts to explore the factors associated with the quality of life of cancer and non-cancer patients, with a special focus on social support and access to care. Although much work has been done in the existing literature on the quality of life of cancer patients, the literature largely focused on cancer patients, and a single type of cancer at a time. This study, on the contrary, focuses on all types of cancer patients, and compares the outcomes to non-cancer patients as well. Also, I am focusing on cancer and non-cancer patients in Nepal, where this sort of research is scant.

The existing literature provides different definitions and measures of quality of life, such as SF36[20], EORTC QLQ-C30[21], EuroQol. Irrespective of their difference, all measures consider QoL as a multidimensional construct that captures functioning of an individual on four core domains: physical, psychological/emotional, social, and occupational well-being (Fallowfield 2002). Differences also exist in the questionnaire setup and the number of questions. To avoid further discomforting of an already suffering patient by asking too many questions, I use EuroQol, a very brief and concise instrument, to measure the quality of life.

I use primary data collected through a field survey from Nepalese cancer and non-cancer patients, and employ the general (mixed) structural equation modeling (SEM) technique for econometric analysis. SEM is flexible in terms of specifying the variance-covariance structure and analyzing the interdependent relationships of the latent variables measured through different observed variables. The results show that social support is very important for cancer patients. It is positively associated with their QoL. However, it does not play a significant role in the QoL of non-cancer patients. Stress is inversely related to QoL in both cases, as expected. Also, no difficulty in accessing health care facility is positively associated with cancer and non-cancer patient’s QoL.

The rest of the chapter is organized as follows. Section 3.2 briefly reviews major factors associated with quality of life. Section 3.3 explains the conceptual framework. Section 3.4 discusses data and methods. Section 3.5 presents and explains the empirical methodology. Section 3.6 discusses the results, and Section 3.7 concludes the chapter.

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[20] Short Form 36

[21] European Organization for Research and Treatment of Cancer QOL core 30-item questionnaire

3.2. Conceptual Framework

Quality of life is a broad concept, which includes economic, political, social, cultural, environmental, and health dimensions (Wilson and Cleary 1995). Although health is only part of the overall quality of life, I am fundamentally concerned with the health component. By focusing on cancer and non-cancer patients, and measuring their quality of life after they contracted the disease, I essentially consider health-related quality of life and not the overall quality of life.

Figure 3.1 provides a conceptual model (based on Glanz *et al.* 2015, p.187) that paves the way for the rest of the study. The figure shows that social support enhances physical health through several pathways, both directly and indirectly by diminishing the negative effects of stress. Glanz *et al.* (2015) describe these channels as *direct effect pathway* and *stress-buffering pathway*.

[Insert Figure 3.1 here…]

As my quality of life measure and health of an individual are tied together, any external source that affects physical health also affects the quality of life of an individual. Chronic diseases including cancer negatively affect physical function of the human body, thus diminishing quality of life as well. While administering the survey, I witnessed that physical functioning of most cancer patients had declined due to the disease, when the patients described their stories before and after the disease. In several cases, they suffered from extreme pain and, therefore, could not perform selfcare and usual activities. As my quality of life measure is based on physical conditions, when these conditions improve the quality of life improves. I argue that both health and quality of life improve simultaneously which allows me to directly relate social support to quality of life. Based on the premises just described, in my empirical model, I test both the direct effect pathway and the stress-buffering pathway. In Figure 3.1, many theoretical pathways, such as connection, esteem, and control, are involved through which social support affects health. In my empirical setup, I directly link social support to quality of life to test the direct effect model, and indirectly link it through stress appraisals to test the indirect effect or stress-buffering model. In the jargon of structural equation modeling, I can refer to the stress-buffering model as a mediation model. The effect of stress on the quality of life is mediated through social support. Social support protects persons from the pathogenic effect of stress, thereby improving their health and quality of life (Cohen *et al.* 1985). It operates as a stress buffering tool. Many studies investigated this relationship and mostly found evidence in favor of the buffering properties of social support (Cohen *et al.* 1985).

Figure 3.2 lays out the general structure of the pathway model that highlights the variables involved in the econometric analysis. The conceptual and theoretical underpinnings of the path model come from Figure 3.1. I test the relationship between social support, stress, and quality of life through the direct and indirect effect models. Social support and stress are measured by several variables represented in the structure.

[Insert Figure 3.2 here…]

3.3. Factors Affecting Quality of Life

Many studies have explored factors that are associated with quality of life of either cancer patients or survivors. The factors include age at cancer diagnosis (Lu *et al.* 2009; Peuckmann *et al.* 2007), education (Peuckmann *et al.* 2007), income (Casso *et al.* 2004; Yan *et al.* 2016), marital status (Broeckel *et al.* 2000), time since diagnosis (Lu *et al.* 2009) and treatment modalities, such as chemotherapy (Lu *et al.* 2009; Broeckel *et al.* 2000), radiotherapy. This section reviews major factors that affect patients' quality of life.

3.3.a. Social Support

Individual lives are fraught with difficulties. Expected and unexpected life events, possibly shocks, have an impact, positive or negative, on an individual's life. It may improve or deteriorate their quality of life. Several studies have documented that favorable life events enhance quality of life (Headey and Wearing 1992), or provide a buffer against the impact of any unfavorable event (Cohen *et al.* 1987). Some events such as job loss and divorce, may decrease life satisfaction or quality of life, but it bounces back after a certain period of time (Diener and Lucas 1999). However, sometimes the intensity of the adverse event is so great, such as in case of accidents or chronic illnesses like cancer, that it puts a long lasting effect on the QoL. Research has shown that quality of life is responsive to the life events, yet several adaptive mechanisms have the ability to reduce the negative effects of stressful life events (Oliver *et al.* 2010). One of the mechanisms that helps cope with adverse shocks is social support. It has also been given great importance in the extant literature (Pocnet *et al.* 2016; You and Lu 2014; Ganz *et al.* 2002; Bloom *et al.* 2004; Bloom *et al.* 2007). Several definitions exist in the literature about social support, but they all converge on social cohesion (Sarason and Sarason 1986). Social support has been drawn from a variety of sources such as family, friends, and community, and can be categorized into many different types, such as emotional support, tangible support, informational support, companionship support, received support, perceived support, structural support and functional support. Generally, an individual who is surrounded by many people that he/she can rely on, who care about him/her, value him/her, and love him/her, has more social support than a person who is devoid of some or all these relationships. There are many available instruments to measure social support, such as the Perceived Social Support Stress Scale (PSSS), Medical Outcome Study Social Support Survey (MOS-SS), and Social Network Index (SNI), but the literature is in disagreement as to which measures are best (Moser *et al.* 2012).

Many studies have documented social support as an important determinant for the well-being of individuals. It is associated with better physical and emotional health, particularly among individuals with preexisting stress conditions such as cancer (Achat *et al.* 1998; Kornblith *et al.* 2001; Karels *et al.* 2007; Keijsers *et al.* 2010; Landi *et al.* 2004; You and Lu 2014; Ganz *et al.* 2002; Bloom *et al.* 2002; Bloom *et al.* 2007; Uchino 2006). Besides having a direct effect on the physical and mental health of an individual, social support also has buffering properties, which means that stressful events occurring in the presence of social support produce less distress than in its absence (Thoits 1995; Glanz *et al.* 2015; Langford 1997; Trevino *et al.* 2013; Pietras *et al.* 2011; Şengül *et al.* 2014; Uchino 2006).

3.3.b. Stress

Many social and epidemiological studies have focused on stress, but despite the enormous use, no specific definition of the terminology is available (Fallen *et al.* 1997; Golden *et al.* 2005). Selye (1956) described it as a psychological response to two major types of contrasting environmental stimuli: major but infrequent and minor but frequent life events (Holmes and Rahe 1967; Kanner *et al.* 1981). The minor but frequent life event may not cause stress as humans adapt to situations and bounce back to their previous level of happiness (Pocnet *et al.* 2016). However, the major but infrequent life events act as shocks and cause major disruption which can be lasting, and recovery is difficult. Cancer is an infrequent life event that acts as a shock, and like other infrequent shocks, it causes disruption in the social, economic, and physical life of the patient (Bishop 2005). This, in turn, generates stress and has consequences for patients’ QoL (Fortune *et al.* 1997). The literature has defined the experience of cancer diagnosis and treatment as a traumatic event capable of eliciting symptoms consistent with post-traumatic stress disorder (Alter *et al.* 1996; Cordova *et al.* 1995).

Chronic illness such as cancer impose heavy physical, social, emotional, and economic burden on patients, thereby causing stress (Bishop 2005). Many factors, such as disease severity, physical difficulties, psychological state, family issues, and economic burden, contribute to the onset and further progression of stress, and accompany patients through all stages of the disease and its treatment (Mcbride 2000; Redd 1995). It consequently deteriorates patients' quality of life (Turner *et al.* 2005; Hwang *et al.* 2003; Iconomou *et al.* 2004; Mahon *et al.* 1990; Northouse *et al.* 1995; Delgado 2007). However, the decline in QoL varies by patients because patients with the same medical condition, stage, and disease progression might rate their quality of life differently, due to subjective responses to the changes produced by the disease (Delgado 2007; Miller 2000).

3.3.c. Access to Care

The mountainous terrain of Nepal makes it difficult for government and private health care providers to operate in the hilly areas. Also, there are not enough government hospitals providing cancer treatment to patients (Poudel *et al.* 2017b). They have to travel far to get health care services. Not just cancer treatment, but the treatment of other chronic illnesses is not readily available. I focus on health care access, in addition to social support and stress, to find how it is related to the quality of life.

3.3.d. Research Hypothesis

My review of the literature shows that there are different measures of quality of life, social support, and health. The complex structure of the three major variables of interest makes it difficult to compare the results (Tremolada *et al.* 2016). In this study, my primary focus is on the cancer patients in Nepal. But, I also analyze non-cancer patients who are suffering from other chronic illnesses. Some of the chronic illnesses such as high blood pressure, are not as deadly as cancer, but I sampled those patients in order to make a comparison group.

I explore the following hypotheses in this chapter:

Hypothesis 1: Social Support (perceived) is positively associated with QoL.

Hypothesis 2: Stress is negatively associated with QoL. Based on the buffering hypothesis, social support decreases stress, thus contributing to higher QoL.

Hypothesis 3: Access to health care services improves QoL.

Hypothesis 4: Wealth is positively associated with QoL.

3.4. Data and Methods

3.4.a. Context and Data Collection

This chapter employs the same survey dataset that I used in Chapter 2, collected by the author through a field survey. More details on data collection are available in Section 2.3.a of Chapter 2.

I focus on cancer and non-cancer patients. The cancer patients include Lung, Breast, Stomach and Esophageal, Head and Neck and Brain, Cervix/Uteri, Trachea, Colon and Rectal, Prostate, Bladder, Oral and Nasopharynx, and Others. The non-cancer patients include patients that are suffering from other chronic illnesses such as Diabetes, Chronic Obstructive Pulmonary Disease (COPD), Obesity, and Heart Disease. We administered the survey to both inpatient and outpatient cancer and non-cancer patients who are 18 years of age or older.

The questionnaire consists of several sections. I gathered data on the quality of life of patients using the EuroQol five dimension three level questionnaire, their domestic and social life as well as their demographics. I also asked patients questions about patient doctor communication and social support.

Thirteen hundred and ten patients were interviewed in total, out of which 70 percent (910) are cancer patients and 30 percent (400) are non-cancer patients.

3.4.b. Socio-demographics of Cancer and Non-Cancer patients

Table 3.1 provides a brief description of the socio-demographics of cancer and non-cancer patients. Seventy percent of the patients in the sample are cancer patients. We focused on both inpatient and outpatient cancer and non-cancer patients; however, due to hospital restrictions, we collected data mostly on outpatients. Only 15 percent of cancer and 20 percent of non-cancer patients are inpatients. Overall, about 16 percent of the total patients are inpatients. In my sample, on average about 58 percent of the patients are females; and among cancer and non-cancer patients, about 61 percent and 52 percent are females, respectively. Overall and in cancer and non-cancer categories, most of the patients are married (80.0) with average age around 52 and no schooling. The most prevalent ethnic groups among patients are Brahmin, Chhetri, and Janajati; in our sample about 75 percent of the patients belong to one of these groups. The majority of my sample falls in the middle income category, NRS 10,001 [USD 100] to NRS 30,000 [USD 300]. While conducting the survey, I observed that most patients came from far-flung areas, work in agriculture, and do not have high income. This is reflected in my data, too.

[Insert Table 2.3 here…]

The major types of cancer that I observe in my data are Lung, Breast, Stomach and Esophageal, Head and Neck and Brain, and Cervix. Figure 2.2 of Chapter 2 displays the overall distribution of cancer types among cancer patients in the sample. The Others category includes all other types of cancers not presented in the figure such as Trachea, Colon and Rectal, Prostate, Bladder, and Oral and Nasopharynx. The patients suffer mostly from breast cancer followed by cervix, lung, head and neck and brain, and stomach and esophageal. The most common occurrence among females is breast cancer (31%) followed by cervical cancer (28%), while lung cancer (17%), head and neck and brain (15%), and oral and nasopharynx (10%) exist mostly among males. My figures correspond to the numbers reported by some international and local organizations such as the World Health Organization (WHO)[22] and the Central Bureau of Statistics, Nepal (CBS).[23] The WHO and a few other studies such as Poudel *et al.* (2017b) report that cancer incidence among female patients is higher than male patients. Similarly, they report that, among males, lung cancer incidence is highest followed by lip and oral cancer, and among females, cervix/uteri cancer has the highest occurrence followed by breast cancer. My statistics reveal the same pattern.

3.4.c. Empirical Estimation Variables

Table 3.2 presents descriptive statistics for the variables used in the estimation, quality of life, social support, stress, wealth index, and access to care. I discuss these variables below, separately.

[Insert Table 3.2 here…]

3.4.c.i. Quality of Life

I assess the quality of life of patients by using the EuroQol measure. It measures the general quality of life using five dimensions. The dimensions include pain, depression,

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[22] https://www.who.int/cancer/country-profiles/npl_en.pdf

[23] https://cbs.gov.np/wp-content/upLoads/2019/02/Statistical-Year-Book-2017.pdf; https://cbs.gov.np/wp-content/upLoads/2019/02/Nepal-in-Figures-2018.pdf

mobility, selfcare, and usual activities.[24] Each dimension is measured on a 3 point Likert scale. For instance, the choice categories of pain are: no pain, moderate pain, and extreme pain. We asked patients questions, such as “what is your current level of pain,” “what is your current level of depression,” etc., to know their current level of each dimension.

In addition to treating quality of life as a latent construct, we measure it quantitatively as well. Generally, EuroQol provides a set of weights for most countries to value a health state, which represents a set of responses provided by a patient to the five dimensions of the EuroQol measure. Using a set of weights, I can convert each health state into a single summary index value. An index value is a quantitative measure which I can use to analyze and compare patients. EuroQol is lacking different health state weights for Nepal. Therefore, in order to get a quantitative measure of quality of life of patients, I refer to Chapter 2 of this dissertation that provides willingness to pay[25] for each attribute level of the QoL. I use patients’ willingness to pay as a weight to quantify quality of life. In addition to using patients’ willingness to pay for each attribute as a weight, I also use the individual utility measure as a weight (Chapter 2). Equation 3.1 mathematically defines the concept:

$$\begin{aligned} QOL_i = {} & \alpha_1 pain_{i1} + \alpha_2 pain_{i2} + \alpha_3 pain_{i3} + \beta_1 dep_{i1} + \beta_2 dep_{i2} + \beta_3 dep_{i3} \\ & + \gamma_1 mob_{i1} + \gamma_2 mob_{i2} + \gamma_3 mob_{i3} + \delta_1 selfcare_{i1} \\ & + \delta_2 selfcare_{i2} + \delta_3 selfcare_{i3} + \lambda_1 usualact_{i1} \\ & + \lambda_2 usualact_{i2} + \lambda_3 usualact_{i3} \end{aligned} \tag{3.1}$$

where QOL_i is patient i’s quality of life. Table 3.3 provides the willingness to pay and utility weights for all variables. $pain_1$, dep_1, mob_1, $selfcare_1$, and $usualact_1$ represent

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[24] https://euroqol.org/wp-content/uploads/2018/12/EQ-5D-3L-User-Guide_version-6.0.pdf.

[25] Using a mixed logit model, I estimated patients’ willingness to pay for each attribute level, setting the least desirable level of each attribute (extreme pain, extreme depression, confined to bed, unable to do selfcare, cannot perform usual activities) as a status-quo level. The model estimate coefficients that I not only used as utility weights in quantifying quality of life but also utilized to estimate willingness to pay for each attribute. I also calculate total willingness to pay using all the attribute levels. A WTP weight represents a fraction of the total willingness to pay for that attribute level.

extreme pain, extreme depression, confined to bed, unable to do selfcare, and cannot perform usual activities. To represent status-quo, the least desirable category of each dimension is assigned 0 weight.

Using WTP and utility weights provided in Table 3.3, I quantified quality of life, as shown in Table 3.2. The mean value of quality of life calculated using willingness to pay estimates as weights is 0.43 with a standard deviation of 0.13, while the mean value is 4.61 if I use utility estimates as weights. The statistics show that non-cancer patients have a better quality of life than cancer patients.

[Insert Table 3.3 here…]

3.4.c.ii. Social Support

Social networks explain connections between individuals and their relationships. Friends, family members, colleagues, and other relationships that an individual has provide support besides acting as conduits of health information and determinants of health behavior, such as smoking, etc. (Glanz *et al.* 2015). Social support is a broad concept. It contains different types of support, as described by Glanz *et al.* (2015), such as perceived support, received support, emotional support, belonging support, tangible support, and informational support. We asked various questions related to the social life of a patient in the survey. The questions belong to different types of social support, and, for purposes of this analysis, I do not categorize the support questions into their types. I consider all of these as measures of social support.

We asked respondents to rate the following statements: (1) “There is always someone I can talk to about my day to day problems;” (2) “There are plenty of people I can lean on when I have problems;” (3) “I find my circle of friends and acquaintances too limited;” (4)

“There are many people I can trust completely;” (5) “There are enough people I feel close to;” (6) “I can call on my friends whenever I need them” The respondents were required to answer on a 3-point scale that includes Yes, More or Less, and No as categories. I recoded a few of the above variables to align their direction of influence with others, and to make sure that the higher number reflects more social support. In the narrative, all social support variables are prefixed by SS; SS1 corresponds to the first statement above. I treat social support as a latent variable, and use all 6 dimensions to measure social support.

3.4.c.iii. Stress

Fear of disease is among the factors that can generate stress for a human. Stress, as Cohen *et al.* (1997) describe it, is a human perception that a situation, particularly bad, exceeds social, material, or psychological resources for coping. It is also related to human coping abilities. It does not affect all people equally. Some people experience life threatening situations and yet manage to cope well, whereas others suffer badly. In our case, besides the fear of disease, we consider other factors that act as stress generating factors such as income, social support, etc. All chronic illnesses inflict pain and suffering and are feared, but cancer, above all is highly dreaded (Fischhoff *et al.* 1978). Therefore, due to high fear, cancer is expected to create more stress in patients, than any non-cancer chronic illness.

Stress affects health directly through its physiological effects, and indirectly through maladaptive health behaviors such as smoking (Glanz *et al.* 2015). It affects patients’ quality of life indirectly by deteriorating patients’ health, and directly through affecting other dimension(s) of quality of life, such as depression.

I consider stress as a latent variable, and use a number of variables to measure it. We asked patients to rate the following statements: (1) “I miss having a really close friend;” (2)

"I experience a general sense of emptiness;" (3) "I miss the pleasure of the company of others;" (4) "I miss having people around me;" (5) "I often feel rejected" The respondents were required to answer on a 3-point scale that comprises of No, More or Less, and Yes. All stress variables are prefixed by SR.

3.4.c.iv. Wealth Index

We asked respondents questions about their monthly income from all sources and about their ownership of various assets, such as radio, tv, vehicle, etc. Many patients refused to provide their monthly income, therefore, using their ownership of various assets, I create and use a wealth index instead of income. During the initial analysis of asset ownership, I excluded the assets that are owned by more than 95 percent of the households or less than 5 percent of the households.[26] After doing principal component analysis, I select the first component that explains the most variation. I separate the component into five quintiles to categorize people based on their wealth. The fifth quintile represents wealthy people, while the first quintile represents comparatively poor people. Table 3.2 shows the most difference in the mean values between cancer and non-cancer patients in the fifth quintile. This shows that on average non-cancer patients are in the 5th quintile, thus comparatively wealthier than cancer patients.

3.4.c.v. Access to Care

This study also explores the possibility of providing enhanced access to care facilities to patients and its effects on patients' quality of life. We asked patients, "how difficult is it to contact usual source of care after hours?," and the patients were required to respond on a 4-point Likert scale ranging from very difficult to not at all difficult. Two thirds of Nepal is a

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[26] https://docs.wfp.org/api/documents/WFP-0000022418/download/ (accessed: June 12, 2019)

hilly area and people living in hilly areas often do not have access to basic health facilities. Also, only a few hospitals cater to cancer patients. Therefore, first, providing access to care after normal hours might help patients, and affect their quality of life. Table 3.2 shows that around 45 percent of the patients have difficulty in accessing usual source of care after hours.

3.5. Empirical Strategy

3.5.a. Structural Equation Model

Theoretically, quality of life is an abstract concept. Many authors' writing on the concept discuss the varying definitions of quality of life. For instance, Liu (1976) equates the number of definitions to the number of people, emphasizing the fact that people differ in what they find important. Similarly, Baker and Intagliata (1982) point out that the number of definitions equals the number of people studying the phenomenon. But, in spite of these differences, all definitions involve the concept of satisfaction, such as satisfaction from life conditions, or life satisfaction (Zheng *et al.* 2018; Felce and Perry 1995). Various instruments are devised, such as SF36, EuroQol, that attempt to quantify QoL for understanding and comparison. Still, as an elusive concept, QoL cannot be fully captured and people derive satisfaction from a variety of sources. Nonetheless, I attempt to estimate the quality of life of cancer and non-cancer patients using willingness to pay and utility estimates of different attributes of the quality of life.

Based on the premise described above, I consider QoL as a latent construct. I use a general mixed (latent and observed) structural equation modeling (SEM) approach for the empirical analysis. It allows me to consider my dependent variable as latent, measure it through multiple indicators, and estimate the effects of other latent and non-latent variables. I am using SEM as it serves my purposes in multiple ways. First, it accounts for the interdependence among different latent constructs such as QoL, Social Support, and Stress, and other observed exogenous causal indicators. Second, it allows me to simultaneously measure the latent dimension by other observed variables, in other words, it incorporates the measurement model within the general model. Finally, it allows me to specify appropriate covariance structure for the system of equations. In essence, SEM is a combination of factor analysis and path analysis (Kline 2015).

The following two sections explains the SEM system employed in the empirical analysis.

3.5.b. Structural Model

The following equation represents our structural model:

$$QoL^* = \gamma_0 + \gamma_1 SS^* + \gamma_2 SR^* + \gamma_3 AC + \gamma_4 WI + \gamma_5 \boldsymbol{X} + \zeta \tag{3.2}$$

Equation 3.2 describes the effects of social support (SS), stress (SR), access to care (AC), wealth (WI), and other observed indicators ($\boldsymbol{X}$) on quality of life (QoL). QoL, SS and SR are latent variables measuring quality of life, social support, and stress, respectively. $\boldsymbol{X}$ is a vector of other observed indicators that, I theorize, have a relationship with quality of life. The vector includes gender, age, and education. The gammas are the parameters that show the magnitude of the relationship and zeta (ζ) is the associated error term.

3.5.c. Measurement Model

$$Pain = \lambda_1 QOL^* + \delta_1, \qquad \lambda_1 = 1 \tag{3.3}$$

$$Depression = \lambda_2 QOL^* + \delta_2 \tag{3.4}$$

$$Mobility = \lambda_3 QOL^* + \delta_3 \tag{3.5}$$

$$Selfcare = \lambda_4 QOL^* + \delta_4 \tag{3.6}$$

$$Usual\ activities = \lambda_5 QOL^* + \delta_5 \tag{3.7}$$

$$SS1 = \lambda_6 SS^* + \delta_6 \tag{3.8}$$

$$SS2 = \lambda_7 SS^* + \delta_7, \qquad \lambda_7 = 1 \tag{3.9}$$

$$SS3 = \lambda_8 SS^* + \delta_8 \tag{3.10}$$

$$SS4 = \lambda_9 SS^* + \delta_9 \tag{3.11}$$

$$SS5 = \lambda_{10} SS^* + \delta_{10} \tag{3.12}$$

$$SS6 = \lambda_{11} SS^* + \delta_{11} \tag{3.13}$$

$$SR1 = \lambda_{12} SR^* + \delta_{12}, \qquad \lambda_{12} = 1 \tag{3.14}$$

$$SR2 = \lambda_{13} SR^* + \delta_{13} \tag{3.15}$$

$$SR3 = \lambda_{14} SR^* + \delta_{14} \tag{3.16}$$

$$SR4 = \lambda_{15} SR^* + \delta_{15} \tag{3.17}$$

$$SR5 = \lambda_{16} SR^* + \delta_{16} \tag{3.18}$$

The latent variables are linked to observed variables via measurement equations. The first block of equations, Equations 3.3 – 3.7, represent the measurement models for quality of life. The observed variables are pain, depression, mobility, selfcare and usual activities measured on a three point Likert scale. The second and third block of equations, Equations 3.8-3.13 and Equations 3.14-3.18, represent the measurement model for social support and stress, respectively. In the social support equation, SS1-SS6 correspond to the first to sixth question mentioned in Section 3.4.c.ii. Similarly, stress variables SR1-SR5 correspond to the first to fifth question of Section 3.4.c.iii. I assume block independence among the three systems of equations, Equations 3.3-3.7, 3.8-3.13, and 3.14-3.18.

Intuitively, the quality of life of cancer and non-cancer patients differ from each other. The fear of cancer coupled with other socio-economic factors makes cancer patients' quality of life worse. A very basic factor that plays a vital role in determining quality of life is treatment cost. The treatment cost for cancer, in most cases, is much more than non-cancer chronic diseases. Pfaendler *et al.* (2015) noted a few drawbacks of cancer treatment, such as urinary, gastrointestinal, sexual side effects, yet without it, the quality of life declines. Figures 3.3 and 3.4 present the distributions of our weighted measures of quality of life, willingness to pay weighted QoL and utility weighted QoL, for cancer and non-cancer patients. Each figure shows two dissimilar distributions. The results of statistical tests such as the Kolmogorov-Smirnov[27] and variance comparison test[28] also confirm the dissimilarity. Recognizing the difference in the distributions of the quality of life of cancer and non-cancer patients, I perform the analysis separately and compare the results.

[Insert Figures 3.3 and 3.4 here…]

3.6. Results and Discussion

The literature embraces controversy as to the issue of asserting causality through structural equation modeling (Mueller 1999). Researchers have a mistaken belief that SEMs convert association or partial association between latent and observed variables into causal relations. The significant coefficients of the model do not necessarily imply the presence or absence of a strong causal relation. Although SEM is not suggested to be used for assessing causality, it can still be used to assess the accuracy of complex causal relationships that are *a priori* identified in the literature (Toma *et al.* 2012). In that regard, I employ SEM not to determine causality but to assess the accuracy of the conceptual model of social support postulated by Glanz *et al.* (2015). The empirical estimation involves latent variables that are measured by many observed variables, therefore, I cannot apply traditional econometric approaches for estimation.

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[27] P-value for WTP weighted QoL = 0.00; P-value for utility weighted QoL = 0.00.

[28] P-value for WTP weighted QoL = 0.008; P-value for utility weighted QoL = 0.009.

Before proceeding to the analysis of results, I discuss model fit indices briefly. Structural equation modeling has been increasingly used in social sciences, and with its increased use, statisticians have developed plenty of indices that determine the fit of the model (Hooper *et al.* 2008). The fit indices reflect how the model best fits the data and represents the underlying theory. Disagreement exists in the literature regarding not only the use of fit indices, but also what their cut-offs should be, and which indices to report. Model chi-square, Root mean square error of approximation (RMSEA), Normed-fit index (NFI), Non-Normed fit index (NNFI) or Tucker-Lewis index (TLI), and Comparative fit index (CFI) are some of the many indices that are frequently used and reported. The chi-square is the traditional measure of assessing model fit that evaluates the magnitude of the discrepancy between sample and fitted covariance matrices (Hu and Bentler 1999). An insignificant result at the 0.05 threshold signals a good model fit. Although chi-square is popularly used, there are limitations to its use. It assumes multivariate normality and depends on sample size. Deviations from normality and small sample size would lead to the rejection of the null hypothesis, which means that the model does not fit the data well (McIntosh 2007). The probability value of my chi-square is 0.00 which is well below the threshold. But, my model may not fulfill the conditions of the test perfectly, especially the assumption of multivariate normality. RMSEA is another fit index that is often reported in SEM analysis. It also determines how well the model with unknown parameter estimates fits the population covariance matrix (Byrne 2013). The recommended threshold for RMSEA is 0.08 which shows a good fit, while 0.08-0.10 shows a mediocre fit (MacCallum *et al.* 1996). My RMSEA value is 0.07 which is within good range and therefore shows a good fit. Other fit indices, NFI, NNFI, and CFI, also have their limitations. For NNFI and CFI, the values stay between 0 and 1, and the closer they are to 1 the better fit the model is (Hu and Bentler 1999; Byrne 2013; Bentler 1990; Kline 2015; Tobachnick *et al.* 2007; Hooper *et al.* 2008). My values of NNFI (0.73) and CFI (0.77) indicate a fair fit.

Table 3.4 presents my main SEM results using pooled data. I use statistical software STATA for estimation purposes, which uses a maximum likelihood estimator for computing SEM models. The top panel of the table shows structural model estimates related to QoL, while the bottom panel shows measurement model estimates for the latent variables involved. In a single set up I estimate the direct effect model and the indirect effect model. As expected, and consistent with theory, social support is positively associated and stress is negatively associated with quality of life. Patients who expect or perceive more social support have a better quality of life than the ones who do not expect or perceive it. Similarly, lower stress seems to have health benefits in terms of increased quality of life.

Another interesting hypothesis tested in this study is how patients perceive the access to medical care after hours and how that is related to the quality of life. The results show that unrestricted access to medical care is positively associated with the quality of life of patients. Intuitively, if the person is provided care at any time or if he/she perceives that he/she can get care any time, that affects people's health, and health is linked to our quality of life, so it improves. As discussed earlier, two-thirds of Nepal is a hilly area where adequate medical facilities are scarcely available. People have to travel to far-off areas to get medical help. There are only a few places that treat cancer patients, and the patients have to travel, sometimes, to far-flung areas for treatment. Therefore, providing medical facilities close to their places and providing unrestricted access will have positive effects on their quality of life.

Education seems to play a positive role in the quality of life, which is consistent with expectations. Education benefits health and quality of life through income. More educated people have better earning opportunities and therefore have higher incomes than less educated people. There are other ways through which education affects QoL. It imparts more knowledge about health and hygiene, and how health improves or deteriorates through hygienic and unhygienic food and environment. During the survey, mostly, we encountered people with low education who did not have basic knowledge of health. Sometimes they contract cancer but due to ignorance they keep working and do not visit the hospital. When the disease progresses to an advanced stage from where it is difficult to recover, they visit hospitals for medical examination and further treatment. Having basic knowledge of the disease, which I expect the education delivers, would help in early diagnosis and treatment. Therefore, education in this sense is related to quality of life.

Drawing on the previous literature, I categorized wealth into five quintiles. The first quintile contains comparatively poor people, and the fifth quintile contains comparatively wealthy people. The results show a positive association of wealth with quality of life, which increases as we move up the quintiles. Wealth reflects the economic condition of the household and this is one aspect in determining overall quality of life of an individual. As discussed earlier, overall quality of life contains not only health, but also many other variables and wealth/income is one of them. In a sense, wealth is also associated with better health as it is a means to afford and gather better food, better living conditions, and better medical opportunities. That way, wealth is positively related to quality of life. The measurement model for quality of life, social support, and stress shows that all the observed variables are positively and strongly associated with the respective latent variable.

Another point that I have not discussed so far is the difference in the quality of life of cancer and non-cancer patients. The descriptive analysis shows that on average non-cancer patients have a better quality of life than cancer patients. Intuitively, that is according to my expectation as among all the chronic diseases cancer is highly feared. It decreases patients' physical capabilities and mental faculties, thereby deteriorating their health and quality of life. Furthermore, it adds to patients' stress level which further decreases their quality of life. On the other hand, non-cancer diseases are also chronic and life deteriorating, but they do not cause damage as bad as cancer. I used an additional dummy variable for cancer patients. The results show that cancer is significantly negatively associated with quality of life.

3.6.a. Mediatory Role of Social Support

My conceptual model pointed out that social support can have buffering effects by protecting people from the pathogenic effects of stress. The results in Table 3.4 show that social support is negatively associated with stress. According to my results, people who have more friends in times of need or who expect or perceive that they can get help whenever they need it from their friends and family have lower stress than the people who have low or no social support. Stress, in turn, is negatively associated with quality of life. The direct arrow in Figure 3.2 shows the direct effect of social support on quality of life while the two arrows linking social support, stress, and quality of life represents indirect effect or mediatory role of social support. While the direction of arrows presents a counterintuitive picture by showing that stress is playing a mediatory role, theoretically, social support is a buffering medium against the negative effects of stress. The direct effect in Table 3.4 is positive; I can estimate the indirect effect by multiplying the effect of social support on stress and that of stress on quality of life. Both parts of the indirect effect are negative, therefore multiplying them would give us a positive effect which ultimately shows that social support has a positive effect on quality of life by reducing stress.

[Insert Table 3.4 here…]

3.6.b. Results by Cancer and Non-Cancer patients

As shown by Figures 3.3 and 3.4 and the significant cancer dummy from the pooled sample, cancer patients' quality of life is different from non-cancer patients. Therefore, I analyze the results by the type of patients. Table 3.5 presents the results. I applied the same covariance and path structure in both models. The only difference between the two is the number of observations. The fit statistics of both models hover around the statistics I have in the case of the full sample. Due to the extremely low number of observations in the case of non-cancer patients, I only test the direct effects model and the direct effect of stress on quality of life. The results show that social support has a positive and stress has a negative relationship with the quality of life. But, in the case of non-cancer patients, social support seems to have no significant effect, although stress is significant in the right direction. This suggests that social support is more important for cancer patients than non-cancer patients. Providing easy access to health care services affects both the cancer and non-cancer patients' quality of life. All other results are in accordance with the main results.

[Insert Table 3.5 here…]

3.7. Conclusion

This chapter examined the relationship between social support, stress, access to health care services, and quality of life, taking into account other confounding factors. Among patients with chronic illness, I am particularly focused on cancer patients. I did analyze non-cancer patients for comparison and found interesting results.

Using primary data from four hospitals in Nepal, I applied the structural equation modeling technique to arrive at the results. I found that social support plays an important role in determining quality of life. It is positively associated with patients’ QoL. In particular, I found that it affects cancer patients’ quality of life more than non-cancer patients’. This does not mean that non-cancer patients do not value social support, but other chronic illnesses are not perceived as deadly as cancer and, therefore, these patients might not need as much support as cancer patients. On the other hand, stress is significantly negatively associated with quality of life in both the cancer and non-cancer cases. This highlights that stress is an important factor in determining quality of life. All chronic illness patients are under stress due to this adverse health shock, and it affects their quality of life negatively. My analysis also supports the buffering properties of social support in the pooled model. I found that social support decreases stress, which ultimately improves quality of life. Apart from social support and stress, easy access to health care services after hours is positively associated with patients’ quality of life.

Table 3.1: Descriptive Statistics Associated with Cancer and Non-Cancer Patients

	Average	Cancer patients	Non-cancer patients
Age (in years)	52.0	52.0	53.0
	%	%	%
Patients		70	30
Inpatients (=1)	16.0	15.0	20.0
Gender (Female=1)	58.0	61.0	52.0
Married	80.0	82.0	76.0
Education			
No Schooling (=1)	53.0	56.0	46.0
Bachelors (=1)	2.0	1.0	4.5
Ethnicity			
Brahmin/Chhetri/Janajati	75.0	69.0	89.0
Income			
< NRS 10,000	20.0	24.0	12.0
NRS 10,001 to NRS 30,000	55.0	55.0	54.0
> NRS 50,000	10.0	7.0	15.0
Sample Size (*N*)	1310	910	400

Data source: Nepal Study Center, UNM

Table 3.2: Descriptive Statistics of Estimation Variables

Variables	Description	Overall		Cancer		Non-cancer	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
Measures of Quality of Life							
Pain	What is your current level of pain? (1. Extreme pain… 3. No pain)	2.23	0.64	2.18	0.63	2.33	0.64
Depression	What is your current level of depression? (1. Extreme depression… 3. No depression)	2.30	0.62	2.20	0.62	2.47	0.57
Mobility	What is your current level of mobility? (1. Confined to bed… 3. No problem)	2.75	0.50	2.78	0.48	2.68	0.55
Selfcare	What is your current level of performing self-care activities? (1. Cannot perform selfcare….3. No problem)	2.75	0.50	2.76	0.49	2.75	0.50
Usual activities	What is your current level of performing usual activities? (1. Unable to perform…3. No problem)	1.96	0.81	1.84	0.77	2.22	0.84
QOL (WTP)	Quality of life with willingness to pay for attributes as weights.	0.43	0.13	0.42	0.13	0.46	0.14
QOL (Utility)	Quality of life with utility for attributes as weights.	4.61	1.40	4.48	1.34	4.90	0.49
Social Support (SS)							
SS (1)	There is always someone I can talk to about my day-to-day problems.	2.64	0.63	2.60	0.66	2.74	0.54
SS (2)	There are plenty of people I can lean on when I have problems.	2.46	0.71	2.43	0.72	2.52	0.68
SS (3)	I find my circle of friends and acquaintances too limited.	2.17	0.84	2.11	0.85	2.32	0.81
SS (4)	There are many people I can trust completely.	2.44	0.59	2.40	0.61	2.51	0.55
SS (5)	There are enough people I feel close to.	2.52	0.62	2.50	0.63	2.57	0.57
SS (6)	I can call on my friends whenever I need them.	2.48	0.68	2.46	0.69	2.52	0.65

Table 3.2 contd.: Descriptive Statistics of Estimation Variables

Variables	Description	Overall		Cancer		Non-cancer	
Stress							
SR(1)	I miss having a really close friend.	2.01	0.80	2.14	0.79	1.71	0.75
SR(2)	I experience a general sense of emptiness.	1.53	0.70	1.58	0.73	1.39	0.61
SR(3)	I miss the pleasure of the company of others.	2.00	0.73	2.10	0.71	1.76	0.70
SR(4)	I miss having people around me.	1.75	0.73	1.84	0.74	1.56	0.66
SR(5)	I often feel rejected.	1.29	0.59	1.31	0.62	1.24	0.52
Wealth Index							
1st quintile (poor)	1st quantile of wealth index	0.25	0.43	0.24	0.42	0.27	0.45
2nd quintile	2nd quantile of wealth index	0.16	0.37	0.18	0.39	0.11	0.31
3rd quintile	3rd quantile of wealth index	0.20	0.40	0.20	0.40	0.18	0.38
4th quintile	4th quantile of wealth index	0.22	0.41	0.23	0.42	0.20	0.40
5th quintile (wealthy)	5th quantile of wealth index	0.17	0.37	0.14	0.24	0.23	0.42
Access to Care							
How difficult is it to contact usual source of care after hours? (1. Very difficult...4. Not at all difficult)							
Very difficult		0.21		0.25		0.11	
Somewhat difficult		0.23		0.22		0.26	
Not too difficult		0.24		0.22		0.26	
Not at all difficult		0.32		0.30		0.37	

Data source: Nepal Study Center, UNM

Notes: For SS and SR variables, the Likert scale in the survey is: 1=Yes; 2=More or Less; and 3=No. Except SS(3), I recoded 1=Yes into 3 and 3=No into 1. Therefore, after recoding, the highest category is 3=Yes and the lowest category is 1=No.

Table 3.3: QOL Weights for Cancer Patients

Variable	Weights	
	WTP	Utility
Pain2 (Moderate pain)	0.10	1.08
Pain3 (No pain)	0.15	1.56
Dep2 (Moderate depression)	0.03	0.30
Dep3 (No depression)	0.08	0.83
Mob2 (Moderate problem in mobility)	0.07	0.79
Mob3 (No problem in mobility)	0.12	1.30
Selfcare2 (Moderate problem in doing selfcare)	0.07	0.75
Selfcare3 (No problem in doing selfcare)	0.09	0.95
Usualact2 (Moderate problem in performing usual activities)	0.12	1.29
Usualact3 (No problem in performing usual activities)	0.16	1.72

Data source: Nepal Study Center, UNM

Notes: WTP and Utility weights are generated from the mixed logit Model. All variables, except price, are set at random in the model. The utility weights are simply the utilities generated by the model. The WTP and the Utility weights for the non-desirable level of an attribute is zero. The total willingness to pay for all the attribute levels combined is NRS 4,337,143.00 (USD 43, 371)

Table 3.4: Structural Equation Model Estimates of Quality of Life Using Pooled Data

	Coefficient	SE
Structural model estimates: QOL		
Stress	-0.22***	(0.02)
Social support	0.05***	(0.02)
Access to care after hours: Very difficult	Ref.	
Somewhat difficult	-0.02	(0.03)
Not too difficult	0.09***	(0.03)
Not at all difficult	0.12***	(0.03)
Other confounding factors		
Cancer Yes=1	-0.09***	(0.02)
Age	-0.00***	(0.00)
Female	-0.04**	(0.02)
Education: *No school*	Ref.	
Some school Yes=1	0.09***	(0.03)
Bachelors Yes=1	0.15***	(0.05)
Wealth Index: Wealth 1 (Lowest)	Ref.	
wealth2	0.07**	(0.03)
wealth3	0.06*	(0.03)
wealth5	0.12***	(0.04)
wealth4	0.12***	(0.03)
Structural model estimates: Stress		
Social support	-0.45***	(0.04)
Measurement Model Estimates: Social Support		
Depend on people (SS2)	1.00	
Problem sharing (SS1)	0.35***	(0.03)
Circle of friends (SS3)	0.46***	(0.05)
Trust people (SS4)	0.60***	(0.03)
Close to people (SS5)	0.76***	(0.03)
Call Friends (SS6)	0.65***	(0.04)
Measurement Model Estimates: Stress		
Miss close friend (SR1)	1.00	
Sense of emptiness (SR2)	0.63***	(0.04)
Miss the company (SR3)	0.85***	(0.04)
Feel rejected (SR5)	0.35***	(0.03)
Miss people (SR4)	0.79***	(0.05)
Measurement Model Estimates: QOL		
Pain	1.00	
Depression	1.00***	(0.07)
Mobility	0.60***	(0.05)
Selfcare	0.77***	(0.06)
Usual activities	1.44***	(0.10)

Data source: Nepal Study Center, UNM.

Notes: *, **, *** denotes statistical significance at the 0.10, 0.05, and 0.01 level, respectively. Sample size (*N*) for this estimation is 1310. SE=standard error. LR (Likelihood Ratio) for above estimation is 2154.56, and Log-likelihood is -29497.06

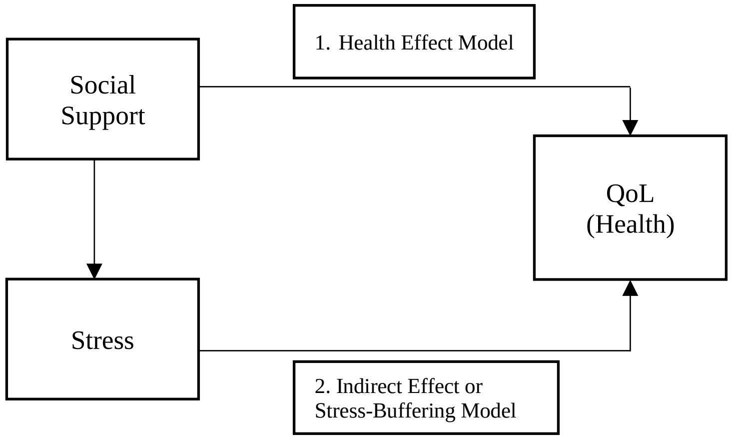
Table 3.5: Structural Equation Estimates of Quality of Life by Cancer and Non-Cancer Patients

	Cancer	SE	Non-cancer	SE
Structural Model Estimates: QOL				
Stress	-0.18***	(0.03)	-0.34***	(0.06)
Social support	0.08**	(0.03)	-0.02	(0.03)
Access to Care: Very difficult	Ref.		Ref.	
Somewhat difficult	-0.02	(0.04)	0.05	(0.06)
Not too difficult	0.08*	(0.04)	0.15***	(0.06)
Not at all difficult	0.13***	(0.04)	0.16***	(0.06)
Other confounding factors				
Age	-0.00***	(0.00)	-0.00***	(0.00)
Female	-0.05	(0.03)	-0.01	(0.03)
Education: *No School*	Ref.		Ref.	
Some school Yes=1	0.10***	(0.03)	0.05	(0.04)
Bachelors Yes=1	0.14*	(0.08)	0.12*	(0.07)
Wealth Index: Wealth 1 (Lowest)	Ref.		Ref.	
wealth 2	0.07	(0.04)	0.04	(0.05)
wealth 3	0.06	(0.04)	0.04	(0.05)
wealth 5	0.10**	(0.05)	0.10**	(0.05)
wealth 4 (Highest)	0.11***	(0.04)	0.10**	(0.05)
Measurement Model Estimates: Social Support				
Depend on people (SS2)	Ref.		Ref.	
Problem sharing (SS1)	0.46***	(0.05)	0.43***	(0.05)
Circle of friends (SS3)	0.34***	(0.06)	0.59***	(0.08)
Trust on people (SS4)	0.62***	(0.04)	0.60***	(0.04)
Close to people (SS5)	0.80***	(0.04)	0.72***	(0.04)
Call friends (SS6)	0.88***	(0.07)	0.65***	(0.05)
Measurement Model Estimates: Stress				
Miss close friend (SR1)	Ref.		Ref.	
Sense of emptiness (SR2)	0.65***	(0.05)	0.67***	(0.06)
Miss the company (SR3)	0.82***	(0.05)	0.90***	(0.06)
Miss people (SR4)	0.80***	(0.06)	0.81***	(0.07)
Feel rejected (SR5)	0.36***	(0.04)	0.43***	(0.05)
Measurement Model Estimates: Quality of Life				
Pain	Ref.		Ref.	
Depression	0.89***	(0.09)	1.02***	(0.11)
Mobility	0.54***	(0.06)	1.06***	(0.12)
Selfcare	0.76***	(0.07)	1.01***	(0.11)
Usual activities	1.15***	(0.11)	1.89***	(0.20)
N (Sample Size)	910		400	
LR	1477.45		934.92	
(Log-likelihood)	-20193.56		-8039.18	

Data source: Nepal Study Center, UNM.

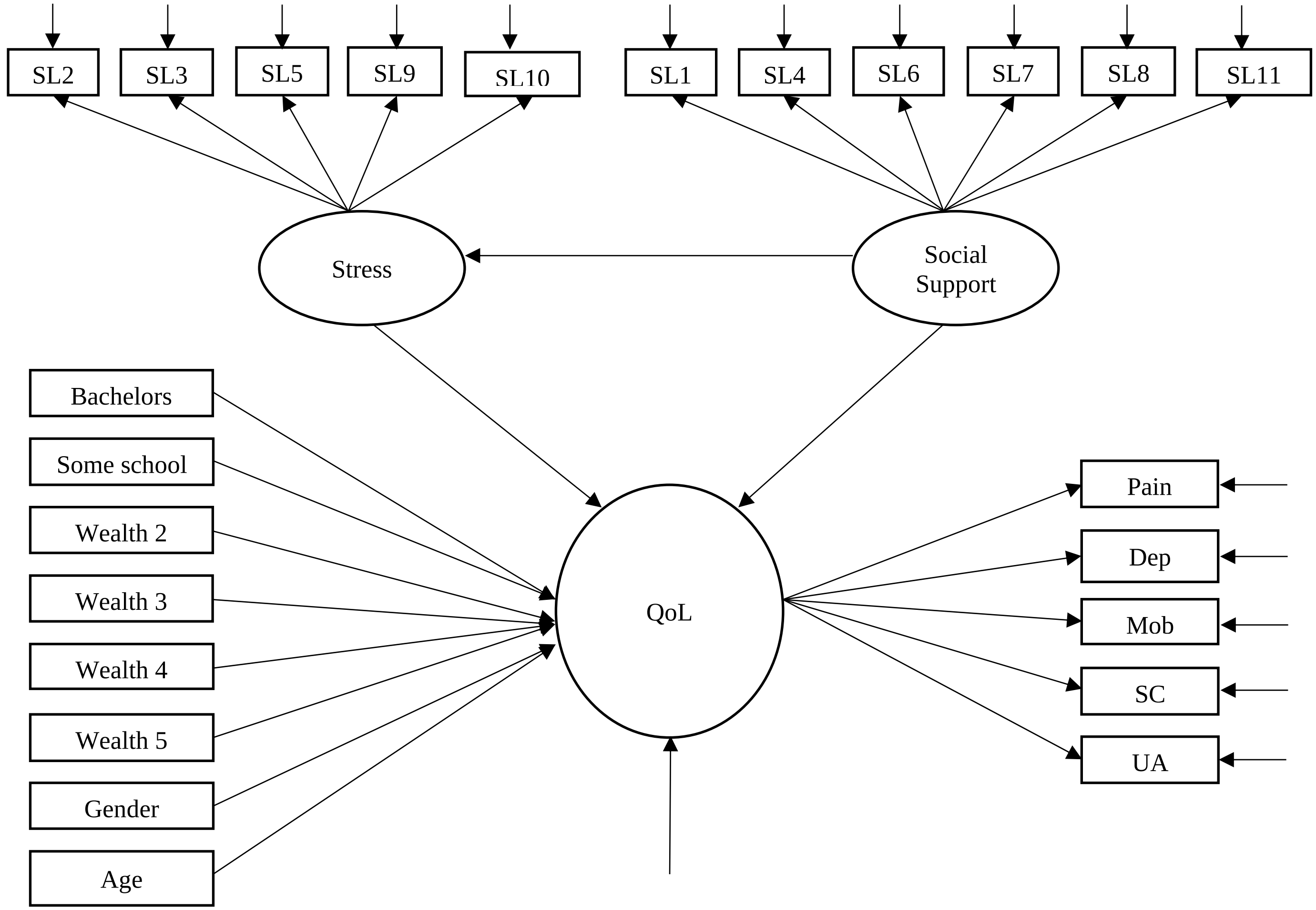
Notes: *, **, *** denotes statistical significance at the 0.10, 0.05, and 0.01 level, respectively. The second and fourth column shows robust standard errors for cancer and non-cancer patients respectively.

Figure 3.1: Conceptual Model of Social Support and Quality of Life



Source: Glanz *et al.* (2015; p. 187)

Figure 3.2: Structural Equation Model of Determinants of Quality of Life



Notes: SL1 to SL11 are indicators of two latent variables: perceived support and stress. In particular, SL2, SL3, SL5, SL9, and SL10 measure stress; while SL1, SL4, SL6, SL7, SL8, and SL11 measure perceived support. Table 3 provides the variable definitions. The variables in ovals are latent variables, while the variables in rectangles are observed variables.

Figure 3.3: Utility Weighted Quality of Life

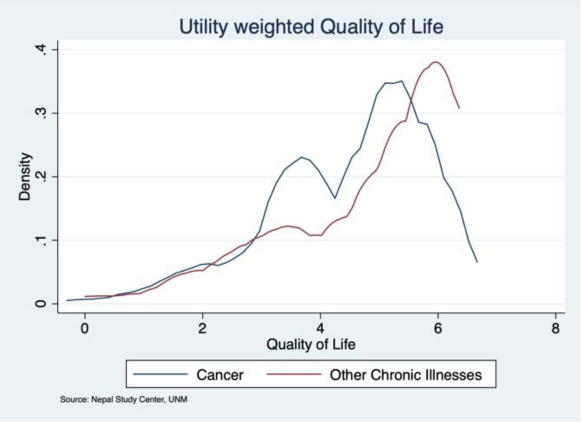
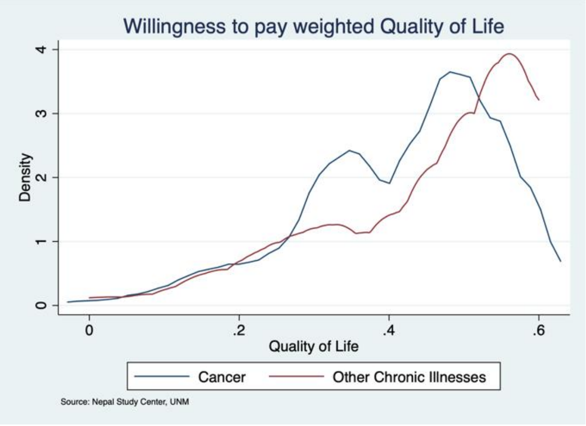


Figure 3.4: WTP Weighted Quality of Life



Chapter 4: Does Social support Help in Post-Disaster Recovery? Evidence from the Gorkha Earthquake of Nepal

4.1. Introduction

Catastrophes and disasters remain among the frequently occurring natural events that individuals and societies experience, affecting more people across the globe than highly publicized but infrequent events, such as terrorist attacks. For instance, a 9.0 magnitude earthquake, tsunami, and nuclear meltdown hit Japan in 2011, killing approximately 18,500 people and leaving millions displaced; extreme drought between 2010 and 2012 caused the deaths of approximately 230,000 people; roughly 140,000 people lost their lives in the 2010 Haiti earthquake; and the 2005 Kashmir earthquake in Pakistan killed more than 85,000 and displaced nearly three million.[29] Researchers categorize disasters as a *wicked policy problem* whose effects are profound and wide-ranging, have no technical solution, and involve multiple stakeholders (Aldrich & Meyer, 2015). An overwhelming number of studies uniformly conclude that although developed and developing countries are equally exposed to such disasters, developing countries are more vulnerable (Novella & Zanuso, 2018). Poorly built housing, no pre-disaster warnings, limited wealth or assets, and weak social safety nets, are a few notable factors that contribute to elevated damage levels (Zorn, 2018). Furthermore, social ills, population growth, increasing inequality, and development in hazard-prone areas, put more people and property at risk each year (Crossett *et al.*, 2004). In the wake of such cataclysmic events, many governments resort to physical measures, strengthening physical infrastructure, and introducing more stringent safety measures, but during policy debates, the building and strengthening social infrastructure is largely ignored.

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[29] Source: UN Chronicle (https://unchronicle.un.org/article/economic-recovery-after-natural-disasters) (accessed: July 7, 2020)

An alternative approach to disaster management and recovery would be to increase levels of social infrastructure such as social support, thereby strengthening community resilience.

Disaster research collectively notes community unification as an underpinning factor in survival and recovery (Fischer III, 1998). While disaster situations typically evoke images of trained professionals working to rescue people, ground realities present a slightly divergent picture. Following a disaster, informal ties, such as friends, family, and neighbors, are the actual first responders, who regularly check on the well-being of others nearby, and also provide immediate life-saving assistance. After two very destructive incidents in Japan, the 1995 Kobe earthquake, and the 2011 earthquake and nuclear meltdown, researchers noted that neighbors pulled out others stuck in the rubble, and saved the elderly and infirm from the incoming tsunami (Aldrich, 2011; Horwich, 2000; Shaw & Goda, 2004). Such collective community efforts prove very rewarding in post-disaster recovery years. This phenomenon engenders a perplexing question that has long puzzled disaster scholars: Why do certain neighborhoods and communities recover more rapidly than others? Researchers are convinced that social support, in addition to relief and recovery efforts and financial aid by local and foreign governments, as well as non-governmental organizations is an extremely important factor that helps in post-calamity long-term recovery. An extensive body of literature focuses on how social support is effective in rebuilding and rehabilitation. Nakagawa & Shaw (2004), while studying communities struck by natural disasters in Tamil Nadu, India, and Kobe, Japan, argue that neighborhoods with higher levels of social support recovered quickly. Chamlee-Wright and Storr (2009) show that due to bonding social support, the low-income Vietnamese community in New Orleans rebounded more robustly after Hurricane Katrina. Aldrich (2017) finds that communities with high levels of theft, coercion, and murder prior to the 2011 tsunami in Japan suffered more after the catastrophe, thus providing evidence for sociological research that has connected higher social support to fewer social ills. Chan *et al.* (2019) finds that social support increases disaster resilience. Jovita *et al.* (2019) interviewed 30 Typhoon Washi survivors in the Philippines, and argue that unity among people in a community leads to speedy recovery. Many other studies, such as Chan *et al.* (2019), Hsueh (2019), Masud-All-Kamal & Hassan (2018), Sadri *et al.* (2018), and Wei & Han (2018), noted social support as a fundamental post-disaster recovery measure that helped communities revive in many ways.

Two deadly earthquakes of 7.8 and 7.3 magnitude struck Nepal in April-May 2015, claiming more than 9,000 lives and leaving about three million displaced. The quakes destroyed approximately 800,000 homes, 20,000 schools, and 600 clinics, and decimated many internationally recognized cultural heritage sites and monuments. Due to its rugged and mountainous terrain, more people in Nepal are vulnerable to natural disasters, particularly earthquakes. The irregular topography also poses challenges for the government to run relief and recovery operations. While a few systematic studies of the 1934 and the 2015 earthquakes in Nepal explore the efficacy of social support in a post-earthquake scenario, many are limited in scope (Bhandari 2014; Aryal 2019). Recognizing their limitations, I analyze the quantitative effects of social support on several recovery measures in this chapter. Among different types of social support, I look at the individual and combined effects of both bonding and bridging social support. Furthermore, since financial support helps in the aftermath of a natural disaster, I also examine effects of financial support in post-crisis recovery, and how social support works in the presence of financial support.

I use original information collected during a field survey in Nepal conducted in May – August 2017. In the analysis, I focus on four factors: housing, food, water, and income, to examine individual recovery. Social and financial support measures each include three components. Family status, volunteering activities, and number of friends collectively form social support, while borrowings, remittances, and wealth constitute financial support. Wealth, in essence, is a measure that I constructed using information on ownership of various household items (tv, radio, vehicle, fan, mobile phone, etc.). In my initial analysis, I analyze each component of social and financial support individually; afterwards, I create social and financial support indices by combining the respective components.

To identify the effects of social and financial support on individual post-earthquake recovery, I use two empirical models: ordered logit and conditional mixed process. Essentially, I have a system of ordered logit equations that individually analyze the effects of social and financial support on the recovery measures. Moreover, to account for possible correlation among error terms of the different equations, I employ a conditional mixed process. Among financial support measures, our results from both ordered logit and mixed process models show that housing recovery has a very strong association with wealth of an individual. Our marginal estimates show that the wealth index increases the probability of permanent housing by three percent. However, no relationship exists between social support and housing. Scholarship notes that after a disaster, survivors are involved in so many rehabilitation processes that no other ideas germinate in their mind. Since, relief and recovery operations mostly provide for food, they divert their attention towards rebuilding or permanent housing with the stock of wealth they have. Thus, the results show a strong association between wealth and housing. Borrowing, on the other hand, do not have any substantial impact on housing. The results indicate that except for housing, borrowing has a positive relationship with food, water and income. With borrowed money, predominantly from government sources, survivors care about food and income but not housing. They strive to establish a permanent source of income from which they can build housing later. Compared to housing, social support shows a positive relationship with three of the recovery measures, i.e., food, water, and income.

This chapter is organized in six sections. Section 4.2 reviews the relevant literature on disasters, recovery, factors of recovery including social support, linkages between factors and recovery, and studies in the context of Nepal. Section 4.3 lays out our empirical methodology. Section 4.4 describes the data used in the analysis, provides definitions and measurements of recovery, financial support, and social support measures, and discusses descriptive statistics of the data. Section 4.5 presents and discusses empirical results. Finally, Section 4.6 concludes the chapter.

4.2. Previous Research on Disasters, Recovery, Factors of Recovery, and Linkages

4.2.a. Disasters and Recovery

Disasters are events that disrupt normal daily life routines owing to widespread damage. Several definitions of disasters exist in the literature. For instance, sociologists broadly define disasters as failures of social systems (Girard & Peacock, 1997) or as occasions “when extraordinary efforts are taken to protect and defend some social resource whose existence is perceived as threatened” (Dynes, 1989, p. 9). From the many definitions, one can think of disasters as events that suspend normal daily activities and cause community-wide damage (Aldrich, 2012). Disaster can be further categorized into natural and man-made disasters. Natural disasters include floods, storms, droughts, tornadoes, volcanic eruptions, earthquakes, etc., while man-made disasters include explosions, major fires, nuclear explosions/radiations, etc. Recent examples of natural disasters include the 2020 Monsoon floods in Asia, COVID-19 Coronavirus, while man-made disasters include the 2020 Beirut explosion. Such devastating events take lives; destroy homes, property, businesses, and infrastructure; and suspend the normal flow of goods and services.

There are also different ways to define recovery after a natural calamity, including economic, demographic, infrastructure, and transportation focused metrics (Liu *et al.*, 2006). One simple definition presented by Bertrand (1993) is one in which the community restores itself to its pre-disaster condition; but it is least likely to occur. Synthesizing different definitions, one can say that recovery is the process of repopulation by survivors-who may have fled or been evacuated-and gradual resumption of normal daily activities by the residents. In this chapter, I use various proxies to capture recovery, including access to housing, food, and income. Since I do not know the community's pre-disaster conditions, I cannot say whether the community has been restored to pre-disaster conditions, as required for Bertrand's (1993) definition of recovery. However, through the recovery measures, I can determine if the community is on track to recovery.

4.2.b. Factors Determining Recovery Pace

Previous research largely focuses on a few factors that increase the ability of a town, region, or neighborhood to recover. Researchers mention quality of governance, aid, extent of damage from the disaster, socio-economic and demographic conditions, and population density as the most important factors that determine recovery rates (Aldrich, 2012). Firstly, many observers believe that the quality of governance best determines how resilient[30] the society or neighborhood will be. After a disaster, survivors mostly await the government's response, and outside commentators rush to judge the effectiveness of that response. Many examples in history point out that governments were blamed for inadequate and/or lazy response after a natural disaster. For instance, after Hurricane Katrina, pundits argued that the Bush administration was unprepared for the scale of tragedy that followed (Murray, 2006); and after the Kobe earthquake in Japan, residents criticized the central government for failing to immediately deploy the Self-Defense Forces stationed nearby to assist in recovery efforts (Edgington, 2011). While it is easy for residents, affected people, and commentators to lay the blame of slow and steady recovery on the government, the empirical evidence portrays a different picture: different neighborhoods under the same government recover at different rates in the medium to long term. Immediately after a disaster, many problems typically grip a government: search and rescue efforts as well as provision of immediate relief, such as food, water, medical assistance, etc., to tens of thousands of survivors. A delay may occur in such immediate relief efforts, depending on the scale of destruction, since the government might have a great deal of people and area to deal with. Scholars argue a few other factors matter more in the long run that determine society's long-term recovery (Aldrich, 2012). If an incompetent government determines the rate of recovery, then all neighborhoods should recover at the same pace or stagnate; however, the empirical evidence does not support this hypothesis. Although government efforts count, other vital factors that I discuss in the following paragraphs, also play a key role in recovery after a disaster (Aldrich, 2008).

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[30] Scholarship described community resiliency as a measures of ability of a community to use available resources to respond to, withstand, and recover from adverse events, or ability of a community to deal with stressors and resume normal daily life routines (Aldrich 2012; Aldrich and Meyer 2015).

Secondly, anecdotal evidence suggests that after a cataclysmic event, foreign nations, particularly rich ones, dispatch relief supplies, such as medical aid and human resources, to nations in crisis. After the 2015 earthquake devastated Nepal, many foreign governments, such as the US, UK, China, Australia, Pakistan, Malaysia, and international aid agencies provided much-needed financial assistance and supplies to Nepal. Proponents argue that the amount of aid received by the affected area will influence and speed up the recovery process (Aldrich, 2012). On the other hand, opponents postulate that significant amounts of aid could actually prove counterproductive (Cohen and Werker, 2008). For instance, after the 1972 Managua earthquake in Nicaragua, nations across the globe poured in a tremendous amount of money in aid that engendered massive corruption. It triggered a revolution and a counterrevolution, but not recovery (Garvin, 2010). Empirical studies studying effects of aid have failed to establish a causal relationship between aid and recovery (Webb *et al.*, 2002). As much as the financial aid is necessary for rebuilding and rehabilitation of affected people, many believe that it is only a remedy for the very short term. To continue the recovery process over a long period of time, other factors such as business conditions, damage levels, and socio-economic conditions, also come into play.

Thirdly, existing research considers damage levels from the catastrophe as a determinant of the pace of recovery, but the literature is mixed on this thought. A few argue that the rate of recovery is directly associated with the magnitude of the damage; more damaged areas recover more slowly than areas with less damage (Yasui, 2007). It intuitively makes sense as heavily destroyed areas require more capital and time to recover; they need more rebuilding; more repairs are required; injuries and casualties are higher. Alternatively, some researchers posit that the damage and recovery relationship is negative, meaning the areas that suffer more destruction tend to recover faster (Aldrich, 2012; Kage, 2010).

Fourthly, aside from external factors, many researchers focus on internal characteristics, such as socioeconomic status and demographic conditions, of damaged neighborhoods, and attempt to connect these to recovery pace. They argue that individuals or neighborhoods at the upper end of the socioeconomic spectrum stabilize more rapidly than the ones at the lower end (Brinkley, 2006; Donner & Rodríguez, 2008; Edgington, 2011; Shimizutani, 2007).

Lastly, population density is considered as another internal factor that is linked to recovery pace. Owing to congestion, natural calamities tend to damage higher-density areas more severely. During the post-disaster period, it poses greater challenges for governments and other aid organizations to carry out rescue, relief, and recovery operations. Researchers argue that such areas recover more slowly than areas with lower population densities (Donner & Rodríguez, 2008; Haque, 2003; Tandon & Mohanty, 2000).

4.2.c. Social Capital: An Important Factor

In this chapter, I am focusing social support, which is essentially a part of social capital, for instance support from family members, friends, and other relatives is social support, and it falls under the broad definition of social capital. This section basically discusses social capital, however, using the reasoning presented above, I presume social support has about the same properties as social capital.

Besides standard theories of recovery, much research has also been done on social capital as a factor in disaster recovery. Early studies include Coleman (1988), Putnam (2000a, 2000b), and Putnam *et al.* (1994). While many definitions of social capital exist in the literature, one can simply refer to it as a resource consisting of trust, networks, and social norms, that is, resources situated in one's social structure (Lin, 2008; Nakagawa & Shaw, 2004; Putnam *et al.*, 1994). Many of these networks and social norms form social support. Early research on social capital described it as a collective concept, a community level attribute. Subsequent scholars argued that individuals form the whole society, and they invest in social capital by spending time and energy on connecting with others; therefore, social capital is essentially an individual-level characteristic, combined to form a group-level attribute (Glaeser *et al.*, 1999).

Social capital works through multiple ways in individual and community recovery. It help societies overcome challenges and achieve shared objectives more easily. In the event of a natural disaster, survivors have to deal with great recovery costs, such as financial, opportunity, and psychological costs. During distressing times, individuals need friends, family, and neighborhood support-bonding and bridging social capital[31]- to find solace and garner support for onward recovery without exiting the community. Those with fewer social connections lack such capital, and ultimately engage in exit (Dynes, 2006; Dynes, 2005; Klinenberg, 2015). Furthermore, communities where people are interconnected solve collective action challenges with less difficulty. They can communicate their needs to the resource authorities in a more efficient way. By contrast, neighborhoods without shared norms experience more adversities during the recovery process. Finally, anecdotal evidence suggests that immediately after a disaster, local government and international organizations engage in the recovery process and start providing relief to the survivors. However, even

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[31] Scholars categorize social capital into three forms: bonding, bridging, and linking social capital. Bonding social capital involves friends and family and their relationship. Bridging social capital describes acquaintances and connections among loosely connected people. It often works through institutions, such as schools, clubs, corporations, etc. A connection between different social classes, ethnic, and religious groups comes under the purview of bridging social capital. Linking social capital is essentially a connection between people and persons in power, such as government (Aldrich, 2009, 2017; Aldrich & Meyer, 2015; Nakagawa & Shaw, 2004).

before they arrive, friends, family, and neighbors are an immediate source of aid (Garrison & Sasser, 2009; Hawkins & Maurer, 2010; Heller *et al.*, 2005; Hurlbert *et al.*, 2000). This is even more important in difficult terrain setting, where access and transportation for relief teams are limited, such as Nepal where about 75 percent of the terrain is rugged and mountainous (Aldrich, 2017).

Higher levels of social capital positively affect not only individuals but also communities, societies, and neighborhoods. Scholarship has linked increased levels of social capital to better health outcomes, good governance, and better economic growth (Aldrich, 2012). Putnam (2000a), in his early work, points out that due to social capital, particularly civic engagement, societies in some parts of Italy are performing better than others. He further explains that governments performed better in communities where there is a dense civic network and people behave in a trustworthy way.

Drawing on this foundational research, many disaster scholars have used social capital to look at the trajectory of individual and community post-crisis recovery (Tatsuki and Hayashi, 2002). Their qualitative and empirical investigations provide evidence of its positive role in post-disaster resilience. Social networks provide financial (loans, etc.) and non-financial resources (search and rescue, child care during recovery, emotional support, job help, debris removal, etc.) after a disaster. These circumstances superficially suggest that people who have more social support recover more easily and quickly, since they can get help more easily. Conversely, isolated individuals with fewer social ties are less likely to recover quickly after a disaster. Anecdotally, such individuals face more difficulties while securing help from government sources. For instance, after the Kobe earthquake in Japan, richer social capital, civic involvement, and active citizenship helped survivors to recover more quickly (Tatsuki, 2008).

Nakagawa and Shaw (2004) examine the role of social capital in the post-earthquake rehabilitation and reconstruction programs in two cases: Gujrat, India and Kobe, Japan. They find that communities with higher levels of trust, social norms, participation, and network recovered more speedily than the ones lacking such characteristics. Similarly, due to bonding social capital, the severely flooded low-income Vietnamese community in New Orleans rebounded more robustly than other neighborhoods after Hurricane Katrina (Chamlee-Wright & Storr, 2009). Solidarity among typhoon-affected communities in the Philippines, after the Typhoon Washi in 2011, greatly contributed in their recovery (Jovita *et al.*, 2019). Recent scholarship, such as Chan *et al.* (2019), Hsueh (2019), Masud-All-Kamal and Hassan (2018), Sadri *et al.* (2018), and Wei and Han (2018), also underscores the positive effects of social support for disaster recovery.

In this chapter, I consider bonding and bridging social capital as bonding and bridging social support, since bonding capital comes from friends and family members while bridging comes from connections between loosely connected people. Primarily, it is a sort of support coming from different relationships.

4.2.d. Social support in the Context of Nepal

Social connections are very important and crucial in Nepali Society. The expression *Afno Manchhe* rightly puts social support in Nepali context, meaning “one’s inner circles.” Subedi (2014) discussed this concept in great detail; it is equivalent to simply saying: call a friend/kinship for a favor. Kinship, friends, family are one’s closest connection, and they fall under the umbrella of *Afno Manchhe*. People mostly approach *afno manchhe* whenever a need arises, and use it for individual gain. Having close connections with people in power or at a high social standing is considered very profitable and has great social value.

In the Nepali context, social support is predominantly used for personal benefits, and its merits during or after a natural disaster are largely unexplored. Nepal was devastated several times in history by earthquakes (1934, 2015). Hillig and Connell (2018), while narrating details, explain that immediately after the disasters, people helped each other at the grassroot level. They mobilized resources embedded in strong bonding and bridging social support to support one another. In the short run, it was difficult to reap benefits from linking social support. This experience also illuminated the fact that powerless individuals, with no linking social support, were left isolated from the government's relief and recovery operations (Regmi, 2016). These circumstances call for strong civic engagement, bridging social support, put forward by Putnam (2000a), to achieve shared objectives.

Not many studies exist that analyze the effectiveness of social resources in disaster resiliency after two major earthquakes in Nepal. Bhandari (2014) retrospectively studied how social support helped in recovery of 1934 earthquake survivors. While providing details, the survivors described that bonding social support (family support) provided immediate relief, while bridging and linking social support assisted in long-term recovery. Recently, a few qualitative studies emerged that explored social support benefits using interviews (Aryal *et al.*, 2019; Baharmand *et al.*, 2016; Chatterjee and Okazaki, 2018).

4.2.e. Purposes of this Study

Future and more severe earthquakes than the 2015 earthquake are predicted for Nepal. For instance, Dal Zilio (2020) provides new data showing that a very destructive mega-earthquake could hit Nepal in future. Evidence also exists that the government responded very slowly and exercised discriminatory behavior during relief and recovery operations. Additionally, social support is largely unexamined in the context of disaster recovery in Nepal. A few qualitative studies examine its benefits, but the investigations are very local, spanning 40-50 interviews at most.

Seeking to add to the literature, I empirically investigate the role of social support as a potential resiliency measure. First, I explore how earthquake survivors rebound using bonding and bridging social support. Second, I examine the role of social support in the presence of financial support, which often assists survivors in post-crisis recovery.

4.3. Empirical Strategy

Equation 4.1 shows the relationship between the four recovery measures: *Housing, Food, Water, and Income*, and the main explanatory variables: *Social support, and Financial support.*

$$RM_{ji} = \gamma_{j0} + \gamma_{j1}SC_i + \gamma_{j2}FC_i + \gamma_{j3}\boldsymbol{X_i} + \varepsilon_{ji} \quad for\ j = 1,2,3,4 \tag{4.1}$$

where RM_{ji}, SC_{ji}, FC_{ji}, and $\boldsymbol{X}_{ji}$ are vectors showing recovery measures, social support measures, financial support measures, and potential control variables, respectively for individual *i* and recovery measure *j*; and ε_{ji} is an individual-specific error term. The equation shows that each recovery measure is affected by a set of social support, financial support, and a few other variables such as ethnicity and size of the household. The gammas are estimated parameters that show the association between recovery and explanatory variables. The recovery measures are measured on a five point Likert scale ranging from “strongly disagree” to “strong agree”. A rating of 1 show strong disagreement while a rating of 5 means strong agreement with the statement. Social support measures consist of joint family (multi-generation), volunteering, and friends, while financial support measures include wealth, borrowing, and remittances. Joint family, volunteering, borrowing, and remittances are binary variables which are equal to 1 if the individual is living in a joint family, volunteered in the past 12 months, borrowed any money from any source (predominantly financial institutions), and received any remittances from abroad in the past 12 months. Even though, number of friends were recorded on a continuous scale while interviewing, I convert it into a categorical variable for the purposes of this chapter, with no friends, 4 or less than 4 friends, 5 to 9 friends, and more than 9 friends as categories. The wealth index, measured in local currency, is a continuous variable that represents the financial resources of an individual.

Essentially, Equation 4.1 is a summary of four equations, where each equation represents one of the four recovery measures and the same set of explanatory variables. In the writing below, my reference to four equations simply means the equations implied by Equation 4.1. Since the recovery measures are ordered responses, I employ an ordered regression model, namely the ordered logit or probit model. Initially, I estimate each equation separately to examine the relationship between housing, food, water, or income, and social and financial support measures. Subsequently, I methodically combine the respective elements of social and financial support to form two composite indices, and analyze their combined effects on post-earthquake recovery measures. In the single equation estimation, I assume ε_{ji} is logistically distributed.[32]

As the four dependent variables represent information for the same individual, contemporaneous correlation might exist between the errors of different equations, sharing a multidimensional distribution. Although my primary model consistently estimates parameters

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[32] In practice, the normal and logistic distributions generally gives similar results (Greene, 2003, p. 788).

equation by equation, the estimates become more efficient if the estimation process takes into account the full covariance structure (Roodman, 2011).

To incorporate possible correlation of error terms, we estimate the four equations jointly using Stata's Conditional Mixed Process (*cmp*) estimator,[33] which recognizes the full covariance structure of the error terms. We assume that the errors follow a multivariate normal distribution with a following variance-covariance structure: $\begin{bmatrix} \sigma_{11} & \cdots & \sigma_{14} \\ \vdots & \ddots & \vdots \\ \sigma_{41} & \cdots & \sigma_{44} \end{bmatrix}$, where σ_{11} shows the variance of the first equation and σ_{14} represents the covariance between the first and the fourth equation errors (Kumar *et al.*, 2012).

4.4. Data and Sample

4.4.a. Study Area and Sample Selection

This chapter uses a primary dataset collected through a field survey conducted in a village in the Bahunepati valley of Nepal. The village is located in the Sindhupalchok district and is comprised of nine wards.[34] During the survey, we mainly focused on residents of Bahunepati village in Sindhupalchok, however, our sample is not limited to Bahunepati only. We gave a fair random chance to residents of peripheral districts to participate in the survey. Houses were selected randomly from each ward, keeping in view the population of the ward and the desired sample size. We applied the Random Route Sampling method using the conventional "right-hand rule" for selection of houses.[35] The survey was designed in English, but administered in Nepali.[36]

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[33] Conditional Mixed Process (*cmp*) is a Stata package written by Roodman (2011). The estimator (*cmp*) is written in a Seemingly Unrelated Regressions (SUR) fashion where the dependent variables are explained independently equation by equation, but the errors are correlated. It employs GHK algorithm (Geweke, 1989; Hajivassiliou & McFadden, 1998; Keane, 1992) for efficient estimation of cumulative normal densities for different models.

[34] Ward is the smallest administrative unit in Nepal, and the primary sampling unit for the survey.

[35] See EU-MIDIS (2009) for a step-wise explanation of the process.

[36] Local language of Nepal.

We conducted face-to-face interviews of 510 individuals. Before proceeding with the interviewer, we sought permission from the respondents, and only proceeded if the individual agreed to participate in the survey. We quit if the respondent was younger than 18 years of age.

4.4.b. Measures

The questionnaire consists of various modules that collect data on earthquake impact, coping strategies, recovery, and demographics. We asked respondents questions about their post-earthquake housing, availability and sufficiency of food, water, and income. In addition, we collected data on the socio-demographics of the respondents. The following sections shed light on the variables that we use in this study.

4.4.c. Housing, Food, Water, and Income

The 2015 Nepal earthquake caused tremendous damage and loss. It destroyed hundreds of thousands of houses and rendered many people homeless. According to the government of Nepal and a few other reports,[37] approximately 8 million people were affected. Roughly 75 percent of the country is covered by mountains, where many people earn their livelihood by terrace farming or cattle rearing. In addition to damaging building structures, the earthquake wiped out terrace farms and cattle, thereby destroying people's entire livelihood. Water streams or systems that run through the mountains were also wrecked during the catastrophe.

To assess respondents' post-disaster situation, during the interview, we asked respondents to rate several statements on a five point Likert scale ranging from strongly disagree to strongly agree. The statements were related to their housing, availability of food,

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[37] https://nepal.unfpa.org/sites/default/files/pub-pdf/Final%20Setting_0.pdf. (accessed May 31, 2020)

water, and source of income. Respondents were asked to rate the following statements: (1) I now have permanent housing; (2) I now have adequate access to food; (3) I now have adequate access to clean drinking water; and (4) I now have a job or a source of income. Since, questions were asked in the survey individually, the recovery is at the individual level, but collectively I can term it as community recovery.

4.4.d. Social support Measures

There is no uniform measure of capturing social capital objectively, as social scientists used disparate ways to measure it. However, all these measures broadly manifest either *attitudinal and cognitive aspects* or *behavioral aspects* of social capital. Attitudinal and cognitive aspects encompass questions that measure an individual's own perception of trust or that measure level of trust in relation to other groups, local or national government, neighbors. Statements like "Most people can be trusted" or "Most people are honest," or questions such as "Do you trust others not to take advantage of you?" or "What level of trust do you have in those who live near you?" fall under the purview of attitudinal and cognitive aspects of social capital. Behavioral aspects of social capital consist of topics pertaining to an individual's actions or doings in building social capital. For example, questions such as "How many times have you donated blood in the last month?" or "With how many friends or contacts do you discuss your problems?" or questions about volunteering activities, membership in social organizations, are within the scope of behavioral aspects (Aldrich and Meyer, 2015; Nakagawa and Shaw, 2004; Putnam, 2000b).

In this chapter, I use a mix of attitudinal and cognitive and behavioral aspects of social capital to measure social support. I consider three measures: family structure; volunteering; number of friends, that I believe help people recover from a natural disaster. I explain these variables briefly in the following paragraphs.

In Nepal, people either live in a nuclear family system or a joint family system. Nuclear families are different from joint families in which a couple only lives with their children. Joint families, on the other hand, consist of three or more generations that live together with their spouses and children. The dataset contains information on the family structure of the respondents, whether s/he is living in a nuclear family or joint family. As compared to nuclear families that are alone in case of a disaster, joint families have many members that can help and rely on each other for moral and financial support in times of need. Since individuals are interlinked in a joint family set up and can depend on each other, these households are considered more food secure, compared to nuclear families (Sam *et al.*, 2019). Also, joint families have more earning members who, mostly, contribute significantly to the total earnings of the household. Therefore, joint families have more total income.

In addition, I also consider number of friends and volunteering as elements of social support. Previous studies have considered social support and volunteering separate from each other when examining their effects on the health of an individual (Harris and Thoresen, 2005; Kumar *et al.*, 2012; Onyx and Warburton, 2003). Since volunteering allows an individual to expand his/her social network by connecting with other people and making new friends, I can say that a person who volunteers has more social support. To measure volunteering, I use the following dichotomous question, "In the past 12 months, have you worked with others in your village/neighborhood to do something for the benefit of the community?" To measure number of friends, I use, "How many close friends and relatives do you have with whom you can freely share private matters, call or help, or borrow money?" For purposes of this analysis, I categorize numbers of friends into four categories: no friend, 1-4 friends, 5-9 friends, and more than 9 friends.

4.4.e. Financial support Measures

I also consider three measures of financial support: wealth, borrowing, and remittances. Wealth and remittances from family members abroad show financial strength of an individual that can provide a cushion in the event of a natural disaster. People who have sound financial resources can cope better and recover more quickly after a disaster, as compared to those who do not have such resources. Additionally, after the mega earthquake, the central bank of Nepal, Nepal Rastra Bank, had ordered banks and financial institutions to provide concessional loans to people in need. Therefore, I also consider borrowing, mainly from banks and other financial institutions, as a source of financial support. Remittances from abroad, in addition to wealth and borrowing, can be considered an undisturbed source of income that can provide remedy for some financial worries.

Since income is an important variable that reflects financial ability of an individual to cope with any adverse situation, I can use it as a financial support measure. However, during the interview, many respondents felt shy while talking about their income, and many respondents refused to provide their income. Therefore, I have missing and less reliable information. To overcome this, I use information on individual’s asset ownership as a measure of their wealth. Respondents were asked questions about their ownership of various assets, such as radio, tv, vehicle, etc. Using this information, I create a wealth index and include it in our empirical model. During the initial analysis of asset ownership, I excluded assets that are owned by more than 95 percent of households or less than 5 percent of households.[38] To create the wealth index, I ran principal component analysis and selected the first component that explains most of the variation.

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[38] https://docs.wfp.org/api/documents/WFP-0000022418/download/ (accessed: May 31, 2020)

I also use two other questions in this analysis concerning borrowing and remittances to observe respondents' financial health after the disaster. Respondents were asked: "After the earthquake, did you try to borrow from someone outside the household or from an institution?" and categorized responses into "No, I did not try," "I tried but was turned down," and "Yes, I borrowed." Since many people were under financial stress after the disaster, I assume people predominantly borrowed from banks or other financial institutions. The dichotomous question, "Did your household receive remittances in the past 12 months?," was used to ascertain if the household had received any remittances recently.

4.4.f. Control Variables

In addition to the above variables, data were also collected on several other variables that may be correlated with the four recovery measures (housing, food, water, and income). Specifically, I use ethnicity and household size as control variables that have implications for our outcome variables. Evidence from a study,[39] conducted in phases after the 2015 earthquake, shows that people belonging to lower ethnic groups face barriers that made their recovery difficult. Compared to upper ethnic groups, they experience difficulty in rebuilding and accessing food. Similarly, providing for or accessing food, water, and shelter for many household members is challenging, compared to household with fewer members. Therefore, I include ethnicity and household size in models to control for their effect.

Nepalese society consists of multi-ethnic groups. Although people belong to 125 different castes,[40] they can be categorized into seven major castes: (1) Brahaman/Chhetri; (2) Tarai/Madhesi Other Castes; (3) Dalits; (4) Newar; (5) Janajati; (6) Muslim; and (7) Others

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[39] https://asiafoundation.org/wp-content/uploads/2017/05/Aid-and-Recovery-in-Post-Earthquake-Nepal-Quantitative-Survey-September-2016.pdf (accessed Aug 27, 2020)

[40] http://old.cbs.gov.np/image/data/2018/Statistical%20Year%20Book%202017.pdf. (accessed May 31, 2020)

(Bennett *et al.*, 2008). About 29 percent of the whole population is either Brahmin or Chhetri, and about 24.5 percent is either Newar or Janajati. Since the majority of the population belongs to Brahmin, Chhetri, Newar, or Janajati, I re-categorize castes and form three categories: Brahmin/Chhetri; Newar/Janajati, and Other Caste. Brahmin and Chhetri are considered the top castes, and are more or less similar, therefore, I classify them as one caste. Newars and Janajatis are considered same socially, thus I group them in one category. All others: Dalits, Muslim, etc. are assigned to the third category called Other Caste.

4.4.g. Descriptive Analysis of the Measures

Table 4.1 provides summary statistics of the recovery measures and explanatory variables. Although the outcome variables are ordinal, I still present their mean scores in the top section of the table. Mostly, the mean values stay slightly above 3, showing that majority of people stayed neutral or on the upside of the Likert scale (agree and strongly agree). People may have had difficulty in finding adequate housing, water, and a source of income, however, many people accessed food after the disaster without much difficulty, as the statistics show. About 9 in 10 respondents either strongly agreed or agreed that they now have adequate access to food.

The next set of variables in the table represent mean scores of social support measures. At the time of the survey, about 34 percent of respondents were living in joint families, and about 55 percent had volunteered for the benefit of the community in the past 12 months. Since I converted a skewed continuous variable representing total number of friends into a categorical variable with four categories, the mean value of 2.69 shows that majority of the respondents have either 1-4 friends or 5-9 friends, the third and fourth category. More precisely, summary statistics of the original continuous variable show that on average a respondent has about 9 friends.

The mean value of the wealth index, among financial support measures, is only the mean value of the first principal component, which shows that a majority of respondents have no wealth at all. The wealth index consists of general household items, such as a radio, television, cell phone, bicycle, motorcycle, fan, air conditioner, car, etc. As the disaster destroyed everything people had, they were left with nothing; therefore, a zero value of the wealth index intuitively makes sense. However, I presume respondents had different wealth status before the earthquake, and it also depends on the caste, since anecdotal evidence suggests that Brahmins/Chhetris are the traditional ruling castes of Nepal, and they control the majority of Nepal's social and political resources. Building on this evidence, back-of-the-envelope, I categorized respondents into five quintiles based on their wealth, and find that majority of Brahmins/Chhetris including Newars/Janajatis fall in the upper three quintiles, compared to other castes. To overcome their financial worries, about 41 percent of respondents borrowed money either from their friends or other financial institutions, and a few of the respondents (12%) also received remittances from abroad in the past 12 months. The financial support measures thus present a bleak picture of respondents after the earthquake. The survey was conducted two years after the earthquake, and people were still struggling to stabilize their lives. During those hard times when people lost the majority of their financial support, they built their social support mostly by volunteering.

The majority of the sample is either Brahmin/Chhetri or Newar/Janajati. About 84 percent of the sample is split between these two castes, while remaining respondents belong to other castes. Even though earthquake was bad and equally difficult for all, being socially upper-class and politically controlling, Brahmins/Chhetris might have had better resources that can help them to cope with post-disaster difficulties more easily, compared to others.

[Insert Table 4.1 here…]

4.5. Empirical Results and Discussion

4.5.a. Main Results

Tables 4.2 and 4.3 present the central results of this paper. Table 4.2 shows the ordered logit estimates, while Table 4.3 contains the conditional mixed process estimates for the social and the financial support measures.

In Table 4.2, among the financial support measures, the composite wealth index and borrowing affect different recovery measures; remittances, on the other hand, do not have any significant relationship with the outcome measures. Wealth has a positive relationship with housing and food recovery, as expected, and no relationship with water and income recovery. One explanation could be that people spent whatever resources they had at their disposal to survive the calamity, and regain housing and food. By contrast, if they did not have any substantial wealth, they might have been more focused on their instant survival by securing food and water as well as temporary housing from borrowed resources. This phenomenon is also suggested by the directional relationship of borrowing with the outcome measures. The estimates show a positive relationship of borrowing with food, water, and income, and no relationship with housing. The relationships intuitively make sense: when people do not have their income, wealth, or anything to eat, they try to borrow money for their immediate survival. Although remittances can provide resources, they occur infrequently and, sometimes, are too insignificant to make a dent in a survivor’s recovery.

Financial support, consisting of liquid and illiquid assets that are readily available for spending, is an accepted channel that can help in the recovery process after a disaster. However, in the absence of financial support, the results show that social support also helps in recovery. The set of variables, joint family, volunteering, and numbers of friends, in Table

4.2 falls under the broad category of social support. The estimates show a consistent and significant positive association of joint family and volunteering with food, water, and income; number of friends helps in food and income recovery, but not with housing and water. Based on the estimates, if a respondent was living in a joint family system, s/he had improved access to food, clean drinking water, and a source of income. Compared to the nuclear family system, joint families have more earning members, who contribute significantly to the earnings of the household; they are considered more food secure, and they can help each other in times of need. That way, joint families can recover more easily and quickly in terms of food, water, and income. Also, the positive but insignificant estimate of joint family for housing shows that, compared to nuclear families, joint families can get permanent housing more easily; however, that might not be the priority immediately after a disaster. Similarly, except housing, volunteering helps provide food, water, and a source of income. Through many volunteering activities for the benefit of community, an individual may be able to build new relationships that help him/her in the recovery. For number of friends, compared to no friend(s), having friends helps. The estimates show that having friends has a positive association with food and income recovery. Friends can help each other in times of need. If a person does not have anything to eat, a friend may share whatever s/he has. Since everybody in the area was in the same predicament, friends might not be able to help each other in housing recovery, which is suggested by the insignificant estimates. Additionally, housing is a form of capital that requires significant financial support, especially wealth to rebuild, it might be difficult for friends to help with this, but they can help with food and income. Friends can help in getting a source of income by sharing information, referring him/her for any job, or starting a joint business venture.

Ethnicity is more a prominent factor for food recovery than any other measure. Compared to various other castes, Brahmins/Chhetris and Newars/Janajatis are in more favorable position to have housing and food. Anecdotal evidence suggests that after the 2015 earthquake, ethnic discrimination emerged overtime; lower ethnic groups were excluded from local government and international relief aid, financial and non-financial. The upper ethnic groups including Brahmins/Chhetris and Newars/Janajatis may have had better social connections that helped them to get help from government and non-government sources. A report by a nonprofit international development organization underscores this fact by providing data that shows that likelihood of getting aid from government of low caste groups reduced gradually.[41] Another explanation could be that upper caste groups mainly exists at the upper end of the wealth spectrum, thus, having more financial freedom allows them to spend more on food and rebuilding.

Table 4.3 contains the conditional mixed process estimation of the recovery measures, which takes into account possible contemporaneous correlation among the error terms. The results here are very similar to the results in Table 4.2. The direction of the relationships between social and financial support measures and the recovery measures is the same as discussed in the previous paragraphs.

[Insert Tables 4.2 and 4.3 here…]

4.5.a.i. Marginal Effects

Tables 4.4 and 4.5 present the marginal effects of the ordered logit and conditional mixed process models. In Table 4.4, for brevity, I only show marginal effects for three social support and two financial support measures on housing, food, water, and income recovery

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[41] https://asiafoundation.org/wp-content/uploads/2017/05/Aid-and-Recovery-in-Post-Earthquake-Nepal-Quantitative-Survey-September-2016.pdf (accessed Aug 27, 2020)

measures. Also, all three social support and only two financial support measures, excluding housing, are significant in Tables 4.2 and 4.3, thus, I present their marginal effects. From the five ordinal categories of each recovery measure, I exclude the middle category: Neutral and include the remaining four categories: strongly disagree, disagree, agree, and strongly agree. From the social support measures, I include joint family, volunteering, and two categories of number of friends: 5-9 friends, and more than nine friends. From the financial support measures, I include the wealth index and borrowing. The estimates show that the wealth index increases the chances of a permanent housing and food recovery after an earthquake by about three percent each. Social support measures and borrowing do not affect housing recovery; however, they do have a disproportionate effect on food, water, and income compared to wealth. For example, borrowing increases the chances of food recovery by 15 percent, and of water and income recovery by 13 and 15 percent, respectively. As discussed before, compared to a nuclear family member, a member of a joint family is more food secure in that it increases the chances of food, water, and income recovery by 10, 7, and 8 percent, respectively. Volunteering is the variable with the largest impact on food recovery. It increases the chance of food recovery by about 17 percent compared to only 10 percent for water and income recovery. The results show that friends only help each other in securing food and source of income. Having 5-9 friends increases the chances of respondents to strongly agree with the food and income statements by 12 and 16 percent, respectively.

Table 4.5 shows marginal effects from the conditional mixed process model, where the four equations are jointly estimated while taking into account the possible correlation among the error terms. The marginal effect of the wealth index stays the same at three percent for housing and food. However, unlike the ordered logit model, the marginal effects of borrowing decrease by two percentage points each for food, water, and income recovery. Among the social support measures, the increased probability of food and income recovery from being a joint family member, volunteering, and having 5-9 friends almost stays the same as before, except water recovery, where only volunteering increases its chances by 11 percent.

[Insert Tables 4.4 and 4.5 here…]

4.5.b. Robustness Check: Social and Financial support Indices

Thus far, I have analyzed the separate effects of different social and financial support measures on each outcome measure. To check the robustness of individual social and financial support measures, I analyze the combined effects, where I create composite social and financial support indices by combining the various measures in each category. For each index, first I normalize the variables using the following formula: $X' = \frac{X - minimum\ value}{maximum\ value - minimum\ value}$, where X' and X are the normalized and original values of a variable. The normalized variable ranges from 0 to 1. Next I add the normalized values of the wealth index, borrowing, and remittances to create an index for financial support; similarly, I add the normalized values of joint family, volunteering, and friends to create an index for social support. Note that for social support index, I use the continuous rather than categorical variable for number of friends.

Tables 4.6 and 4.7 show the ordered logit and conditional mixed process estimates of the recovery measure equations, respectively, with the composite social and financial support indices. Table 4.6 shows that the financial support index has a strong positive effect on all four recovery measures, while the social support index only affects three: food, water, and income. Intuitively, and as discussed before, social relationships either in the form of friends or family members can only help with accessing food, water, and a source of income. Table 4.7 shows the same directional relationship, after jointly estimating the four equations.

[Insert Tables 4.6 and 4.7 here…]

4.5.b.i. Marginal Effects of Social and Financial support Indices

Tables 4.8 and 4.9 show the marginal effects obtained from the ordered logit and conditional mixed process models with social and financial support indices. As before, for brevity, I only show marginal effects on the four response categories of housing, food, water, and income recovery. Table 4.8 shows that the financial support index increases the probability of food recovery by 13 percent followed by income recovery (10%), water recovery (8%), and housing recovery (5%). On the other hand, the social support index affects food recovery the most (14%), followed by income recovery (10%) and water recovery (8%). The marginal effect values presented in Table 9 are almost identical to those in Table 4.8, except that the financial support index for water recovery and the social support index for income recovery decrease by one percentage point for the respective strongly agree categories.

[Insert Tables 4.8 and 4.9 here…]

4.6. Summary and Conclusion

In April-May 2015, Nepal suffered two strong earthquakes of 7.8 and 7.3 magnitude, which destroyed buildings, decimated historic temples and monuments, and killed thousands. The economic and social costs of the quakes were enormous. Local government and non-government organizations, and many foreign governments and relief organizations poured in heavy aid and helped in relief and recovery operations.

This chapter draws attention to an underutilized resource that can influence community resilience in a positive way, namely, social support. Following a natural disaster, governments spend resources on building physical infrastructure with more stringent building codes and urge residents to prepare for any such future event in purely materialistic ways, such as to stockpile food and water for at least 5 days, etc. Indeed, such preparations matter and are important, but, equally important is building strong ties with neighbors, friends, and local organizations. In the event of a disaster, governments generally respond, but evidence also shows that occasionally governments respond sluggishly. Friends, family, and neighbors are actual first responders whose efforts save many lives. Relief operations by neighbors following the 2011 disasters in Japan are prime examples of social support effectiveness.

I use an original dataset gathered through extensive field work in Nepal, conducted in one of the severely damaged districts. Utilizing information contained in the dataset, I estimate the effects of bonding and bridging social support individually and combined, and in presence of financial support. The results indicate that social support is as important as financial support in post-disaster recovery. Even after accounting for possible contemporaneous correlation among errors terms, the results stay almost the same, thus confirming the efficacy of social support. In other words, one does not have to be wealthy to recover from a crisis, social support can be equally important and effective.

Table 4.1: Summary Statistics

Variables	Definition	Mean/SE
Recovery Measures		
Housing	I now have permanent housing. 1=Strongly disagree..5=Strongly agree	3.186 (1.383)
Food	I now have adequate access to food. 1=Strongly disagree..5=Strongly agree	4.059 (0.837)
Water	I now have adequate access to clean drinking water. 1=Strongly disagree..5=Strongly agree	3.576 (1.323)
Income	I now have a job or source of income. 1=Strongly disagree..5=Strongly agree	3.771 (0.995)
Social support Measures		
Joint Family	Respondent living in a joint family 1=yes	0.343 (0.475)
Volunteer	Have you worked for the benefit of the community in the past 12 months? 1=yes	0.553 (0.498)
Friends	How many close friends and relatives do you have whom you freely share private matters, call on help, borrow money?	2.669 (0.929)
Financial support Measures		
Wealth Index	Summary measure of created wealth index	0.00 (1.311)
Borrowing	Borrowing after the earthquake. 1=yes	0.412 (0.493)
Remittances	Did your household receive remittances in the past 12 months? 1=yes	0.120 (0.325)
Other Confounders		
Brahmin/Chhetri	Respondent belongs to Brahmin or Chhetri caste. 1=yes.	0.414 (0.493)
Newar/Janajati	Respondent belongs to Newar or Janajati caste. 1=yes.	0.422 (0.494)
Household size	Total number of household members.	5.549 (2.267)
N		510

Data source: Nepal Study Center, UNM

Notes: Standard errors (SE) are reported in parenthesis. *N* represents number of observations.

Table 4.2: Ordered Logit Estimates of Social and Financial support Measures

	Housing	Food	Water	Income
Social support				
Joint family	0.08	0.58***	0.36**	0.51**
	(0.20)	(0.20)	(0.18)	(0.20)
Volunteering	-0.05	1.04***	0.55***	0.64***
	(0.17)	(0.21)	(0.17)	(0.18)
No friend	ref.	ref.	ref.	ref.
1-4 friends	-0.29	0.77*	-0.25	0.82**
	(0.36)	(0.43)	(0.29)	(0.33)
5-9 friends	0.07	0.85*	-0.14	1.20***
	(0.37)	(0.46)	(0.31)	(0.36)
More than 9 friends	-0.26	0.57	-0.28	0.80**
	(0.37)	(0.46)	(0.33)	(0.36)
Financial support				
Wealth Index	0.24***	0.12*	0.03	-0.01
	(0.06)	(0.07)	(0.06)	(0.06)
Borrowing Yes=1	0.20	0.89***	0.69***	0.96***
	(0.20)	(0.23)	(0.20)	(0.20)
Remittances Yes=1	0.23	0.40	0.08	0.26
	(0.30)	(0.30)	(0.33)	(0.28)
Other caste	ref.	ref.	ref.	ref.
Brahmin/Chhetri	0.40	1.25***	0.31	-0.19
	(0.24)	(0.33)	(0.24)	(0.25)
Newar/Janajati	0.71***	0.86**	-0.28	-0.19
	(0.23)	(0.33)	(0.25)	(0.24)
N	510	510	510	510

Data source: Nepal Study Center, UNM

Notes: *, **, *** denotes statistical significance at the 0.10, 0.05, and 0.01 level respectively. *N* represents number of observations. Bootstrap standard errors are in parentheses.

Table 4.3: Conditional Mixed Process Estimates of Social and Financial support Measures

	Housing	Food	Water	Income
Social support				
Joint family	0.05	0.33***	0.20*	0.24**
	(0.11)	(0.12)	(0.11)	(0.11)
Volunteering	-0.01	0.57***	0.34***	0.35***
	(0.09)	(0.11)	(0.10)	(0.10)
No friends	ref.	ref.	ref.	ref.
1-4 friends	-0.13	0.37*	-0.19	0.40**
	(0.19)	(0.22)	(0.17)	(0.19)
5-9 friends	0.07	0.45*	-0.12	0.63***
	(0.21)	(0.23)	(0.19)	(0.20)
More than 9 friends	-0.11	0.30	-0.20	0.41**
	(0.21)	(0.23)	(0.19)	(0.20)
Financial support				
Wealth Index	0.13***	0.06*	0.01	-0.01
	(0.03)	(0.04)	(0.03)	(0.03)
Borrowing Yes=1	0.08	0.46***	0.38***	0.50***
	(0.10)	(0.12)	(0.11)	(0.11)
Remittances Yes=1	0.11	0.22	0.06	0.21
	(0.17)	(0.17)	(0.17)	(0.15)
Other caste	ref.	ref.	ref.	ref.
Brahmin/Chhetri	0.23	0.65***	0.15	-0.11
	(0.14)	(0.16)	(0.13)	(0.14)
Newar/Janajati	0.41***	0.41***	-0.20	-0.11
	(0.14)	(0.16)	(0.13)	(0.14)
N	510	510	510	510

Data source: Nepal Study Center, UNM

Notes: *, **, *** denotes statistical significance at the 0.10, 0.05, and 0.01 level respectively. *N* represents number of observations. Robust standard errors are in parentheses.

Table 4.4: Ordered Logit Marginal Effects of Social and Financial support Measures

	Strongly Disagree	Disagree	Agree	Strongly Agree
Housing				
Joint family	-0.01	-0.01	0.01	0.01
Volunteering	0.00	0.00	0.00	0.00
5-9 friends	-0.01	-0.01	0.00	0.01
More than 9 friends	0.03	0.03	-0.02	-0.04
Wealth Index	-0.03***	-0.03***	0.03***	0.03***
Borrowing	-0.03	-0.02	0.02	0.03
Food				
Joint family	-0.01	-0.03**	-0.05*	0.10**
Volunteering	-0.01*	-0.06***	-0.07***	0.17***
5-9 friends	-0.01	-0.05	-0.03	0.12*
More than 9 friends	-0.01	-0.04	-0.01	0.08
Wealth Index	0.00	-0.01*	-0.01*	0.03*
Borrowing	-0.01*	-0.05**	-0.06***	0.15***
Water				
Joint family	-0.03*	-0.04*	0.00	0.07*
Volunteering	-0.05**	-0.06***	0.01	0.10**
5-9 friends	0.01	0.01	0.00	-0.02
More than 9 friends	0.02	0.03	0.00	-0.05
Wealth Index	0.00	0.00	0.00	0.00
Borrowing	-0.06**	-0.07***	0.01	0.13***
Income				
Joint family	-0.01*	-0.04*	0.00	0.08*
Volunteering	-0.02**	-0.05***	0.01	0.10***
5-9 friends	-0.04*	-0.10**	0.07	0.16***
More than 9 friends	-0.03	-0.08*	0.07	0.10*
Wealth Index	0.00	0.00	0.00	0.00
Borrowing	-0.03***	-0.07***	0.02	0.15***

Data source: Nepal Study Center, UNM

Notes: *, **, *** denotes statistical significance at the 0.10, 0.05, and 0.01 level respectively.

Table 4.5: Conditional Mixed Process Marginal Effects of Social and Financial support Measures

	Strongly Disagree	Disagree	Agree	Strongly Agree
		Housing		
Joint family	-0.01	-0.01	0.01	0.01
Volunteering	-0.00	-0.00	0.00	0.00
5-9 friends	-0.01	-0.01	0.01	0.01
More than 9 friends	0.03	0.02	-0.02	-0.03
Wealth Index	-0.03^{***}	-0.02^{***}	0.02^{***}	0.03^{***}
Borrowing	-0.02	-0.01	0.01	0.02
		Food		
Joint family	-0.01^{*}	-0.03^{**}	-0.04^{*}	0.10^{**}
Volunteering	-0.03^{**}	-0.05^{***}	-0.06^{***}	0.17^{***}
5-9 friends	-0.02	-0.05	-0.03^{*}	0.12^{*}
More than 9 friends	-0.02	-0.03	-0.01	0.08
Wealth Index	-0.00	-0.01^{*}	-0.01^{*}	0.03^{*}
Borrowing	-0.02^{**}	-0.04^{**}	-0.05^{***}	0.13^{***}
		Water		
Joint family	-0.03	-0.03	-0.00	0.07
Volunteering	-0.06^{***}	-0.05^{***}	0.00	0.11^{***}
5-9 friends	0.02	0.02	0.00	-0.04
More than 9 friends	0.03	0.03	0.00	-0.06
Wealth Index	0.00	0.00	-0.00	-0.00
Borrowing	-0.07^{***}	-0.05^{***}	0.00	0.12^{***}
		Income		
Joint family	-0.02^{*}	-0.03^{*}	0.00	0.07^{*}
Volunteering	-0.03^{**}	-0.04^{***}	0.01	0.09^{***}
5-9 friends	-0.06^{*}	-0.08^{**}	0.05	0.16^{***}
More than 9 friends	-0.05	-0.06	0.05	0.09^{*}
Wealth Index	-0.00	-0.00	0.00	0.00
Borrowing	-0.04^{***}	-0.06^{***}	0.02	0.13^{***}

Data source: Nepal Study Center, UNM

Notes: *, **, *** denotes statistical significance at the 0.10, 0.05, and 0.01 level respectively.

Table 4.6: Ordered Logit Estimates of Social and Financial support Indices

	Housing	Food	Water	Income
Social Index	0.04	0.82***	0.42***	0.64***
	(0.13)	(0.12)	(0.11)	(0.13)
Financial Index	0.40***	0.80***	0.46***	0.65***
	(0.13)	(0.16)	(0.17)	(0.15)
Other caste	*Reference category*			
Brahmin/Chhetri	0.44*	1.28***	0.35	-0.14
	(0.23)	(0.32)	(0.23)	(0.24)
Newar/Janajati	0.76***	0.91***	-0.22	-0.11
	(0.22)	(0.33)	(0.24)	(0.24)
N	510	510	510	510

Data source: Nepal Study Center, UNM
Notes: *, **, *** denotes statistical significance at the 0.10, 0.05, and 0.01 level respectively. *N* represents number of observations. Bootstrap standard errors are in parentheses.

Table 4.7: Conditional Mixed Process Estimates of Social and Financial support Indices

	Housing	Food	Water	Income
Social Index	0.04	0.46***	0.24***	0.33***
	(0.07)	(0.07)	(0.07)	(0.07)
Financial Index	0.20***	0.43***	0.25***	0.37***
	(0.08)	(0.09)	(0.09)	(0.08)
Other caste	*Reference category*			
Brahmin/Chhetri	0.26*	0.67***	0.16	-0.09
	(0.14)	(0.16)	(0.13)	(0.14)
Newar/Janajati	0.44***	0.44***	-0.17	-0.08
	(0.13)	(0.16)	(0.13)	(0.14)
N	510	510	510	510

Data source: Nepal Study Center, UNM
Notes: *, **, *** denotes statistical significance at the 0.10, 0.05, and 0.01 level respectively.

Table 4.8: Order Logit Marginal Effects of Social and Financial support Indices

	Strongly Disagree	Disagree	Agree	Strongly Agree
Housing				
Social support Index	0.00	0.00	0.00	0.00
Financial support Index	-0.05***	-0.04**	0.04***	0.05**
Food				
Social support Index	-0.01*	-0.05***	-0.06***	0.14***
Financial support Index	-0.01*	-0.05***	-0.05***	0.13***
Water				
Social support Index	-0.04***	-0.04***	0.00	0.08***
Financial support Index	-0.04**	-0.05**	0.01	0.09**
Income				
Social support Index	-0.02***	-0.05***	0.02*	0.10***
Financial support Index	-0.02**	-0.05***	0.02	0.10***

Data source: Nepal Study Center, UNM

Notes: *, **, *** denotes statistical significance at the 0.10, 0.05, and 0.01 level respectively.

Table 4.9: Conditional Mixed Process Marginal Effects of Social and Financial support Indices

	Strongly Disagree	Disagree	Agree	Strongly Agree
Housing				
Social support Index	-0.01	-0.01	0.01	0.01
Financial support Index	-0.05**	-0.03*	0.03**	0.05*
Food				
Social support Index	-0.02***	-0.04***	-0.05***	0.14***
Financial support Index	-0.02**	-0.04***	-0.05***	0.13***
Water				
Social support Index	-0.04***	-0.03***	0.00	0.08***
Financial support Index	-0.04**	-0.04**	0.00	0.08**
Income				
Social support Index	-0.03***	-0.04***	0.01	0.09***
Financial support Index	-0.03***	-0.05***	0.01	0.10***

Data source: Nepal Study Center, UNM

Notes: *, **, *** denotes statistical significance at the 0.10, 0.05, and 0.01 level respectively.

Chapter 5: Conclusion

The primary objectives of this dissertation are threefold: first, ascertain cancer and non-cancer patients' utility from different attributes of quality of life; second, estimate their willingness to pay for improved quality of life; third, investigate the importance of social support in improving quality of life, and its effectiveness in post-disaster resiliency.

To achieve my objectives, I use primary datasets from Nepal collected through two field surveys conducted by UNM's Nepal Study Center. One survey was conducted in 2018 in different cancer and non-cancer hospitals of Nepal to collect information regarding quality of life of these patients. Another survey was conducted in 2017 in the Sindhupalchok district of Nepal in the wake of the 2015 mega earthquake.. This survey provides information on social support and post-disaster resiliency of survivors.

Using the 2018 individual level dataset to estimate a random parameter logit model, I found that cancer patients attain utility from all attributes of the quality-of-life measure. Delving further into the analysis, I found that the patients are willing to trade money for better quality of life. Among the five attributes that I focused on in my analysis, cancer patients ranked *no problem in performing in usual activities* and *no pain* highest and second highest, while non-cancer patients ranked them in reverse order. In monetary terms, cancer patients are willing to pay approximately Nepali Rupees 2.6 million to improve their quality of life from the current state to the best state, i.e. the one containing the most desirable level of each attribute.

While the second chapter focused on economic aspects, the third chapter analyzed non-economic or social aspects of quality of life. It investigated the role of social support as well as other factors including stress and access to health care services in relation to quality of life of cancer and non-cancer patients. Using the same data set as Chapter 2 and utilizing structural equation modeling techniques, I found that social support plays a key role in improving quality of life of cancer patients. This chapter also highlighted that stress is an extremely important factor in determining quality of life. As I expected, access to health care services influences quality of life of both cancer and non-cancer patients in a positive way.

The fourth chapter further investigated social support in a disaster resiliency context. I argued that social support can assist survivors in regaining housing, food, water and income. I tested this argument using the 2017 survey data from Nepal and employing a system of ordered logit equations. The results revealed that bonding and bridging social support helped with post-disaster recovery not only collectively but individually as well. Anecdotally and evidently, financial support helps in difficult situations. Therefore, first, I analyzed the role of financial support by itself, and second, the effectiveness of social support in the presence of financial support. The results were certainly striking that social support did not lose its significance in the presence of financial support, yet it helped survivors in the recovery of food, water, and income, but not housing. Thus, I conclude that social support is equally effective in post-disaster resilience as financial support.

5.1. Suggestions and Recommendations

Based on the results of Chapters 2, 3, and 4, we can make the following some recommendations and/or suggestions:

Firstly, my review of the literature shows that the people of Nepal are lacking basic facilities of life such as clean drinking water, sewage and sanitation facilities.[42] Excessive

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[42] https://thewaterproject.org/water-crisis/water-in-crisis-nepal (accessed Apr 4, 2019).

amounts of air pollutants exist in the environment that are detrimental to the health of the inhabitants. Tobacco use and drinking further aggravates the problem. . These factors provide a conducive environment for individuals to contract cancer. The government could increase health education, formulate policies to curb some of these risky human behaviors or at least bring them to certain limits. Similarly, the government could devise plans to bring air pollution levels within non-deleterious limits, and to provide basic necessities of life.

Secondly, a majority of the population, in our sample too, do not have the necessary information about cancer. Besides living in unhealthy conditions, they are less educated or illiterate. They do not know about the symptoms of the disease and do not visit a hospital at an early stage of the disease. Another hurdle that prevents people from going to the hospital, especially for women, is the social stigma attached to the disease. Therefore, educating them through well-organized programs, and through print and electronic media would be beneficial.

Thirdly, not a lot of health facilities are available in Nepal. Only seven hospitals possess the necessary equipment to deal with cancer patients (Subedi and Sharma 2012). Expanding the network of health facilities throughout the country, or even initiating programs that provide screening for the major types of cancers would help to control cancer.

Fourthly, as the statistics show, a vast number of people are living below the poverty line.[43] Many cannot afford the full treatment cost of a disease like cancer. The government could formulate a national insurance plan that provides comprehensive coverage to cancer patients; a plan that covers the entire cost of the treatment. This will increase patients' quality of life.

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[43] https://thewaterproject.org/water-crisis/water-in-crisis-nepal (accessed Apr 4, 2019).

Fifthly, my analysis shows that patients' quality of life improves if provided easy access to health care services and decreased stress levels. It also improves with higher income. Based on the results, if Nepal's government devises policies aimed at providing easier access to health care facilities and offering stress management therapies at the hospitals, especially cancer hospitals, patients' quality of life would improve. Providing easy access to care does not only mean building hospitals or health care units in far-flung areas, but also increasing hours of operation of existing general government hospitals. I also found that higher wealth and education are positively associated with quality of life. Based on this finding, I suggest, if the government can spare resources, an increase in the financial help that the government is already providing, improvements in medical education, through print and electronic media or through setting up medical camps etc., to the people of remote areas who do not have knowledge of diseases, symptoms, and the treatment options.

Sixthly, as future predictions of an even more severe earthquake exist, I believe my results clearly carve out one direction where the government of Nepal can invest its resources. Designing policies and programs that can grow connections among residents will provide critical resilience to neighborhoods and communities, for instance, the government could build community centers that allows people to interact with each other. Thus, besides investing in physical infrastructure, building social infrastructure may prove equally fruitful in recovering from any such future event.

Appendix A: Details of Discrete Choice Experiment

For the discrete choice experiment, I used three levels of the five attributes of the quality of life, EuroQoL, measure. Further, to estimate patients' willingness to pay for improved quality of life, I added an extra attribute of cost that initially had five levels: 25000, 50000, 100000, 175000, 300000 (all in Nepali Rupees). Later, after debriefings with oncologists, patients, and other coordinating doctors in the field, and after deliberations with Dr. Alok Bohara (principal investigator) and Dr. Jennifer Thacher (advisor on project), I increased cost levels to 11. Using the SAS macro *%ChoicEff* and *DoE.base* package of R statistical software, I obtained a full factorial design; however, its infeasibility allowed me to use fractional factorial design, which essentially is a subset of full factorial design. Resultantly, I generated 12 versions of the survey with three choice sets in each survey and three alternatives in each choice set including status-quo.

A.1: Randomization

Since, we had 12 versions of the survey, it was extremely important to randomize the many versions for information accuracy. To do that, before proceeding to actual field survey, I generated a random list of the 12 survey versions using the randomization algorithm of Microsoft Excel. The algorithm randomized it in such a way that it spanned our anticipated number of observations (1500). Using that randomized list, we printed the necessary versions of the questionnaire and stacked them according to the list. The enumerators were instructed to pick only so many questionnaires from top of the stack they expect to complete in a day. They continued this process every day until the list exhausted.

Appendix B: Details of 2018 Survey

B.1: Study Site and Background Information

According to Subedi and Sharma (2012), seven major hospitals, among others, in Nepal are providing cancer services.[44] Of these seven hospitals, only five of them possess advanced level facilities, such as radiotherapy, to treat the patients. Three of the seven hospitals receive the most load of patients every year (Subedi and Sharma 2012). These include B. P. Memorial Cancer Hospital, Bharatpur; Bir Hospital, Kathmandu; and Bhaktapur Hospital, Kathmandu. Considering the importance and huge influx of cancer patients to these hospitals, we administered our survey in these three hospitals.

B.2: Survey Design

The survey was designed at the Nepal Study Center (Department of Economics, UNM) in English language and was later translated into Nepali by the enumerators. A thorough literature review on the issues and concerns regarding cancer was done before drafting the questionnaire. They survey contains many sections including general health status, valuing life, quality of life, discrete choice experiment, and demographics. Pre-tested questionnaire and guidelines were followed in framing the domestic, emotional and social life of cancer patients. The main focus of the questionnaire was assessing the quality of life. Pre-tested and well-established instruments measuring quality of life were taken and

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[44] **Major cancer hospitals in Nepal**: (1) B. P. Koirala Memorial Cancer Hospital, Bharatpur; (2) Bir Hospital/National Academy of Medical Sciences (NAMS), Kathmandu; (3) Teaching Hospital, Tribhuvan University, Kathmandu; (4) Kanti Children's Hospital, Kathmandu; (5) Bhaktapur Cancer Hospital, Bhaktapur; (6) Teaching Hospital, B. P. Koirala Memorial Institute of Health Sciences; (7) Teaching Hospital, Manipal College of Medical Sciences, Pokhara.

transformed into discrete choice setup. Using the existing guidelines and with the help of an experienced professor, orthogonal design of the choice experiment and several versions of the questionnaire were created. The initial draft of the questionnaire was sent to the coordinators of our collaborator in the field, Dhulikhel Hospital, Kathmandu University Hospital, for their comments and suggestions. The chairman and coordinating doctors of Dhulikhel Hospital gave their inputs on the questionnaire which was then tested among cancer patients of Bhaktapur cancer hospital for its length and transparency. The questionnaire was finalized after incorporating the suggestions from pilot testing. Two institutional review boards: IRB of University of New Mexico, USA; National Health Research Council, Nepal, thoroughly scrutinized the survey and granted permission to undertake it.

B.3: Hiring and Training of Enumerators

Initially five enumerators (including one lead enumerator who coordinated with other four) were selected through personal interviews to take part in the survey. Keeping in view the work load, the amount of time the enumerators were taking to finish the survey, and the target sample size, two more enumerators were hired later. The enumerators underwent a thorough training provided by the UNM student investigators including me, who were in Nepal for the duration of data collection process. The training sessions ensured that all the enumerators were uniform in their understanding of the questions and in their language while communicating with the patients. The training focused on two main areas: Survey Details and Survey Protocol. UNM investigators with the help of lead enumerator educated other enumerators about survey details covering survey introduction and survey questions. The training continued for 2-5 days. During training, enumerators were asked to interview (aloud) each other and fill out the questionnaire. I, as a student investigator and field supervisor, made sure that enumerators understood and asked the questions correctly. This exercise greatly helped enumerators gain familiarity with the questions, increased their speed and accuracy, and eliminated confusions. The training was also imparted to instruct enumerators the process of conducting the survey. Since, multiple versions of the survey were available, and each version contained different sets of discrete choice experiment therefore, during instruction, I clearly conveyed instructions on how to pick version number of questionnaire and who to include in the survey.

B.4: Instructions for Enumerators

For successful completing, it is extremely important that enumerators follow the set guidelines. Below are a few of the instructions that were provided to enumerators for compliance:

5.1.a.i. Every day before going to the hospital for survey, make sure that:

  a. you have correct versions of the survey
  b. the survey pages are not missing, and everything is legible
  c. you have all necessary materials (pens, water bottles, snacks, etc.)
  d. you have gifts for the respondent.

5.1.a.ii. Before asking questions, enumerators should:

  a. introduce themselves
  b. explain purposes of the study
  c. proceed if necessary conditions are met, such as respondent must be older than 18 years of age, and not severely disabled, etc.

5.1.a.iii. During the survey

a. enumerators should keep in mind the Likert Scale of different questions. For a few questions, the Likert scale procced in reverse fashion.

b. for discrete choice experiment, make sure you understand the choice set very well and be able to explain it clearly. The pictures are also available in a choice set for those who are illiterate or feeling difficult to converse.

c. distinguish check box answers from fill-in answers, and write legibly where required.

d. present/convey all answers choices available for a question to the respondent. Do not just ask an open ended question when it is actually a close-ended question.

5.1.a.iv. at the end of the day, hand over all the filled survey booklets to the lead investigator (Niharika Jha). I will work with her in compiling the data. My goal is to computerize the data every day to ensure clarity and highlight corrections or revisions.

5.1.a.v. you goal is to collect quality information. During the survey, do not just assume information based on your intuition (unless it is too obvious like if a patient is *confined to bed*, etc.) and write on your own. Ask all questions.

5.1.a.vi. since cancer patients are already in distressing situation, cordially greet the person at the onset, and remain diplomatic and amicable during the survey.

5.1.a.vii. stay neutral and respectful to all respondents.

5.1.a.viii. do not influence respondents answers through your actions or any verbal or non-verbal way. Do not put words in their mouth, allow them first to finish. Listen carefully while they are answering.

5.1.a.ix. communicate with me and among each other if you have any problem.

B.5: Focus Group

Before proceeding to actual field survey, we needed respondents opinions about survey questions and Likert scale of answers. The survey contains questions on very sensitive and sometimes conflicting topics such as domestic life of women. We needed advice on framing those questions in such a way that serves dual purpose of getting necessary information without hurting any respondent’s feelings.

In doing so, we gathered about 8-10 participants including the enumerators and discussed the survey with them. During this discussion, our focus was to converse on the general theme of the survey, and our information elicitation approach. Participants provided valuable feedback mostly on general health questions, social and domestic life, quality of life and discrete choice experiment, which was subsumed in the survey to produce a final version.

B.6: Debriefing

In addition to focus groups, we conducted debriefings not only with patients but also with oncologists and general physicians working in cancer and general hospitals. During this one-to-one talk, we asked and discussed same survey questions. Doctors, particularly, in this informal discussion explained in details different stages of cancer and how the patients feel, based on their experience. They advised on a few question’s answer categories and how to correctly ask to elicit important information. Considering their advice, we revised a few questions.

B.7: Pre-tests

After revising the questions based on debriefing and focus group, a final draft of the survey was created. Thirty cancer patients were randomly selected for pre-testing. Enumerators asked the questions and filled out the questionnaire. Initial analysis of the data revealed anomalies primarily in the discrete choice experiment section of the survey. Length of the survey and time the enumerators took to ask and fill the questionnaire was another trouble that needed attention and redressal. To remedy these problems, we again conducted debriefings with patients. We specifically asked respondents reason of choosing certain alternative to get a deep understanding of their thought process (Dr. Jennifer Thacher's advice). After necessary revisions, a second round of pre-testing was administered, that removed the irregularities emerged after the first round.

B.8: Final Survey

Upon the successful completion of pre-tests and making necessary adjustments, enumerators were sent out to conduct the final survey in cancer hospitals of Nepal. At times, two teams were formed to simultaneously carry out the survey in two hospitals. Each enumerator was responsible for conducting at least six interviews per day (30-45 minutes per patient).

Appendix C: Details of 2017 Survey

Dr. Veeshan Rayamajhee and I were student investigators for this survey. I was involved in the survey design process; however, he [Rayamajhee], as a field supervisor, managed the survey on-ground. I gleaned the administration process from his dissertation (pages 174-181).

C.1: Instructions for Enumerators

Enumerator Mantra:

During the final survey, it is very important to ensure that the survey guidelines are followed.

1. Every day before going to the community for survey, make sure that:
   - you have marked household numbers in each survey booklet. Each enumerator is assigned to complete at least 102 surveys. First enumerator will be given numbers from 1 to 102, second will be given 103 to 204, third will be given 205 to 306, fourth will be given 307 to 408, fifth will be given 409 to 510 and so

     forth. will get numbers from
   - received random bids that I will supply and fill out the numbers in each survey

     booklet.
   - the survey pages are not missing and everything is legible.
   - you have all necessary materials (pens, water bottle, snacks).
   - you have gifts for the household (if applicable).
2. Before proceeding to ask survey questions, enumerators should:
   - Introduce themselves

     "We are working on a survey study project conducted by Nepal Study Center at the University of New Mexico (USA), facilitated by Kathmandu University Hospital. A group of UNM students have been working in Bahunepati right after the 2015 earthquake in the construction of a Women's Community Center.")

  - Explain the purpose of our study:
    - Assessment of the earthquake impacts in the wellbeing (wealth, health, food security, and perception) of Bahunepati households
    - Evaluate what helps in the long-run recovery of earthquakes and similar natural disaster shocks. What helps and what doesn’t?
    - Evaluate the feasibility of weather indexed micro-insurance program, effectiveness of women’s community center programs.

3. During the survey,
  - You should have already developed a thorough understanding of the survey questionnaire. Examples of things that that enumerators should keep in mind:
    - Likert scale (e.g. you should be able to distinguish *very likely* from *likely* and be able to explain it well to the household representative. One way of doing that is to first explain them what these scales mean and them ask them for a number. That way, the likelihood of enumerator’s influencing the survey is diminished)
    - For section C (Willingness to Pay for Weather-indexed Micro-insurance), make sure you understand the program/package very well and be able to explain it. Before proceeding to ask any questions about the micro-insurance, make sure that the

respondent has a clear understanding of the coverage (items that are covered: paddy, cows, buffalos, etc), payoffs (how much households will receive), and how and when the payoffs will be disseminated (e.g. rainfall index).

- Make sure to distinguish check box answers from fill in answers.
- For each question, give them all the options. DO NOT just ask open ended questions when there are answer choices and pick the applicable boxes. Variation is important (e.g. if the answer is ‘certain,’ make sure to ask how certain: ‘certain’ versus ‘highly certain.’ This distinction is important.)
- **Remember to map out the locations of your survey. Each chowk and route should be labeled. If the data shows major anomalies or confusion, this allows us to backtrack houses and confirm responses.**

4. After collecting data, make sure that you have handed in all survey booklets to the lead enumerator (Aashish). I will work with him in compiling data. My goal is to enter the data every day to ensure clarity and allow revisions and corrections.
5. Your primary goal is to collect **quality** data from the households, *do not assume information* about the households and fill it out on your own (unless it is too apparent like the type of roof, floor).

  - Be able to explain missing observations or anomalous ones. If you have any questions, please please call me right away (Veeshan: **9818687343**).
  - Respondents may find it difficult to answer some questions relating to income, loans, etc. Be polite and ask them to provide rough estimates if they are not sure. Do not pressure them to answer uncomfortable questions. Use your judgment.

6. Since missing observations can hinder research, try to be as thorough as possible. Be diplomatic and amicable.
7. Be respectful and neutral to all the respondents.
8. Do not influence respondents' answers; do not show any kind of verbal and non-verbal sign towards their response, and most importantly read the questions just the way it is and listen carefully.
9. Follow the protocol: especially the right-hand rule of randomization.
10. Be a team player. Collaborate, not compete!
11. **Communicate** with me and among each other. Share your numbers. Mine is **9818687343** (Veeshan).

C.2: Sample Selection

To facilitate a proper pre-post analysis, we stratify data collection process according to the following distribution based on the 2014 data as well as sample size computation rules. Compared to the 2014 data, we will oversample.

Ward No.	**Sample Size (Frequency)**	**2014 Sample Size**	**Percent**	**Cumulative Percent**
1	30	20	5.68	5.68
2	91	65	18.47	24.15
3	36	25	7.10	31.25
4	70	49	13.92	45.17
5	70	49	13.92	59.09
6	48	34	9.66	68.75
7	30	20	5.68	74.43
8	51	36	10.23	84.66
9	77	54	15.34	100.00
Other	503	352	-	-

C.3: Random Route Sampling

In order to select households for the survey, we will employ a Random Route Sampling method using the conventional "right hand rule." Step-wise explanation of the process, based on EU-MIDIS (2009) is as follows:

1. From each ward (smallest population sub-administrative unit), we will select a specific percentage of houses (refer to section 6) and enumerate house numbers. The percent number is decided based on the population of each ward and our desired sample size. If possible, we will acquire this information from the local Village Development Committee office.
2. Record the GPS location of each house (or simply map out the survey area) chosen to be in the sample, based on simple proportional sampling. This will help speed up the data collection process.
3. Go to the main chowk (central town) of each ward. Pick a random point as a starting point. Stand facing one direction, say North, and start walking towards your right on the right side of the street/path without crossing the street. Pick your sampling houses from the same direction. In doing so, we record every 3rd house (then 6th, then 9th) or 2nd (then 5th, then 8th) and so on.

Follow the process until you approach the end of the path. Then, turn and perform the process using the right-hand rule again.

4. If we fail to acquire required sample size in the first round, we walk back to the main chowk where we started. This time, we turn to a different direction, say South, and repeat the same process.

C.4: Hiring and Training of Enumerators

Five enumerators (including one lead enumerator who will coordinate the other four) will be hired and trained. The training will focus on two areas:

- Survey Details. The lead investigator will educate enumerators on the survey details covering:
  - Survey Introduction: objective, hypotheses and relevance
  - Survey Questions: Enumerators will be asked to interview (aloud) each other and fill out the survey. This will help them gain familiarity with the survey materials and eliminate any confusion or discrepancies that may exist.
- Survey Protocol: How should the enumerators proceed to conduct the survey? We will discuss the right-hand rule and randomization, and the risks associated with not following the rule.
- Discussions about accommodation and stipend for enumerators.

Materials Required:

1. Nepali survey- 6 copies
2. English survey- 6 copies
3. Survey protocol- 6 copies

C.5: Focus Group

A group of 8-10 participants will be brought to a place for the focus group study. This will be a round table type discussion that will speak on the key issues of the survey. The lead investigator will guide the discussion, but the primary focus of this event will be to get appropriate feedback on the survey's general theme and our information elicitation approach. Three major points will be covered:

- 2015 earthquake shock and recovery (three dimensions-economic, health, psychosocial)
    - Are there other dimensions of wellbeing that are relevant?
    - Are the existing ones irrelevant?
    - Are they redundant?
- Coping Strategies
    - Are the coping strategies listed in the survey pertinent to the specific context of Sindhupalchok and peripheral areas?
    - Are there other strategies that are more prevalent? More effective?
    - Is social capital enhancement an effective coping strategy?
- Pre-post-Earthquake Impact Study:
    - Impacts on health status, food security, domestic violence, social capital.
- Weather-indexed micro-insurance and willingness to pay
    - Familiarity with micro-insurance and applicability.
    - Is the scheme clear?
- Women's Community Center uses

Moreover, other questions that will be discussed are:

- Are there other forms of social capital that exist in Bahunepati?

Based on the feedback from the survey, appropriate revisions will be made to the questionnaire. *The objective is to confirm if the issues that the survey tries to address align with the ground reality of the area.*

Note: Enumerators MUST attend the focus group discussion to ensure thorough understanding of the issues from the respondents' perspectives. The focus group discussion will last for approximately two hours.

Materials required:

- Survey Questionnaire (6-8 copies)

C.6: Debriefing

Debriefing is conducted in one-to-one interview with household respondents. The purpose will be to reexamine the survey based on the outcomes of the focus group discussions and make necessary revisions to the survey questionnaire. If the findings from debriefing is contradictory to the focus group results, it will force us to go back to the drawing board and reconcile the differences. The debriefing can be formatted as an informal talk, which may include all the questions as well as the additional questions relating to the study. Same questions that were asked during the focus group discussions can be repeated. After repeatedly asking similar questions to people at different locations, the final questionnaires can be finalized. The first debriefing may be conducted back to back with focus group discussions or steps 2 and 3 may be combined into one.

Samrat's advice: Debriefing can be conducted by just reading each question out aloud slowly or asking people to look at the survey and read each question. This will give us an idea of how long the survey will take and whether (or not) people understand every question.

C.7: Pre-tests

Based on the feedback from 2 and 3, a final survey draft should be created. Then, a set of 30 households should be picked randomly to test the survey instruments. If the results reveal anomalous or lopsided results (everyone saying yes or no while expressing their preferences) or if they object to certain stipulation in the question, then a second round of debriefing should be done and some adjustments should be applied. Then, a second round of pretest should be conducted (~30 households). A final draft of the survey will be decided before sending out enumerators for the final survey.

C.8: Final survey

Upon the successful completion of pre-tests and making necessary adjustments, enumerators will be sent out to conduct the final survey. Each enumerator is responsible for conducting at least six interviews per day (30-45 minutes per household).

Appendix D: 2018 Survey Questionnaire-English

Health, Wellness and Quality of Life Choice Preference Study of the Cancer Patients of Nepal: A Discrete Choice Experiment

Namaskar, I am [Enumerator's name: ....] from the Nepal Study Center at the University of New Mexico, USA. We are conducting a research survey to examine the health, wellness and quality of life of cancer patients in Nepal. The survey will take approximately 30 minutes.

You will be asked a series of questions to understand the importance of different factors of quality of life, the treatment available to improve those factors, your willingness to pay the cost associated with the treatment, and the trade-off between quality and length of life. Some questions in this survey may cause you to feel slightly uncomfortable. Some questions will be Yes/No, while some questions ask you to choose one of different options. Some questions in this survey may cause you to feel slightly uncomfortable. In such cases, you may refuse to answer any individual question. Through this, we can analyze the importance of different factors of quality of life, and this will help us in recommending policies on how to improve the quality of life of cancer patients.

All of your responses will be *anonymous.* Only the researchers involved in this study and those responsible for research oversight will have access to the information you provide. Your responses will be handwritten and stored securely at the research facility at Nepal Study Center in the University of New Mexico. Your responses will be numbered and coded, and your name will not be on any documents. The coding will be used on all your documents, but will not connect to your name. So while we know from the record of your verbal consent that you participated in this research study, no data will be linked to you. The primary surveys will be stored in a locked safe until coding.

Participation in this study is completely voluntary. You are free to decline to participate, to end participation at any time for any reason, or, again, to refuse to answer any individual question. Refusing to participate will involve no penalty or loss of benefits to which you are otherwise entitled.

Thank you for participating in this study.

Do you want to participate in the survey? *(Tick one)*

1. Yes (Proceed) ☐
2. No (Quit) ☐

Hospitals *(Tick one)***:**

1	Bhaktapur	
2	Bir	
3	Dhulikhel	
4	Bharatpur	
5	NCHRC	

1. Are you 18 years or older? *(Ask if respondent looks very young)*

18 years or older	1. (Start the Survey)
Less than 18 years old	2. Can't include in the survey

To be filled by enumerators

SURVEY VERSION:

Date of Interview: ___/___/2018____ (dd/mm/yyyy) e.g. 19 September 2017

Enumerator's Name: .... Enumerator's Signature: …………..

About the respondent:

Full Name: Mr./Mrs./Miss..

Address *(If address not known, any famous place around the house):*: ....

Contact no. ....

City: ……………………………………….

VDC or Municipality: ………………………

Ward #: …………………………………

District: ……………………………………

A. GENERAL HEALTH STATUS

First of all, I would like to ask you some questions about your general health status. Please answer these questions as accurately as possible.

1. Is the patient Inpatient or Outpatient?

   a. Inpatient (1) ☐
   b. Outpatient (2) ☐

2. Does the patient know he/she has Cancer? *(Tick one)*

   a. Yes (1) ☐
   b. No (2) ☐

2. When was the cancer first diagnosed? *(Record the time)*

   a. __________Years (1)
   b. __________Months (2)
   c. __________Weeks (3)

3. What type of disease do you have? *(Tick one)* ***To enumerator: If patient doesn't know he has cancer, ask the following questions to the attendant or see the patient file, if allowed.***	1	Cancer	
	2	Diabetic	
	3	Blood pressure	
	4	Mental disorder	
	5	Epilepsy	
	6	Asthma	
	7	Others (*Please specify*) ……………………………………	

4. What type of cancer do you have? *(Tick one)* ***To enumerator: If patient doesn't know he has cancer, ask the attendant or see the patient file, if allowed.***	1	Lung	
	2	Breast	
	3	Stomach & Esophageal	
	4	Head &Neck & Brain	
	5	Cervix Uteri	
	6	Trachea	
	7	Colon and rectal	
	8	Prostate	
	9	Bladder	
	10	Oral & nasopharynx	
	11	Others (*Please specify*) ……………………………………	

5. Why did you think cancer must have caused to you? *(Tick all that apply)* ***To enumerator: Ask for every single option, if they say yes, then tick it. But all the options should be presented to them.***	1	Genetics	
	2	Tobacco / Smoking	
	3	Diet and Physical activity	
	4	Sun and UV exposure	
	5	Because of my wrongdoings	
	6	Contagious –I got it from someone	
	7	Other reasons	
	8	Don't know	

6. What are the other major health diseases do you have apart from cancer? *(Tick all that apply)* ***To enumerator: Ask for every single options, if they say yes, then tick it. But all the options should be presented to them.***	1	Diabetic	
	2	Blood pressure	
	3	Mental disorder	
	4	Epilepsy	
	5	Asthma	
	6	Heart Disease	
	7	COPD	
	8	Alzheimer	
	9	Others (*Please specify*) ……………………………………	
	10	None	

B. VALUING LIFE

Now, I would like to ask you some questions about the quality and length of life. This will allow us to understand patient's preferences for quality and length of life. Please answer the following questions as accurately as possible.

7. On the following 5-point scale, please rate the importance of quality of life? *(Tick one)*

   d. Very Important (5) ☐
   e. Important (4) ☐
   f. Moderately Important (3) ☐
   g. Slightly Important (2) ☐
   h. Not Important at all (1) ☐

8. On the following 5-point scale, please rate the importance of length of life? *(Tick one)*

   a. Very Important (5) ☐
   b. Important (4) ☐
   c. Moderately Important (3) ☐
   d. Slightly Important (2) ☐
   e. Not Important at all (1) ☐

9. Please state your preference for quality of life vs length of life by choosing one of the following options? *(Tick one)*

   a. Quality of life is all that matters (5) ☐
   b. Quality of life is more important (4) ☐
   c. Both are equally important (3) ☐
   d. Length of life is more important (2) ☐
   e. Length of life is all that matters (1) ☐

C. DOMESTIC LIFE OF WOMEN SUFERING FROM CHRONIC ILLNESSES

ONLY FEMALE QUESTIONNAIRE: IF GENDER of the respondent is MALE, skip this section and go to module D

> Now, I would like to ask you some questions about your domestic life since you were detected with your medical condition and before that. This will allow us to understand if having chronic illnesses have a healthy domestic life or not. Please answer the following questions as accurately as possible.

Section I

Now start asking questions to the patient

10. Is your husband alive?	YES (1)	NO (2)

If No, then skip to Section II

Enumerators, answer this yourself:

11. Is patient answering in privacy or her husband is present?	YES (1)	NO (2)

12. Do you currently live with your husband?	YES (1)	NO (2)

13. What is your husband's education level?

a. No formal Schooling ☐

b. Grades 1-5 ☐

c. Grades 6-8 ☐

d. Grades 9-12 ☐

e. Bachelors ☐

f. Masters or other professional ☐ degree

g. Others *(Please specify)* ……………………….

14. (Does/did) your (last) husband/partner ever do any of the following things to you in last 12 months?	OFTEN(1) ☐	SOMETIMES(2) ☐	NOT AT ALL(3) ☐
a) push you, shake you, or throw something at you?	☐	☐	☐

b) slap you?	☐	☐	☐
c) twist your arm or pull your hair?	☐	☐	☐
d) punch you with his fist or with something that could hurt you?	☐	☐	☐
e) kick you, drag you or beat you up?	☐	☐	☐
f) try to choke you or burn you on purpose?	☐	☐	☐
g) threaten or attack you with a knife, gun or any other weapon?	☐	☐	☐
h) physically force you to have sexual intercourse with him even when you did not want to?	☐	☐	☐
i) force you to perform any sexual acts you did not want to?	☐	☐	☐

15. Did the following ever happen as a result of what your (last) husband/partner did to you:	YES(1)	NO(2)
a) You had cuts, bruises or aches?	☐	☐
b) You had eye injuries, sprains, dislocations or burns?	☐	☐
c) You had deep wounds, broken bones, broken teeth, or any other serious injury?	☐	☐

16. Has your partner ever physically assaulted you?	YES(1) ☐	NO(2) ☐

If NO, then jump to 18

17. If yes, are the physical assaults increased since you were detected with medical condition? *(please check (✓) one box)*	STRONGLY AGREE(1)	AGREE(2)	STAYED THE SAME(3)	DISAGREE(4)	STRONGLY DISAGREE(5)
	☐	☐	☐	☐	☐

18. (Does/did) your husband/partner drinks alcohol?	OFTEN(1) ☐	SOMETIMES(2) ☐	NEVER(3) ☐

Section II

19. Has anyone in your family (except husband) ever physically assaulted you after the medical condition was detected?	YES (1) ☐	NO (2) ☐

If YES, who tried to physically assault you?

a. Children
b. In-laws
c. Own Parents
d. Siblings
e. Others (please specify) …………......

If answered NO for questions 14-19 then skip question 20

20. Thinking about what you yourself have experienced among the different things we have been talking about, from whom have you ever tried to seek help to stop (the/these) person(s) from doing this to you again? Anyone else? RECORD ALL MENTIONED.	NEVER SOUGHT HELP	☐
	OWN FAMILY	☐
	HUSBAND/LIVE-IN PARTNER's FAMILY	☐
	CURRENT/LAST/LATE HUSBAND/ LIVE-IN PARTNER	☐
	CURRENT/FORMER BOYFRIEND	☐
	FRIEND	☐
	NEIGHBOR	☐
	RELIGIOUS LEADER	☐
	DOCTOR/MEDICAL PERSONNEL	☐
	POLICE	☐
	LAWYER	☐
	SOCIAL SERVICE ORGANIZATION	☐
	OTHER (SPECIFY)________________	☐
	COMMENTS by the respondent:	

Now, I would like to ask you some questions about your role in your household. This will allow us to understand how women having chronic illnesses handle their household decisions. Please answer the following questions as accurately as possible.

21. Who usually decides how the money you earn will be used?	WIFE ALONE(1) ☐	JOINTLY(2) ☐	ANYONE ELSE(3) ☐	HUSBAND ALONE ☐
22. Who usually decides how your (husband's/partner's) earnings will be used	WIFE ALONE(1) ☐	JOINTLY(2) ☐	ANYONE ELSE(3) ☐	HUSBAND ALONE ☐
23. Who usually makes decisions about health care for yourself	WIFE ALONE(1) ☐	JOINTLY(2) ☐	ANYONE ELSE(3) ☐	HUSBAND ALONE ☐
24. Who usually makes decisions about making major household purchases?	WIFE ALONE(1) ☐	JOINTLY(2) ☐	ANYONE ELSE(3) ☐	HUSBAND ALONE ☐
25. Who usually makes decisions about visits to your family or relatives?	WIFE ALONE(1) ☐	JOINTLY(2) ☐	ANYONE ELSE(3) ☐	HUSBAND ALONE ☐
26. Would you say that using contraception is mainly your decision, mainly your (husband's/partner's) decision, or did you both decide together?	WIFE ALONE(1) ☐	JOINTLY(2) ☐	ANYONE ELSE(3) ☐	HUSBAND ALONE ☐

D. QUALITY OF LIFE PREFERENCE: CHOICE EXPERIMENT[45]

Note to Enumerators: Please explain to patients that, in this section, we are conducting a choice experiment to measure the preferences of patients towards different dimensions of quality of life. Please explain different dimensions of quality of life and the treatment that hospital wants to introduce including its effects.

Introduction:

In this section, we are interested in learning the quality of life choice preferences of patients. Quality of life of patients is assessed by different factors: Pain, Depression, Mobility, Self-Care, and Usual-Activities. The hospital wants to introduce a treatment that affects the quality of life of patients by reducing pain and depression, increasing mobility, self-care, and usual activities. The treatment involves giving medicines, therapy, counselling, and care-giver services that affect different factors of quality of life. The treatment improves the quality of life of patients; however, it does not affect the expected probability of survival.

D.1 Pain:

Patients suffer from pain. It can affect their enjoyment of life from moderate to severe extent. The treatment involves pain medicine, therapy for reducing pain from extreme-pain to no-pain.

27. What is your current level of pain? *(Tick one)*

a. No-Pain (1) ☐
b. Moderate-Pain (2) ☐
c. Extreme-Pain (3) ☐

28. How important, do you think, is reducing the pain of patients? (*Tick one*)

a. Very Important (5) ☐
b. Important (4) ☐
c. Moderately Important (3) ☐
d. Slightly Important (2) ☐
e. Not Important at all (1) ☐

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[45] https://euroqol.org/wp-content/uploads/2016/09/EQ-5D-5L_UserGuide_2015.pdf

D.2 Depression:

Patients suffer from mental anxiety and depression. It does influence patient’s quality of life. The treatment involves counselling services for reducing the depression from extreme-depression to no-depression.

29. What is your current level of depression? *(Tick one)*

a. Not depressed at all (1) ☐
b. Moderately depressed (2) ☐
c. Extremely depressed (3) ☐

30. How important, do you think, is reducing the depression of patients? *(Tick one)*

a. Very Important (5) ☐
b. Important (4) ☐
c. Moderately Important (3) ☐
d. Slightly Important (2) ☐
e. Not Important at all (1) ☐

D.3 Mobility:

Medical condition affects the mobility of the person. Sometimes, it affects the mobility to a moderate extent and patients can walk with some support; however, sometimes, patients are totally confined to bed and they can't even walk. The treatment provides care-giver services and therapy services that can help patient move.

31. What is your current level of mobility? *(Tick one)*

a. I can walk and run (1) ☐
b. I can walk with some support (2) ☐
c. I am unable to walk (3) ☐

32. How important, do you think, is improving the mobility of patients? *(Tick one)*

a. Very Important (5) ☐
b. Important (4) ☐
c. Moderately Important (3) ☐
d. Slightly Important (2) ☐
e. Not Important at all (1) ☐

D.4 Self-Care:

Self-care involves patients performing activities, such as: eating, drinking, dressing, washing, etc. by himself. In some cases, cancer patients can perform self-care activities with difficulty, while in other cases, patients can't perform such activities and need an outside assistance. The treatment provides an outside assistance in the form of a care-giver who will help or perform patient's self-care activities.

33. Please tell me about your current level of performing self-care activities? (*Tick one*)

   a. I have no problem doing self-care (1) ☐
   b. I have moderate problem doing self-care (2) ☐
   c. I cannot do self-care (3) ☐

34. How important, do you think, is improving the ability of a patient so that he/she can perform self-care activities by him/herself? *(Tick one)*

   a. Very Important (5) ☐
   b. Important (4) ☐
   c. Moderately Important (3) ☐
   d. Slightly Important (2) ☐
   e. Not Important at all (1) ☐

D.5 Usual-activities:

Usual-activities involves performing activities, such as outside work (bringing groceries, etc.), study, housework (cleaning, etc.), family or leisure activities. As medical condition affects the quality of life of patients, they may not be able to perform usual activities. The treatment provides an outside assistance in the form of a care-giver who will help or perform patient's usual-activities.

35. Please tell me about your current level of performing usual-activities? *(Tick one)*

   a. I have no problem performing my usual activities (1) ☐
   b. I have moderate problem performing my usual activities (2) ☐
   c. I am unable to perform my usual activities (3) ☐

36. How important, do you think, is improving the ability of a patient so that he/she can perform usual-activities by him/herself? *(Tick one)*

   a. Very Important (5) ☐
   b. Important (4) ☐
   c. Moderately Important (3) ☐
   d. Slightly Important (2) ☐
   e. Not Important at all (1) ☐

D.6 Treatment Cost:

Improving the quality of life involves improving the various components discussed above through treatment. The treatment involves medicine, therapy, counselling services, and care-giver services. To improve the quality of life, the patient or the relatives of the patient has to pay some additional cost for the treatment, apart from what has been covered by the government.

37. How much money are you or your relatives can or willing to spend in terms of your treatment? *(Record the amount in NRS)*
    __________________ NRS

38. On the following scale, describe your hardship in paying the treatment cost? *(circle one in each row).*

	No Hardship	Small Hardship	Moderate Hardship	Great Hardship
NRS 1,000	1	2	3	4
NRS 25,000	1	2	3	4
NRS 50,000	1	2	3	4
NRS 100,000	1	2	3	4
NRS 175,000	1	2	3	4
NRS 300,000	1	2	3	4
NRS 500,000	1	2	3	4
NRS 900,000	1	2	3	4
NRS 1,200,000	1	2	3	4
NRS 1,700,000	1	2	3	4
NRS 2,500,000	1	2	3	4
NRS 3,500,000	1	2	3	4

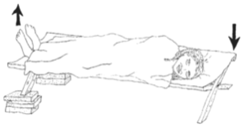
On the following pages, we will present you with different sets of alternatives and ask you to choose one.

Each time we will show you three different possible alternatives that would fulfill the task of improving the quality of life of patients on different grounds and ask which of the plans you prefer. The alternatives vary depending on the level of pain, depression, mobility, self-care, and usual-activities. Each alternative contains different levels of the afore-mentioned factors and it costs you in terms of the treatment.

You may not like either of the plans presented. Nonetheless, please choose the one you like the best (or dislike the least).

The following questions are very important, so please consider them carefully.

39. Consider the following three possible alternatives

	Alternative-A	**Alternative-B**	**Status Quo**
Pain	 No change in pain	 No change in pain	No-Change
Depression	 No depression	 No change in depression	
Mobility	 No problem	 Moderate problem	
Self-Care	 No change self-care level	 Moderate problem	
Usual-activities	 Moderate problem	 No change in usual-activities level	
Treatment Cost	NRS 175,000	NRS 1,000	NRS 0
Which alternative do you prefer? *(Tick one)*	☐	☐	☐

40. How certain are you of your choice? (*Tick one*)

Very certain (5)	Somewhat certain (4)	Neither certain nor uncertain (3)	Somewhat uncertain (2)	Very uncertain (1)
☐	☐	☐	☐	☐

41. Which attribute did you like in your recent choice of treatment alternative? *(Tick all that apply)*

a. Pain (1)	☐
b. Depression (2)	☐
c. Mobility (3)	☐
d. Self-care (4)	☐
e. Usual-activities (5)	☐
f. Treatment cost (6)	☐

42. Consider the following three possible alternatives

	Alternative-A	**Alternative-B**	**Status Quo**
Pain	 Moderate pain	 No pain	No-Change
Depression	 Moderate depression	 No depression	
Mobility	 No change in mobility	 Moderate problem	
Self-Care	 No change in self-care level	 Moderate problem	
Usual-activities	 Moderate problem	 Moderate problem	
Treatment Cost	NPR 1,000	NRS 500,000	NRS 0
Which alternative do you prefer? *(Tick one)*	☐	☐	☐

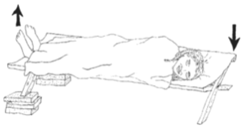
43. How certain are you of your choice? (*Tick one*)

Very certain (5)	Somewhat certain (4)	Neither certain nor uncertain (3)	Somewhat uncertain (2)	Very uncertain (1)
☐	☐	☐	☐	☐

44. Which attribute did you like in your recent choice of treatment alternative? *(Tick all that apply)*

a. Pain (1)	☐
b. Depression (2)	☐
c. Mobility (3)	☐
d. Self-care (4)	☐
e. Usual-activities (5)	☐
f. Treatment cost (6)	☐

45. Consider the following three possible alternatives

	Alternative-A	**Alternative-B**	**Status Quo**
Pain	 No pain	 Moderate pain	No-Change
Depression	 No change in depression	 No depression	
Mobility	 No problem	 Moderate problem	
Self-Care	 No change in self-care level	 No problem	
Usual-activities	 Moderate problem	 No change in usual-activities level	
Treatment Cost	NRS 1,000	NRS 50,000	NRS 0
Which alternative do you prefer? *(Tick one)*	☐	☐	☐

46. How certain are you of your choice? (*Tick one*)

Very certain (5)	Somewhat certain (4)	Neither certain nor uncertain (3)	Somewhat uncertain (2)	Very uncertain (1)
☐	☐	☐	☐	☐

47. Which attribute did you like in your recent choice of treatment alternative? *(Tick all that apply)*

a. Pain (1)	☐
b. Depression (2)	☐
c. Mobility (3)	☐
d. Self-care (4)	☐
e. Usual-activities (5)	☐
f. Treatment cost (6)	☐

E. EMOTIONAL STATUS

Now, I would like to ask you some questions about the behavior and thinking pattern that suggests the presence of depression in past two weeks of time. This will allow us to understand if patients have any symptoms related to depression. Please answer the following questions as accurately as possible.

The Patient Health Questionnaire (PHQ-9)

Over the past 2 weeks, how often have you been bothered by any of the following problems?	Not at all	Several days	More Than Half of the Days	Nearly Every Day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed or hopeless	0	1	2	3
3. Trouble falling asleep, staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself – or that you're a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or, the opposite – being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3
Column Totals		______ +	______ +	_____
Add Totals Together		____________________		

10. If you checked off any problems, how difficult have those problems made it for you to; Do your work, take care of things at home, or get along with other people?

☐ Not difficult at all ☐ Somewhat difficult ☐ Very difficult ☐ Extremely difficult

F. SOCIAL LIFE

Now, I would like to ask you some questions about your social life that suggests the level with which you are happy with your social life. Please answer the following questions as accurately as possible.

		Yes (1)	More or less (2)	No (3)
1	There is always someone I can talk to about my day-to-day problems? *(please check (✓) one box)*	☐	☐	☐
2	I miss having a really close friend? *(please check (✓) one box)*	☐	☐	☐
3	I experience a general sense of emptiness? *(please check (✓) one box)*	☐	☐	☐
4	There are plenty of people I can lean on when I have problems? *(please check (✓) one box)*	☐	☐	☐
5	I miss the pleasure of the company of others? *(please check (✓) one box)*	☐	☐	☐
6	I find my circle of friends and acquaintances too limited? *(please check (✓) one box)*	☐	☐	☐
7	There are many people I can trust completely? *(please check (✓) one box)*	☐	☐	☐
8	There are enough people I feel close to? *(please check (✓) one box)*	☐	☐	☐
9	I miss having people around me? *(please check (✓) one box)*	☐	☐	☐
10	I often feel rejected? *(please check (✓) one box)*	☐	☐	☐
11	I can call on my friends whenever I need them? *(please check (✓) one box)*	☐	☐	☐
12	Do you participate in any support groups? For e.g. Nepal Cancer Relief Society, Nepal Cancer Support Group etc.	NEVER(1) ☐	SOMETIMES(2) ☐	ALWAYS(3) ☐

G. PATIENT-CENTERED COMMUNICATION AND ENHANCED ACCESS TO CARE

Now, I would like to ask you some questions about the relationship/communication between you and your provider/doctor. This communication is used to find out the quality of care you are getting or the improvements that need to be made in them. Please answer the following questions as accurately as possible.

1. How difficult is it to get to usual source of care?	VERY DIFFICULT(1) ☐	SOMEWHAT DIFFICULT(2) ☐	NOT TOO DIFFICULT(3) ☐	NOT AT ALL DIFFICULT(4) ☐
2. How difficult is it to contact usual source of care after hours?	VERY DIFFICULT(1) ☐	SOMEWHAT DIFFICULT(2) ☐	NOT TOO DIFFICULT(3) ☐	NOT AT ALL DIFFICULT(4) ☐

H. DEMOGRAPHICS

In order for us to perform a detailed study, we need to know about you and your family. This will help us know how different or similar our survey respondents are. In order to cater our project to fit the needs of this community, it is important that you answer these questions as accurately as possible.

All the survey information will be fully confidential. Your responses will be completely anonymous.

48. Gender of the respondent *(Tick one)*

   a. Male ☐

   b. Female ☐

49. Age of the respondent *(record in years)* _____________

50. Caste/ethnicity of the household head *(Tick one)*

   a. Brahmin ☐

   b. Chhetri ☐

   c. Janajati ☐

   d. Pahadi Dalit ☐

   e. Tarai Dalit ☐

   f. Others *(Please specify)* …………………………

51. Religion of the household head *(Tick one)*

☐ a. Hinduism

☐ b. Buddhism

c. Muslim ☐

☐ d. Kiratism

☐ e. Christianity

☐ f. Sikhism

g. Jainism ☐

h. Others (*Please specify*) ………………………….

52. Education level of respondent *(Tick one)*

a. No formal Schooling ☐

b. Grades 1-5 ☐

c. Grades 6-8 ☐

d. Grades 9-12 ☐

e. Bachelors ☐

f. Masters or other professional ☐ degree

g. Others (*Please specify*) ……………………….

53. What is your current marital status? *(Tick one)*

a. Never Married ☐

b. Currently Married ☐

c. Divorced ☐

d. Separated ☐

e. Widowed ☐

54. Does your household own any of the following items? *(Tick one in each row)*

Item	**Yes (1)**	**No (0)**	**How many?**
Radio/Tape/CD player	☐	☐	
Bicycle	☐	☐	
Motorcycle/scooter	☐	☐	
Fans (all kinds)	☐	☐	
Television/deck	☐	☐	
Telephone set/cordless phone/ mobile phone/pager	☐	☐	
Sewing machine	☐	☐	
Camera (still/movie)	☐	☐	
Motor car, etc.	☐	☐	
Refrigerator or freezer	☐	☐	
Washing machine	☐	☐	
Computer/Printer	☐	☐	

Now, I would like to ask you about your household income:

55. Approximately, what is your monthly income from all sources, before taxes? *(Tick one)*

a. NRS 0 ☐
b. < NRS 5,000 ☐
c. RS 5,001 to NRS 10,000 ☐
d. NRS 10,001 to NRS 20,000 ☐
e. NRS 20,001 to NRS 30,000 ☐
f. NRS 30,001 to NRS 50,000 ☐
g. NRS > 50,000 ☐
h. Don’t know ☐
i. Refused ☐

56. Approximately, what is your monthly household income from all sources, before taxes? *(Tick one)*

a. < NRS 10,000 ☐

b. NRS 10,001 to NRS 20,000 ☐

c. NRS 20,001 to NRS 30,000 ☐

d. NRS 30,001 to NRS 50,000 ☐

e. NRS > 50,000 ☐

f. Don't know ☐

g. Refused ☐

57. Is household income equal to your income? (*Tick one*)

a. Yes ☐
b. No ☐

58. How many children do you have? (Record the number) ____________
a. No. of girls (both minor and adult)__________
b. No. of boys(both minor and adult)__________

Thank you very much for your cooperation!
********************************End of Survey*******************************

Appendix E: 2017 Survey Questionnaire-English

Determinants of Household Resilience Against Natural Disaster Shocks: Evidence from Bahunepati, Nepal

HOUSEHOLD SURVEY 2017

Namaskar, I am [Enumerator's name: ....] from the Nepal Study Center at the University of New Mexico, USA. We are conducting a survey with residents of Bahunepati to assess the immediate and long-run impacts of the 2015 mega-earthquake and to investigate the determinants of household resilience against natural disaster shocks. The survey will take approximately **____** minutes.

You have been randomly selected to participate in this survey, and your household was chosen using a random selection process from a list of households in this VDC. You will be asked a series of questions, most of which have Yes/No answers, designed to understand behaviors regarding the strategies you adopted to cope with climate change and natural disaster shocks. Some questions in this survey may cause you to feel slightly uncomfortable. In such cases, you may refuse to answer any individual question. Although this study will not benefit you personally, we hope that our results will add to the knowledge about how to enhance the ability to protect your household against climate change and natural disaster shocks.

All of your responses will be *anonymous.* Only the researchers involved in this study and those responsible for research oversight will have access to the information you provide. Your responses will be handwritten and stored securely at the research facility at Nepal Study Center in the University of New Mexico. Your responses will be numbered and coded, and your name will not be on any documents. The coding will be used on all your documents, but will not connect to your name. So while we know from the record of your verbal consent that you participated in this research study, no data will be linked to you. The primary surveys will be stored in a locked safe until coding.

Participation in this study is completely voluntary. You are free to decline to participate, to end participation at any time for any reason, or, again, to refuse to answer any individual question. Refusing to participate will involve no penalty or loss of benefits to which you are otherwise entitled.

Thank you for participating in this study.

To be filled by enumerators

SURVEY VERSION: A

Date of Interview: ___________ (dd/mm/yyyy)

Supervisor's Name: .... Enumerator's Name: ....

Begin Time .... End Time ....

<u>About the respondent:</u>

Full Name: Mr./Mrs./Miss...

Respondent's Age .... (MUST be 18+)

Address: .... Contact no. ....

Name of village (VDC): ....

Ward number in VDC (1-9): .... Name of the community (Tole): ....

Household Number (HHNO): ....

Household Latitude: ....

Household Longitude: ....

Relationship of the respondent to the household head[1]: ....

1 Relation of respondent to the household head. Head=1; Husband/wife=2; son/daughter=3; grandchild=4; father/mother=5; brother/sister=6; nephew/niece=7; son/daughter-in-law=8; brother/sister-in-law=9; father/mother-in-law=10; other family relative=11

Section A: Earthquake Impact, Coping Strategies, and Recovery

In this sub-section, I am going to ask you some questions about the **2015 earthquake**. Please note that some questions pertain to immediate impacts of the earthquake, while others concern the current level of recovery.
Your answers will help us assess the immediate impacts of the earthquake as well as evaluate the determinants of long-run recovery.

1. How much do you agree with the following statements? *Please indicate the number corresponding to your level of agreement (lowest to highest number) with each of the following statements by checking (✓) the appropriate number.*

		Strongly Disagree (1)	**Disagree (2)**	**Neutral (3)**	**Agree (4)**	**Strongly Agree (5)**
i-a	My family member was injured in the disaster.	☐	☐	☐	☐	☐
i-b	My family member has recovered from the injuries.	☐	☐	☐	☐	☐
ii-a	The place I was living in was destroyed to the point where I could not live in it.	☐	☐	☐	☐	☐
ii-b	I now have permanent housing.	☐	☐	☐	☐	☐
iii-a	Immediately after the disaster, I had adequate access to food.	☐	☐	☐	☐	☐
iii-b	I now have adequate access to food.	☐	☐	☐	☐	☐
iv-a	Immediately after the disaster, I had adequate access to clean drinking water.	☐	☐	☐	☐	☐
iv-b	I now have adequate access to clean drinking water.	☐	☐	☐	☐	☐
v-a	The disaster caused me to lose my ability to earn money.	☐	☐	☐	☐	☐
v-b	I now have a job or a source of income.	☐	☐	☐	☐	☐
vi-a	The disaster prevented me from moving about my community freely, such as visiting family, friends and neighbors.	☐	☐	☐	☐	☐
vi-b	I am now able to move about my community freely, such as visiting family, friends and neighbors.	☐	☐	☐	☐	☐
vii-a	The disaster destroyed some of my personal property such as home, auto, livestock, personal effects.	☐	☐	☐	☐	☐
vii-b	I have now recovered this property or its equivalent.	☐	☐	☐	☐	☐
viii-a	The disaster caused me emotional distress (e.g. made me feel more anxious/afraid, or depressed/sad).	☐	☐	☐	☐	☐
viii-b	I have recovered emotionally.	☐	☐	☐	☐	☐
ix-a	The disaster increased my experiences with violence (including physical, emotional or sexual abuse from a loved one or stranger.)	☐	☐	☐	☐	☐
ix-b	I am now free from such violence.	☐	☐	☐	☐	☐
x-a	Immediately after the disaster, I was not able to participate in disaster relief, recovery or future community planning with neighbors, local leaders and/or local officials.	☐	☐	☐	☐	☐
x-b	I am now able to participate in disaster relief, recovery or future community planning with neighbors, local leaders and/or local officials.	☐	☐	☐	☐	☐

2. **Impact and Recovery Time:** Please indicate how long the earthquake impact lingered. Write down the corresponding number based on the duration scale provided:

	After the earthquake,	TIME				IF NOT RECOVERED YET, please indicate how long you expect the impact to linger.	
		Weeks	Months	Years		Months	Years
a.	We spent less on food for….						
b.	We spent less on other household goods for….						
c.	My children missed school for….						
d.	I missed work for…						
e.	Adults in my household took up extra labor for …						
f.	Children in my household worked for ….						
g.	My family was emotionally distressed for…..						
h.	My family recovered from injuries for…..						
i.	Household member left village for ….						
j.	Time to recover lost property or its equivalent for ….						
k.	Time to maintain the pre-earthquake level income for ….						

3. How did your household cope with the **2015 earthquake**? *Please check (✓) yes or no.* In what order did you adopt the strategies? Please rank accordingly. (1=first, 2=second, 3= third, 4= fourth, 5=fifth).

	Coping Strategy	**Yes (1)**	**No (2)**	**Order (1-5)**
a.	Sale/mortgage jewelry	☐	☐	
b.	Sale of utensils/appliances	☐	☐	
c.	Sale of crops	☐	☐	
d.	Sale of livestock	☐	☐	
e.	Sale of transport	☐	☐	
f.	Sale of agricultural tools	☐	☐	
g.	Sale of other items	☐	☐	
h.	Family/neighbor/patron help	☐	☐	

i.	Borrow money (from person or institution)	☐	☐	
j.	Advance labor	☐	☐	
k.	More family members in labor	☐	☐	
l.	Use of savings	☐	☐	
m.	Mobilize credit/Received loans	☐	☐	
n.	Government help	☐	☐	
o.	NGO help	☐	☐	
p.	Aid/Relief	☐	☐	
q.	Household members moved away	☐	☐	
r.	Received Remittance help	☐	☐	
s.	Other (please specify) ______________________	☐	☐	

4. If your household made any distress sale/mortgage, could you estimate the value of the distress sale/mortgage?

Rupees

5. After the earthquake, did you **TRY TO** borrow from someone outside the household or from an institution?

No, I did NOT TRY (1)	I tried but was turned down (2)	Yes, I borrowed (3)
☐	☐	☐

6. What was main reason for trying to obtaining loan? (please check (✓) all that apply)

a.	Purchase food	☐	g.	Business startup or restart capital	☐
b.	Healthcare	☐	h.	Purchase of non-farm inputs	☐
c.	Purchase household assets	☐	i.	Purchase land	☐
d.	Purchase livestock	☐	j.	Other (please specify) ______	☐
e.	Purchase agricultural inputs	☐			
f.	Rebuild house	☐			

7. If you were able to obtain a loan, from whom or which institution? (please check (✓) all that apply)

a.	Relative	☐	f.	Non-governmental organization (NGO)	☐
b.	Neighbor	☐	g.	Formal lender (bank/financial institution)	☐
c.	Grocery/Local Merchant	☐	h.	Group-based microfinance	☐
d.	Employer	☐	i.	Other (please specify) ______	☐
e.	Religious institution	☐			

8. How much was the loan?

							Rupees.

9. Is the loan repaid?

Yes (1)	No (2)
☐	☐

10. If yes, how many **months** after taking the loan did you pay it back? *Please write down the number.*

Months………………☐☐

11. If not, approximately when do you expect to pay back the loan? (please check (✓) one box)

1	In a few months	☐
2	Within a year	☐
3	2-3 years	☐
4	3-5 years	☐
5	5-10 years	☐
6	I may not be able to pay in my lifetime	☐

Now, I will ask you questions regarding natural disaster and other shocks, **NOT including the 2015 earthquake**. These questions allow us to isolate the impact of the earthquake from that of other household level shocks as well as to conduct a separate evaluation of the impacts of idiosyncratic shocks. It is important that you answer these questions as accurately as possible.

12. Has the household experienced any of the following **natural disasters** in the past two years? If you answer **YES**, also indicate how severe each disaster was.

	Natural Disaster	**Yes (1)**	**No (2)**	How severe was the impact? (1-4)	<u>Severity Scale:</u> 1: No impact 2. Low Impact 3. Medium Impact 4. High Impact
a.	Flood	☐	☐		
b.	Landslide	☐	☐		
c.	Heavy rainfall	☐	☐		
d.	Storm	☐	☐		
e.	Ice rain/snow	☐	☐		
f.	Drought	☐	☐		
g.	Extreme temperatures	☐	☐		
h.	Wildfires	☐	☐		
i.	River erosion	☐	☐		
j.	Other (please specify) ________________________	☐	☐		

13. Has the household experienced any of the following **shocks** in the past two years?

	Shock	**Yes (1)**	**No (2)**
a.	Loss of employment/business of the <u>main earner</u>	☐	☐
b.	Loss of employment of other members	☐	☐
c.	Death of the main earner	☐	☐
d.	Abandonment by the main earner	☐	☐
e.	Major illness	☐	☐
f.	Conflict/Violence	☐	☐
g.	Loss of house	☐	☐
h.	Loss of land	☐	☐
i.	Loss of durable assets (tractor, machines...)	☐	☐

j.	Loss of livestock/poultry	☐	☐
k.	Loss of crops	☐	☐
l.	Major pests	☐	☐
m.	Poor production	☐	☐
n.	Wedding/Funeral	☐	☐
n.	Other (please specify) ________________________	☐	☐

Section B: *Ex-ante* Risk Perception

In this section, we will ask you questions about your perception of earthquake and other natural disaster risks. There are no right or wrong answers. Please try your best to answer these questions as accurately as possible.

14. In general, how afraid are you of an earthquake? *(please check (✓) one box)*

1	Not afraid at all	☐
2	A little afraid	☐
3	Somewhat afraid	☐
4	Very afraid	☐
5	Extremely afraid	☐

15. In an event of a six magnitude earthquake, how much do you think your house will be threatened? *(please check (✓) one box)*

1	No damage	☐
2	Slightly damaged, livable after minor or no repairs	☐
3	Moderately damaged, livable after major repairs	☐
4	Severely damaged, not livable	
5	Totally destroyed	☐

16. In an event of a six magnitude earthquake, how much do you think your property (livestock, crops, agricultural land, etc.) will be threatened? *(please check (✓) one box)*

1	No damage	☐
2	Slightly damaged	☐
3	Moderately damaged	
4	Severely damaged	☐
5	Totally damaged	☐

17. In how many years do you think the next big earthquake will occur? *Please write down the number.*

Number of years ………….…….☐☐

18. On a scale of 1 to 10, how certain are you of your answer to the previous question? (1=highly uncertain, 10=highly certain)

Degree of Certainty (1 to 10) ……..……☐☐

19. In this area, how likely is it that the following natural disaster/ climate events will occur in the *next ten years*? *Please indicate the number corresponding to your level of perception (lowest to highest number) with each of the following natural disaster event by checking (✓) the appropriate number*

	Natural Disaster	**Almost Certainly Not (1)**	**Unlikely (2)**	**Somewhat likely (3)**	**Highly likely (4)**	**Almost Certain (5)**
a.	Flood	☐	☐	☐	☐	☐
b.	Landslide	☐	☐	☐	☐	☐
c.	Heavy rainfall	☐	☐	☐	☐	☐
d.	Storm	☐	☐	☐	☐	☐
e.	Ice rain/snow	☐	☐	☐	☐	☐
f.	Drought	☐	☐	☐	☐	☐
g.	Extreme temperatures	☐	☐	☐	☐	☐
h.	Wildfire	☐	☐	☐	☐	☐
i.	River erosion	☐	☐	☐	☐	☐
j.	Other (please specify) _________________________	☐	☐	☐	☐	☐

20. **CLIMATE CHANGE:** How likely do you think is climate change going to continue or worsen in the next 10 years if nothing is done to prevent it? *Please check (✓) one box.*

1	Not likely at all	☐
2	Somewhat likely	☐
3	Likely	☐
4	Highly likely	☐
99	I don't know	☐

21. **CLIMATE CHANGE IMPACT:** How much do you think climate change is likely to cause loss of assets and income in the next 10 years (e.g. the loss of agriculture, livestock, house, etc.) *Please check (✓) one box.*

1	No impact	☐
2	Low Impact	☐
3	Medium Impact	☐
4	High Impact	☐

22. **CLIMATE CHANGE CAUSES/ATTITUDE:** How much do you agree with the following statements? *Please check (✓) one box for each statement.*

		Strongly agree	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
a.	Deforestation can cause climate change	☐	☐	☐	☐	☐
b.	Burning fossil fuel can cause climate change	☐	☐	☐	☐	☐
c.	Applying pesticide and chemical fertilizer in agriculture can lead to climate change	☐	☐	☐	☐	☐
d.	Forest fire can cause climate change	☐	☐	☐	☐	☐
e.	Use of modern tools can cause climate change	☐	☐	☐	☐	☐
f.	Humans are responsible for climate change	☐	☐	☐	☐	☐
g.	We should do something to combat climate change	☐	☐	☐	☐	☐
h.	Climate change is God's will	☐	☐	☐	☐	☐

Section C: WILLINGNESS TO PAY FOR WEATHER-INDEXED INSURANCE

We would like to propose a hypothetical micro-insurance program designed to protect Bahunepati households from potential weather shocks. The weather-indexed Insurance product is designed to protect farmers against deficient/excess cumulative rainfall during a cropping season.
In what follows, you will be asked how much you would be willing to pay for the insurance package. Note that you this is not a real insurance program, but please answer as if it was. Also pay careful attention to the payouts, coverage, and your willingness to pay value.

A description of the policy is provided below.

- **How does it work?**

This policy protects farmers against deficient/excess cumulative rainfall during a cropping season. If there is continuous heavy rainfall for 10 days or continuous no rainfall/little rainfall for 30 days, during the crop vegetative phase (months *March* to *June* and *July* to *November* after sowing), a payout would be made to the farmers. In order to make the amount of rainfall more objective and easier to measure, the rainfall data is based on the record of the closest weather station to your village instead of the rainfall on your fields. (Standard: "if the rainfall for any 10 consecutive days is cumulatively above 120 millimeters or any 30 consecutive days is cumulatively below 10 millimeters")

- **What does it cover?**

In additional to paddy, the insurance also covers livestock. In total, it covers paddy, buffaloes, cows, goats, chicken and ducks.

- **What is the payout?**

NRs. 10000 per ropani insured, NRs. 8100 NPR per cow insured, NRs. 26000 per buffaloes insured, NRs. 3800 per goat insured, and NRs. 380 per poultry (including ducks and chicken) insured.

- **When will I get paid?**

Payment would be made to farmers for paddy as long as the weather meets the requirement described in the coverage. As to livestock, payment would be made after evaluation of damage by experts from agriculture office. It's according to the number of dead livestock due to the bad weather.

23. Do you have any questions about the insurance package?

Yes (1)	No (2)
☐	☐

Enumerator: If the answer is **NO**, please make sure to explain the insurance package carefully AGAIN before proceeding.

Instructions to enumerator: The follow up question should be asked carefully.

- Pick the randomly generated bid value from the list provided. (Note: Before the survey, each enumerator will be asked to fill in randomly selected bid values in the survey).
- Ask **Question#24** with the random bid value.
- If the answer is YES, go to the next HIGHER bid value and ask Question#3.
- If the answer is NO, go to the next LOWER bid value and ask Question#3.

Here are the bid amounts (per year):

Nrs. _____ _____ _____ _____ _____ ______

Examples

1) A respondent was asked if she would pay 200 Nrs for the insurance and she said **yes**. Then you should ask if she would pay 500 (the next higher amount).

2) A respondent was asked if they would pay 1000 Nrs for the insurance and he said **no**. Then you should ask if he would pay 500 (the next lower amount).

24. Would you be willing to pay NRs……….[Fill in a randomly generated bid amount] per year? *(please check (✓) one box)*

Yes (1)	No (2)
☐	☐

25. What if you were instead asked to pay NRs…………[the next higher or lower bid amount]? Would you buy the weather-indexed insurance? *(please check (✓) one box)*

Yes (1)	No (2)
☐	☐

26. On a scale of 1 to 10, how certain are you of your answer to the previous question? (1=highly uncertain, 10=highly certain)

Degree of Certainty (1 to 10) ………..…☐☐

Section D: SOCIAL CAPITAL

In this section, we will ask you questions about your friends, relatives, neighbors, and your community participation. The questions in this section will allow us to generate a social capital measure and to examine its role in wellbeing. It is important that you answer these questions as accurately as possible.

Trust and Solidarity:

27. Which statement do you think is more accurate: (please check (✓) one box)

Most people can be trusted (1)	☐
You can't be too careful in dealing with people (2)	☐

28. Would you say that you can trust the following? (please check (✓) each item)

		A lot (1)	Some (2)	Only a little (3)	Not at all (4)
a.	People in your village				
b.	Strangers				

b.	The police				
c.	The army				
d.	Government officials				
e.	Politicians				
f.	News Media				

Interpersonal Relationship and Network:

29. How many close friends and relatives do you have whom you can freely share private matters, call on help, or borrow money? *Please write down the number*

No. of friends and relatives……………..…… ☐☐

30. If you suddenly needed to borrow a small amount of money to pay for expenses for your household for one week, are there people beyond your immediate household and close relatives to whom you could turn and who would be willing and able to provide this money?

1	Definitely	☐
2	Probably	☐
3	Unsure	☐
4	Probably not	☐
5	Definitely not	☐

Neighborhood cohesion:

31. How many years have you been living in this community? (please check (✓) one box)

1	Less than 1 year	☐
2	1 to 5 years	☐
3	5 to 10 years	☐
4	More than 10 years	☐

32. How frequently do you visit your friends and relatives? (please check (✓) one box)

1	Just about every day	☐
2	Several times a week	☐
3	Several times a month	☐
4	Several times a year	☐
5	Once a year or less	☐
6	Never	☐

33. How frequently do your friends and relatives visit you? (please check (✓) one box)

1	Just about every day	☐
2	Several times a week	☐
3	Several times a month	☐
4	Several times a year	☐
5	Once a year or less	☐
6	Never	☐

Groups and Networks

34. Do you or anyone in your household participate in any of the following community groups, organizations or cooperatives? (please check (✓) all that apply)

	Organization/Group	**Yes (1)**	**No (2)**
a.	Microfinance group	☐	☐
b.	Agriculture group	☐	☐
c.	Forest group	☐	☐
d.	Water group (irrigation group)	☐	☐
e.	Women’s group	☐	☐
f.	Credit group	☐	☐
g.	Civic group	☐	☐
h.	Political group	☐	☐
i.	Religious group	☐	☐
j.	Sports group	☐	☐
k.	Health/Sanitation group	☐	☐
l.	Other groups	☐	☐

35. How active would you say you are in your community, such as in local government or volunteer organizations? (please check (✓) one box)

1	Very inactive	☐
2	Somewhat inactive	☐
3	Neither active nor inactive	☐
4	Somewhat active	☐
5	Very active	☐

36. Did you vote in the last election? (please check (✓) one box)

Yes (1)	No (2)
☐	☐

Collective Action and Cooperation:

37. In the past 12 months, have you worked with others in your village/neighborhood to do
something for the benefit of the community? (please check (✓) one box)

Yes (1)	No (2)
☐	☐

38. Altogether, how many days in the past 12 months did you or anyone else in your household participate in community activities?

Number of times participated…….……..…… ☐☐

39. After the earthquake, how actively did you participate in any disaster recovery projects or programs in the community?

1	Very inactively	☐
2	Somewhat inactively	☐
3	Neither actively nor inactively	☐
4	Somewhat actively	☐
5	Very actively	☐

Section E: FOOD SECURITY

In this section, we will ask you about your food security situation. First, we will ask you about the specific food items your family has consumed in the past week. Subsequently, we want to examine the shortage of food that may be prevalent. This will allow us to understand the overall food security situation in the village.

40. Could you please tell me how many days in the past 7 days your household has eaten the following foods and what the source was (input 0 for items that were not eaten over the last 7 days).

	Food Item	a. No of days eaten the item in the last 7 days	b. Food source (write those all applied (code 1))	**Code 1: Food Source Codes:**
i.	Maize	( )	☐ , ☐ , ☐	1=Own production (crops, animal) 2=hunting, fishing 3=gathering 4=borrowed 5=purchase with wages 6=exchange labor for food 7=exchange items for food 8=gift (food) from family relatives 9=food aid (NGOs etc.) 96=Other (specify: ________________)
ii.	Rice/Paddy	( )	☐ , ☐ , ☐	
iii.	Millets	( )	☐ , ☐ , ☐	
iv.	Roots and tubers (potatoes, yam)	( )	☐ , ☐ , ☐	
v.	Wheat/Barley	( )	☐ , ☐ , ☐	
vi.	Fish	( )	☐ , ☐ , ☐	
vii.	White meat- poultry	( )	☐ , ☐ , ☐	
viii	Pork	( )	☐ , ☐ , ☐	
ix.	Red meat-goat, sheep	( )	☐ , ☐ , ☐	
x.	Red meat-Buffalo	( )	☐ , ☐ , ☐	
xi.	Eggs	( )	☐ , ☐ , ☐	
xii.	Pulses/Lentils	( )	☐ , ☐ , ☐	
xiii.	Vegetables	( )	☐ , ☐ , ☐	
xiv.	Oil/Ghee/Butter	( )	☐ , ☐ , ☐	
xv.	Fresh fruits	( )	☐ , ☐ , ☐	
xvi.	Sugar/Salt	( )	☐ , ☐ , ☐	
xvii.	Milk/Curd	( )	☐ , ☐ , ☐	

41. For the following questions, we would like to ask you how you cope with food shortage in the last 7 days. *(please check (✓) one box)*					
		Often (5 or more times) - (4)	From time to time (2 to 3 times) – (3)	Rarely (once) – (2)	Never - (1)
a.	In the past 12 months, how frequently did you worry that your household would not have enough food?	☐	☐	☐	☐
b.	In the past 12 months, how often were you or any household member not able to eat the kinds of food you/he preferred because of a lack of resource?	☐	☐	☐	☐
c.	In the past 12 months, how often did you or any household member have to eat a limited variety of foods due to a lack of resources?	☐	☐	☐	☐

d.	In the past 12 months, how often did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	☐	☐	☐	☐
e.	In the past 12 months, how often did you or any household member eat fewer meals in a day because of resources to get food?	☐	☐	☐	☐
f.	In the past 12 months, how often was there with no food to eat of any kind in your household because of lack of resources to get food?	☐	☐	☐	☐

		Yes (1)	No (2)
g.	In the past 12 months, how often did you or any household member go to sleep at night hungry because there was not enough food?	☐	☐
h.	Has any member of your household received food aid in the last 6 months?	☐	☐

Section F: DEMOGRAPHIC INFORMATION

In order for us to perform a detailed study, we need to know about you and your family. This will help us know how different or similar our survey respondents are. In order to cater our project to fit the needs of this community, it is important that you answer these questions as accurately as possible.
All the survey information will be fully confidential. Your responses will be completely anonymous.

42. How many people currently live in your household? *Please write the numbers*

a.	Total number of household members	☐
b.	Number of children (0 to 5 years)	☐
c.	Number of children (6 to 18 years)	☐
d.	Number of adults (older than 18 years)	☐
5	Number of adult with earnings	☐

43. What is your gender? (please check (✓) one box)

Male (1)	Female (2)
☐	☐

44. How old are you? *Please write the number* ☐ years old.

45. How old is the head of your household? ☐ years old.

46. What is your current marital status? (please check (✓) one box)

1	Never Married	☐
2	Married	☐
3	Divorced	☐
4	Separated	☐
5	Widowed	☐

47. What type of family do you live in? (please check (✓) one box)

1	Nuclear	☐
2	Joint	☐

48. What is your family's primary religion? (please check (✓) one box)

1	Hinduism	☐
2	Buddhism	☐
3	Muslim	☐
4	Kirat	☐
5	Christian	☐
95	Other	☐
	If other, please specify: …………………………	

49. What caste do you belong to? (please check (✓) one box)

1	Brahmin	☐
2	Chhetri	☐
3	Newar	☐
4	Janajati	☐
5	Madhesi, Tharu, Musalman	☐
6	Pahadi Dalit	☐
7	Madhesi Dalit	☐
95	Other	☐
	If other, please specify: …………………………	

50. What is the highest level of education that you have attained? (please check (✓) one box)

1	No formal schooling	☐
2	Grades (1-5)	☐
3	Grades (6-8)	☐
4	Grades (9-10)	☐
5	Grades (10-12)	☐
6	Bachelors	☐
7	Masters or other professional degrees	☐
8	Vocational training	☐

51. What is the highest level of education that the head of your household has completed? (please check (✓) one box)

1	No formal schooling	☐
2	Grades (1-5)	☐
3	Grades (6-8)	☐
4	Grades (9-10)	☐
5	Grades (10-12)	☐
6	Bachelors	☐
7	Masters or other professional degrees	☐
8	Vocational training	☐

52. What is the primary occupation of your household head? (please check (✓) one box)

1	Unemployed	☐
2	Student	☐
3	Agriculture	☐
4	Daily labor	☐
5	Self-employed (small business)	☐
6	House work	☐
7	Administrative job (government, NGOs, private firms)	☐
8	Other	☐
	If other, please specify: …………………………	

53. How close is the nearest road? *Please write down the number.*

		Hours	**Minutes**
a.	Road		
b.	Market		
c.	Hospital		
d.	School		
e.	Local administrative office		
f.	Women’s Community Center (UNM built)		

54. Does any member in your household own any of the following items? (please check (✓) yes or no)

	Items	Yes (1)	No (2)
a.	Radio	☐	☐
b.	TV	☐	☐
c.	Cellphone	☐	☐
d.	Telephone	☐	☐
e.	Bicycle	☐	☐
f.	Motorcycle/scooter	☐	☐
g.	Fan	☐	☐
h.	AC	☐	☐
i.	Sewing Machine	☐	☐
j.	Camera	☐	☐
k.	Car/motor vehicle	☐	☐
l.	Tractor	☐	☐
m.	Refrigerator	☐	☐
n.	Computer	☐	☐
o.	Inverter or solar for electricity	☐	☐
p.	Water pump	☐	☐

55. Does your household own any agricultural land? (please check (✓) one box)

Yes (1)	No (2)
☐	☐

56. How many ropani/bigha of agricultural land does your household own? *Please write down the number and choose* (✓) *the corresponding unit (1=ropani or 2=bigha).*

Ropani(1) ☐

Bigha (2) ☐

57. How many of the following animals does your household own? (Input 0 for if none owned)

a.	Goat	☐
b.	Cow/Bull	☐
c.	Sheep	☐
d.	Buffalo	☐
e.	Chicken	☐
f.	Duck	☐
g.	Pig	☐
h.	Other (specify) ______________	☐

58. Is anyone in your household working abroad? (please check (✓) one box)

Yes (1)	No (2)
☐	☐

59. Did your household receive remittances in the past 12 months? (please check (✓) one box)

Yes (1)	No (2)
☐	☐

If yes (1), please indicate amount: ☐ **Rupees.**

60. What was your total household's average monthly income (in Rupees) last year? (Please check one)

1	Less than 2000	☐
2	2001-4000	☐
3	4001-6000	☐
4	6001-8000	☐
5	8001-10,000	☐
6	10,001-15,000	☐

7	15,001-20,000	☐
8	20,001-30,000	☐
9	More than 30,000	☐
95	Do not know	☐
96	Refused to answer	☐
	If more than 100000, please specify: …………	

61. What is the main material of the floor of the dwelling?

Earth/Sand (1)	☐
Dung (2)	☐
Wood/Planks (3)	☐
Palm/Bamboo (4)	☐
Parquet/Polished Wood (5)	☐
Vinyl or Asphalt Strips (6)	☐
Ceramic Tiles (7)	☐
Cement (8)	☐
Carpet (9)	☐
Other(10)	☐

62. What is the main material of the roof of the dwelling?

Earth/Sand (1)	☐
Galvanized Iron (2)	☐
Wood/Planks (3)	☐
Straw/Thatch (4)	☐
Concrete/Cement (5)	☐
Tiles/Slate (6)	☐
Other (7)	☐

Section G: Women's Community Center

University of New Mexico's team UNM4Nepal and Kathmandu University have built a Women's Community Center (WCC) next to the Bahunepati Clinic. In this section, we will ask you a few questions about the potential uses of WCC. These questions will help us restructure our future programs in this community.		
	In what specific ways do you think WCC can better meet the needs of women of Bahunipati? *Be as specific as you can be.*	
	How often do you think you will visit the Women's Community Center? *(please check (✓) one box)*	More than once a week (1) ☐ Once a week (2) ☐ Every other week (3) ☐ Once a month (4) ☐ Once a year (5) ☐ Never (6) ☐

	From this list of the activities in the women's center, please rank highest (1) to lowest (6) the activities you find most beneficial to you. *Fill in the box with rank numbers.*	Microfinance meeting (1) ☐ Family Planning Meeting (2) ☐ Adult learning and educational classes (3) ☐ Political discussion Fair (4) ☐ Youth Club Activities (5) ☐ Others (6). Please specify…………….. ☐
	The maintenance and the operation of the WCC will require some monthly expenses (electricity, water, cleaning, and repairs). How much are you willing to pay every month into a fund to operate this community center?	Rs. ………… ☐

Section H: HEALTH

In this section, we will ask you questions about your health and your perceived health status. The questions will help us analyze the health status of the individuals and how it is affected by different socio-economic measures. Please answer the questions as accurately as possible.		
	Has a doctor ever diagnosed you with or confirmed that you had any chronic illness? *(please check (✓) one box)*	Yes (1) ☐ No (2) ☐
	Did you have any health problem during the past 6 months (including chronic illness)? *(please check (✓) one box)*	Yes (1) ☐ No (2) ☐
	How often did you go to doctor for the illnesses in the past 6 months? *(please check (✓) one box)*	Constantly (5) ☐ Frequently (4) ☐ Sometimes (3) ☐ Rarely (2) ☐ Never (1) ☐
	Overall, how do you rate your health during the past 12 month/past month/present health status? *(please check (✓) one box)*	Excellent (5) ☐ Very Good (4) ☐ Good (3) ☐ Fair (2) ☐ Poor (1) ☐

Mental Health

In this section, we would like to ask you questions about how you have been feeling during the **past 30 days**. Please answer the questions as accurately as possible.

		All of the time (5)	Most of the time (4)	Some of the time (3)	A little of the time (2)	None of the time (1)
7	During the past 30 days, about how often did you feel hopeless? *(please check (✓) one box)*	☐	☐	☐	☐	☐
7	During the past 30 days, how often did you feel so depressed that nothing could cheer you up? *(please check (✓) one box)*	☐	☐	☐	☐	☐
7	During the past 30 days, about how often did you feel restless or fidgety? *(please check (✓) one box)*	☐	☐	☐	☐	☐
7	During the past 30 days, about how often did you feel that everything was an effort? *(please check (✓) one box)*	☐	☐	☐	☐	☐
7	During the past 30 days, about how often did you feel worthless? *(please check (✓) one box)*	☐	☐	☐	☐	☐
7	During the past 30 days, about how often did you feel nervous? *(please check (✓) one box)*	☐	☐	☐	☐	☐

Section F: INTIMATE PARTNER VIOLENCE

Note: This section is only for female married respondents. If the respondent is male and female unmarried, please skip this section.

In this section, we will ask you questions whether you have experienced violence from your intimate partner. If you experienced, we would like to know the reason. You may refuse to answer the question. Please answer the questions as accurately as possible.

		Yes (1)	No (2)
	Did your husband ever scold you? *(please check (✓) one box)*	☐	☐
	Did your husband ever push, hit, kick, or slap you? *(please check (✓) one box)*	☐	☐
	Did your husband ever force you to have sex when you didn't want to? *(please check (✓) one box)*	☐	☐
	Did he ever hurt you physically because you were from a different caste? *(please check (✓) one box)*	☐	☐
	Did he ever attack you with knife, gun, or other weapon? *(please check (✓) one box)*	☐	☐
	Did he ever try to choke you or burn you? *(please check (✓) one box)*	☐	☐

Appendix F: Stata Codes

F.1: Chapter 2

```
** Cancer patient's WTP compared to control patients
** Cancer patients Conditional logit (alternative specific regressors)

** Conditional Logit
clogit choice asc pain_2 pain_3 dep_2 dep_3 mob_2 mob_3 selfcare_2 selfcare_3 ///
usuact_2 usuact_3 sprice, ///
group(choiceset) cluster(ind)
estimates store base1

** IIA Testing
snapshot restore 2
drop if cancer_control==0
clogit choice asc pain_2 pain_3 dep_2 dep_3 mob_2 mob_3 selfcare_2 selfcare_3 ///
usuact_2 usuact_3 sprice, group(choiceset)
estimates store full

clogit choice pain_2 pain_3 dep_2 dep_3 mob_2 mob_3 selfcare_2 selfcare_3 ///
usuact_2 usuact_3 sprice if alternative!=1, group(choiceset)
estimates store restricted1

clogit choice pain_2 pain_3 dep_2 dep_3 mob_2 mob_3 selfcare_2 selfcare_3 ///
usuact_2 usuact_3 sprice if alternative!=2, group(choiceset)
estimates store restricted2

hausman full restricted1, alleqs constant

hausman full restricted2, alleqs constant

** Random Parameters Logit
mixlogit choice sprice, group(choiceset) rand(asc pain_2 pain_3 dep_2 ///
dep_3 mob_2 mob_3 selfcare_2 selfcare_3 usuact_2 usuact_3) id(ind) cluster(ind) nrep(500)
estimates store mixl

wtp sprice pain_2 pain_3 dep_2 dep_3 mob_2 mob_3 selfcare_2 selfcare_3 usuact_2
usuact_3

** Dealing with Uncertainty
** Ref: Handling respondent uncertainty in Choice Experiments (Lundhede et al. 2009)

** First Method: Eliminate uncertain choices
snapshot restore 2
drop if certain_cs1 <= 3
drop if certain_cs2 <= 3
```

```
drop if certain_cs3 <= 3

** MIXL w/ random errors
mixlogit choice sprice if cancer_control==1, group(choiceset) rand(asc pain_2 pain_3 dep_2
///
dep_3 mob_2 mob_3 selfcare_2 selfcare_3 usuact_2 usuact_3) id(ind) cluster(ind) nrep(500)
estimates store uncertain_model1

wtp sprice pain_2 pain_3 dep_2 dep_3 mob_2 mob_3 selfcare_2 selfcare_3 usuact_2
usuact_3

** Control patients
mixlogit choice sprice if cancer_control==0, group(choiceset) rand(asc pain_2 pain_3 dep_2
///
dep_3 mob_2 mob_3 selfcare_2 selfcare_3 usuact_2 usuact_3) id(ind) cluster(ind) nrep(500)
estimates store uncertain_model1_control

wtp sprice pain_2 pain_3 dep_2 dep_3 mob_2 mob_3 selfcare_2 selfcare_3 usuact_2
usuact_3

** 2nd Method: Asymmetric Recoding: uncertain choice is recoded as a choice of status-quo
alternative
snapshot restore 2
drop per_health
by ind: gen num=_n
reshape wide choice alternative pain pain_1 pain_2 pain_3 ///
dep_1 dep_2 dep_3 mob_1 mob_2 mob_3 selfcare_1 selfcare_2 selfcare_3 ///
usuact_1 usuact_2 usuact_3 asc sprice gen_asc negprice ///
dep mob selfcare usualact price choiceset, i(ind) j(num)

replace choice3=1 if certain_cs1<=3
replace choice2=0 if certain_cs1<=3
replace choice1=0 if certain_cs1<=3

replace choice6=1 if certain_cs2<=3
replace choice5=0 if certain_cs2<=3
replace choice4=0 if certain_cs2<=3

replace choice9=1 if certain_cs3<=3
replace choice8=0 if certain_cs3<=3
replace choice7=0 if certain_cs3<=3

reshape long

mixlogit choice sprice pain_2 pain_3 dep_2 mob_2 mob_3 selfcare_2 selfcare_3 if pretest!=1
& cancer_control==1, ///
```

```
group(choiceset) rand(asc dep_3 usuact_2 usuact_3) id(ind) nrep(500)
estimates store uncertain_model2

mixlogit choice sprice pain_2 pain_3 dep_2 mob_2 mob_3 selfcare_2 selfcare_3 if pretest!=1
& cancer_control==0, ///
group(choiceset) rand(asc dep_3 usuact_2 usuact_3) id(ind) nrep(500)
estimates store uncertain_model2_control

wtp sprice pain_2 pain_3 dep_2 dep_3 mob_2 mob_3 selfcare_2 selfcare_3 usuact_2
usuact_3


** Control Patients
snapshot restore 2
drop if cancer_control==1

mixlogit choice sprice, group(choiceset) rand(asc pain_2 pain_3 dep_2 ///
dep_3 mob_2 mob_3 selfcare_2 selfcare_3 usuact_2 usuact_3) id(ind) cluster(ind) nrep(500)
estimates store control

wtp sprice pain_2 pain_3 dep_2 dep_3 mob_2 mob_3 selfcare_2 selfcare_3 usuact_2
usuact_3

** Lung cancer patients
snapshot restore 2
drop if cancer_control==0

mixlogit choice sprice if typecancer==1, group(choiceset) rand(asc pain_2 pain_3 dep_2 ///
dep_3 mob_2 mob_3 selfcare_2 selfcare_3 usuact_2 usuact_3) id(ind) cluster(ind) nrep(500)
estimates store lung

wtp sprice pain_2 pain_3 dep_2 dep_3 mob_2 mob_3 selfcare_2 selfcare_3 usuact_2
usuact_3

** Breast cancer patients
snapshot restore 2
drop if cancer_control==0

mixlogit choice sprice if typecancer==2, group(choiceset) rand(asc pain_2 pain_3 dep_2 ///
dep_3 mob_2 mob_3 selfcare_2 selfcare_3 usuact_2 usuact_3) id(ind) cluster(ind) nrep(500)
estimates store breast

wtp sprice pain_2 pain_3 dep_2 dep_3 mob_2 mob_3 selfcare_2 selfcare_3 usuact_2
usuact_3

** Cervical cancer patients
```

```
snapshot restore 2
drop if cancer_control==0

mixlogit choice sprice if typecancer==3, group(choiceset) rand(asc pain_2 pain_3 dep_2 ///
dep_3 mob_2 mob_3 selfcare_2 selfcare_3 usuact_2 usuact_3) id(ind) cluster(ind) nrep(500)
estimates store cervical

wtp sprice pain_2 pain_3 dep_2 dep_3 mob_2 mob_3 selfcare_2 selfcare_3 usuact_2
usuact_3

** Overall Willingness to pay
local varlist pain_2 pain_3 dep_2 dep_3 mob_2 mob_3 selfcare_2 selfcare_3 usuact_2
usuact_3
foreach var of local varlist{
nlcom -(_b[`var']/_b[sprice])
}

estimates restore control
nlcom -((_b[pain_3]+_b[dep_3]+_b[mob_3]+_b[selfcare_3]+_b[usuact_3])/_b[sprice])

**WTP Testing
estimates restore mixl
wtp sprice asc pain_2 pain_3 dep_2 dep_3 mob_2 mob_3 selfcare_2 selfcare_3 usuact_2
usuact_3

nlcom -((_b[pain_3]+_b[dep_1]+_b[mob_1]+_b[selfcare_3]+_b[usuact_2])/_b[sprice])
nlcom -((_b[pain_3]+_b[dep_3]+_b[mob_2]+_b[selfcare_2]+_b[usuact_3])/_b[sprice])
nlcom -((_b[pain_2]+_b[dep_2]+_b[mob_3]+_b[selfcare_3]+_b[usuact_2])/_b[sprice])
nlcom -((_b[pain_1]+_b[dep_1]+_b[mob_2]+_b[selfcare_2]+_b[usuact_2])/_b[sprice])
nlcom -((_b[pain_1]+_b[dep_3]+_b[mob_1]+_b[selfcare_3]+_b[usuact_2])/_b[sprice])
nlcom -((_b[pain_2]+_b[dep_1]+_b[mob_2]+_b[selfcare_1]+_b[usuact_3])/_b[sprice])
```

F.2: Chapter 3

```
**Testing equality of distributions
** Kolmogorov-Smirnov Test
ksmirnov qol_wtp, by(cancer_control)
ksmirnov qol_util, by(cancer_control)
ksmirnov qol, by(cancer_control)

** Variance comparison test
sdtest qol_wtp, by(cancer_control)
sdtest qol_util, by(cancer_control)
sdtest qol, by(cancer_control)

** Structural Equation Modeling
```

```
** For Likelihood Ratio Test

sem (perceived_support -> sl_4, ) (perceived_support -> sl_6, ) (perceived_support -> sl_7, )
///
(perceived_support -> sl_8, ) (perceived_support -> sl_1, ) (perceived_support -> QOL, ) ///
(perceived_support -> sl_11, ) (Stress -> sl_2, ) (Stress -> sl_3, ) (Stress -> sl_10, ) ///
(Stress -> sl_9, ) (Stress -> sl_5, ) (Stress -> QOL, ) (age -> QOL, ) (QOL -> pain, ) ///
(QOL -> dep, ) (QOL -> mob, ) (QOL -> selfcare, ) (QOL -> usuact, ) (gender -> QOL, ) ///
(someschool -> QOL, ) (pc2 -> QOL, ) (bachelors -> QOL, ) (wealth2 -> QOL, ) (wealth3 ->
QOL, ) ///
(wealth5 -> QOL, ) (wealth4 -> QOL, ) (pc3 -> QOL, ) (pc4 -> QOL, ) if cancer_control==1,
///
covstruct(_lexogenous, diagonal) cov(_lexogenous*_oexogenous@0)
latent(perceived_support Stress QOL ) ///
cov( perceived_support*Stress e.sl_4*e.sl_6 e.sl_4*e.sl_7 e.sl_4*e.sl_8 e.sl_6*e.sl_7 ///
e.sl_6*e.sl_8 e.sl_2*e.sl_3 e.sl_2*e.sl_9 e.sl_3*e.sl_10 e.sl_5*e.sl_9 e.pain*e.mob ///
e.mob*e.selfcare e.mob*e.usuact) nocapslatent

sem (perceived_support -> sl_4, ) (perceived_support -> sl_6, ) (perceived_support -> sl_7, )
///
(perceived_support -> sl_8, ) (perceived_support -> sl_1, ) (perceived_support -> QOL, ) ///
(perceived_support -> sl_11, ) (Stress -> sl_2, ) (Stress -> sl_3, ) (Stress -> sl_10, ) ///
(Stress -> sl_9, ) (Stress -> sl_5, ) (Stress -> QOL, ) (age -> QOL, ) (QOL -> pain, ) ///
(QOL -> dep, ) (QOL -> mob, ) (QOL -> selfcare, ) (QOL -> usuact, ) (gender -> QOL, ) ///
(someschool -> QOL, ) (pc2 -> QOL, ) (bachelors -> QOL, ) (wealth2 -> QOL, ) (wealth3 ->
QOL, ) ///
(wealth5 -> QOL, ) (wealth4 -> QOL, ) (pc3 -> QOL, ) (pc4 -> QOL, ) if cancer_control==2,
///
covstruct(_lexogenous, diagonal) cov(_lexogenous*_oexogenous@0)
latent(perceived_support Stress QOL ) ///
cov( perceived_support*Stress e.sl_4*e.sl_6 e.sl_4*e.sl_7 e.sl_4*e.sl_8 e.sl_6*e.sl_7 ///
e.sl_6*e.sl_8 e.sl_2*e.sl_3 e.sl_2*e.sl_9 e.sl_3*e.sl_10 e.sl_5*e.sl_9 e.pain*e.mob ///
e.mob*e.selfcare e.mob*e.usuact) nocapslatent

sem (perceived_support -> sl_4, ) (perceived_support -> sl_6, ) (perceived_support -> sl_7, )
///
(perceived_support -> sl_8, ) (perceived_support -> sl_1, ) (perceived_support -> QOL, ) ///
(perceived_support -> sl_11, ) (Stress -> sl_2, ) (Stress -> sl_3, ) (Stress -> sl_10, ) ///
(Stress -> sl_9, ) (Stress -> sl_5, ) (Stress -> QOL, ) (age -> QOL, ) (QOL -> pain, ) ///
(QOL -> dep, ) (QOL -> mob, ) (QOL -> selfcare, ) (QOL -> usuact, ) (gender -> QOL, ) ///
(someschool -> QOL, ) (pc2 -> QOL, ) (bachelors -> QOL, ) (wealth2 -> QOL, ) (wealth3 ->
QOL, ) ///
(wealth5 -> QOL, ) (wealth4 -> QOL, ) (pc3 -> QOL, ) (pc4 -> QOL, ), ///
covstruct(_lexogenous, diagonal) cov(_lexogenous*_oexogenous@0)
latent(perceived_support Stress QOL ) ///
cov( perceived_support*Stress e.sl_4*e.sl_6 e.sl_4*e.sl_7 e.sl_4*e.sl_8 e.sl_6*e.sl_7 ///
```

```
e.sl_6*e.sl_8 e.sl_2*e.sl_3 e.sl_2*e.sl_9 e.sl_3*e.sl_10 e.sl_5*e.sl_9 e.pain*e.mob ///
e.mob*e.selfcare e.mob*e.usuact) nocapslatent

** Only cancer patients

sem (perceived_support -> sl_4, ) (perceived_support -> sl_6, ) (perceived_support -> sl_7, )
///
(perceived_support -> sl_8, ) (perceived_support -> sl_1, ) (perceived_support -> QOL, ) ///
(perceived_support -> sl_11, ) (Stress -> sl_2, ) (Stress -> sl_3, ) (Stress -> sl_10, ) ///
(Stress -> sl_9, ) (Stress -> sl_5, ) (Stress -> QOL, ) (age -> QOL, ) (QOL -> pain, ) ///
(QOL -> dep, ) (QOL -> mob, ) (QOL -> selfcare, ) (QOL -> usuact, ) (gender -> QOL, ) ///
(someschool -> QOL, ) (pc2 -> QOL, ) (bachelors -> QOL, ) (wealth2 -> QOL, ) (wealth3 ->
QOL, ) ///
(wealth5 -> QOL, ) (wealth4 -> QOL, ) (pc3 -> QOL, ) (pc4 -> QOL, ) if cancer_control==1,
///
covstruct(_lexogenous, diagonal) cov(_lexogenous*_oexogenous@0)
latent(perceived_support Stress QOL ) ///
cov( perceived_support*Stress e.sl_4*e.sl_6 e.sl_4*e.sl_7 e.sl_4*e.sl_8 e.sl_6*e.sl_7
e.sl_6*e.sl_8 ///
e.sl_1*e.sl_11 e.sl_2*e.sl_3 e.sl_2*e.sl_9 e.sl_3*e.sl_10 e.sl_5*e.sl_9 e.pain*e.mob
e.mob*e.selfcare ///
e.mob*e.usuact) nocapslatent

** Non Cancer
sem (perceived_support -> sl_4, ) (perceived_support -> sl_6, ) (perceived_support -> sl_7, )
///
(perceived_support -> sl_8, ) (perceived_support -> sl_1, ) (perceived_support -> QOL, ) ///
(perceived_support -> sl_11, ) (Stress -> sl_2, ) (Stress -> sl_3, ) (Stress -> sl_10, ) ///
(Stress -> sl_9, ) (Stress -> sl_5, ) (Stress -> QOL, ) (age -> QOL, ) (QOL -> pain, ) ///
(QOL -> dep, ) (QOL -> mob, ) (QOL -> selfcare, ) (QOL -> usuact, ) (gender -> QOL, ) ///
(someschool -> QOL, ) (pc2 -> QOL, ) (bachelors -> QOL, ) (wealth2 -> QOL, ) (wealth3 ->
QOL, ) ///
(wealth5 -> QOL, ) (wealth4 -> QOL, ) (pc3 -> QOL, ) (pc4 -> QOL, ) if cancer_control==2,
///
covstruct(_lexogenous, diagonal) cov(_lexogenous*_oexogenous@0)
latent(perceived_support Stress QOL ) ///
cov( perceived_support*Stress e.sl_4*e.sl_6 e.sl_4*e.sl_7 e.sl_6*e.sl_7 e.sl_6*e.sl_8
e.sl_7*e.sl_8 ///
e.sl_2*e.sl_3 e.sl_3*e.sl_10 e.sl_5*e.sl_9 e.pain*e.mob e.mob*e.selfcare e.mob*e.usuact)
nocapslatent


** Pooled
sem (perceived_support -> sl_4, ) (perceived_support -> sl_6, ) (perceived_support -> sl_7, )
///
(perceived_support -> sl_8, ) (perceived_support -> sl_1, ) (perceived_support -> QOL, ) ///
```

```
(perceived_support -> sl_11, ) (Stress -> sl_2, ) (Stress -> sl_3, ) (Stress -> sl_10, ) ///
(Stress -> sl_9, ) (Stress -> sl_5, ) (Stress -> QOL, ) (age -> QOL, ) (QOL -> pain, ) ///
(QOL -> dep, ) (QOL -> mob, ) (QOL -> selfcare, ) (QOL -> usuact, ) (gender -> QOL, ) ///
(someschool -> QOL, ) (pc2 -> QOL, ) (bachelors -> QOL, ) (wealth2 -> QOL, ) (wealth3 ->
QOL, ) ///
(wealth5 -> QOL, ) (wealth4 -> QOL, ) (pc3 -> QOL, ) (pc4 -> QOL, ), ///
covstruct(_lexogenous, diagonal) cov(_lexogenous*_oexogenous@0)
latent(perceived_support Stress QOL ) ///
cov( perceived_support*Stress e.sl_4*e.sl_6 e.sl_4*e.sl_7 e.sl_4*e.sl_8 e.sl_6*e.sl_7
e.sl_6*e.sl_8 ///
e.sl_1*e.sl_11 e.sl_2*e.sl_3 e.sl_2*e.sl_9 e.sl_3*e.sl_10 e.sl_5*e.sl_9 e.pain*e.mob
e.mob*e.selfcare ///
e.mob*e.usuact) nocapslatent

sem (perceived_support -> sl_4, ) (perceived_support -> sl_6, ) (perceived_support -> sl_7, )
///
(perceived_support -> sl_8, ) (perceived_support -> Stress, ) (perceived_support -> sl_1, ) ///
(perceived_support -> QOL, ) (perceived_support -> sl_11, ) (Stress -> sl_2, ) (Stress ->
sl_3, ) ///
(Stress -> sl_10, ) (Stress -> sl_9, ) (Stress -> sl_5, ) (Stress -> QOL, ) (cancer -> QOL, ) ///
(age -> QOL, ) (QOL -> pain, ) (QOL -> dep, ) (QOL -> mob, ) (QOL -> selfcare, ) (QOL ->
usuact, ) ///
(gender -> QOL, ) (someschool -> QOL, ) (pc2 -> QOL, ) (bachelors -> QOL, ) (wealth2 ->
QOL, ) ///
(wealth3 -> QOL, ) (wealth5 -> QOL, ) (wealth4 -> QOL, ) (pc3 -> QOL, ) (pc4 -> QOL, ),
///
covstruct(_lexogenous, diagonal) cov(_lexogenous*_oexogenous@0)
latent(perceived_support Stress QOL ) ///
cov( e.sl_4*e.sl_6 e.sl_4*e.sl_7 e.sl_4*e.sl_8 e.sl_6*e.sl_7 e.sl_6*e.sl_8 e.sl_1*e.sl_11 ///
e.sl_2*e.sl_3 e.sl_2*e.sl_9 e.sl_3*e.sl_10 e.sl_5*e.sl_9 e.pain*e.mob e.mob*e.selfcare
e.mob*e.usuact) ///
nocapslatent
```

F.3: Chapter 4

```
** Social Capital: Joint family; Volunteer; Member of an organization
** Financial Capital: Wealth, Membership score, Borrowing, Remittances
*******AFTER EARTHQUAKE****************

** General Regressions with time



** Microfinance and food recovery
ologit recov_house socialindex financialindex ib(3).cas, vce(boot, reps(500) seed(123))
estimates store housingindex

ologit recov_food socialindex financialindex ib(3).cas, vce(boot, reps(500) seed(123))
estimates store foodindex
```

```
ologit recov_water socialindex financialindex ib(3).cas, vce(boot, reps(500) seed(123))
estimates store waterindex

ologit recov_inc socialindex financialindex ib(3).cas, vce(boot, reps(500) seed(123))
estimates store incomeindex


ologit recov_house ib(2).typefamily volunteer i.newfriends wealthindex borrow remittance
ib(3).cas, vce(boot, reps(500) seed(123))
estimates store housing

ologit recov_food ib(2).typefamily volunteer i.newfriends wealthindex borrow remittance
ib(3).cas, vce(boot, reps(500) seed(123))
estimates store food

ologit recov_water ib(2).typefamily volunteer i.newfriends wealthindex borrow remittance
ib(3).cas, vce(boot, reps(500) seed(123))
estimates store water

ologit recov_inc ib(2).typefamily volunteer i.newfriends wealthindex borrow remittance
ib(3).cas, vce(boot, reps(500) seed(123))
estimates store income

** CMP (System of Ordered Probit Equations)
set more off
cmp (recov_house= socialindex financialindex ib(3).cas) ///
(recov_food= socialindex financialindex ib(3).cas) ///
(recov_water= socialindex financialindex ib(3).cas) ///
(recov_inc= socialindex financialindex ib(3).cas), ///
ind($cmp_oprobit $cmp_oprobit $cmp_oprobit $cmp_oprobit) vce(robust)
estimates store indexcmp

cmp (recov_house=ib(2).typefamily volunteer i.newfriends wealth borrow ///
microfinance remittance i.cas householdsize) (recov_food=ib(2).typefamily volunteer ///
i.newfriends wealth borrow microfinance remittance i.cas householdsize) ///
(recov_water=ib(2).typefamily volunteer i.newfriends wealth borrow ///
microfinance remittance i.cas householdsize) (recov_inc=ib(2).typefamily ///
volunteer i.newfriends wealth borrow microfinance remittance i.cas householdsize), ///
ind($cmp_oprobit $cmp_oprobit $cmp_oprobit $cmp_oprobit) vce(robust)
estimates store noindexcmp

cmp (recov_house=ib(2).typefamily volunteer i.newfriends wealthindex borrow ///
remittance ib(3).cas) (recov_food=ib(2).typefamily volunteer ///
i.newfriends wealthindex borrow remittance ib(3).cas) ///
(recov_water=ib(2).typefamily volunteer i.newfriends wealthindex borrow ///
```

```
remittance ib(3).cas) (recov_inc=ib(2).typefamily ///
volunteer i.newfriends wealthindex borrow remittance ib(3).cas), ///
ind($cmp_oprobit $cmp_oprobit $cmp_oprobit $cmp_oprobit) vce(robust)
estimates store noindexcmp1



** Marginal effects
** Housing
estimates restore housing
eststo marginhousing: margins, dydx(*) post

** Food
estimates restore food
eststo marginfood: margins, dydx(*) post
** Water
estimates restore water
eststo marginwater: margins, dydx(*) post

** Income
estimates restore income
eststo marginincome: margins, dydx(*) post

** Marginal Effect of Index Variables
** Housing
estimates restore housingindex
eststo marginhousingindex: margins, dydx(*) post

** Food
estimates restore foodindex
eststo marginfoodindex: margins, dydx(*) post

** Water
estimates restore waterindex
eststo marginwaterindex: margins, dydx(*) post

** Income
estimates restore incomeindex
eststo marginincomeindex: margins, dydx(*) post

** Marginal effects after cmp
** Housing
set more off
estimates restore noindexcmp1
eststo housingnoindexcmp1_eq1o1: margins, dydx(*) predict(eq(#1) outcome(#1) pr) post
force
```

```
estimates restore noindexcmp1
eststo housingnoindexcmp1_eq1o2: margins, dydx(*) predict(eq(#1) outcome(#2) pr) post force
estimates restore noindexcmp1
eststo housingnoindexcmp1_eq1o4: margins, dydx(*) predict(eq(#1) outcome(#4) pr) post force
estimates restore noindexcmp1
eststo housingnoindexcmp1_eq1o5: margins, dydx(*) predict(eq(#1) outcome(#5) pr) post force

** Food
set more off
estimates restore noindexcmp1
eststo foodnoindexcmp1_eq2o1: margins, dydx(*) predict(eq(#2) outcome(#1) pr) post force
estimates restore noindexcmp1
eststo foodnoindexcmp1_eq2o2: margins, dydx(*) predict(eq(#2) outcome(#2) pr) post force
estimates restore noindexcmp1
eststo foodnoindexcmp1_eq2o4: margins, dydx(*) predict(eq(#2) outcome(#4) pr) post force
estimates restore noindexcmp1
eststo foodnoindexcmp1_eq2o5: margins, dydx(*) predict(eq(#2) outcome(#5) pr) post force

** Water
set more off
estimates restore noindexcmp1
eststo waternoindexcmp1_eq3o1: margins, dydx(*) predict(eq(#3) outcome(#1) pr) post force
estimates restore noindexcmp1
eststo waternoindexcmp1_eq3o2: margins, dydx(*) predict(eq(#3) outcome(#2) pr) post force
estimates restore noindexcmp1
eststo waternoindexcmp1_eq3o4: margins, dydx(*) predict(eq(#3) outcome(#4) pr) post force
estimates restore noindexcmp1
eststo waternoindexcmp1_eq3o5: margins, dydx(*) predict(eq(#3) outcome(#5) pr) post force

** Income
set more off
estimates restore noindexcmp1
eststo incnoindexcmp1_eq4o1: margins, dydx(*) predict(eq(#4) outcome(#1) pr) post force
estimates restore noindexcmp1
eststo incnoindexcmp1_eq4o2: margins, dydx(*) predict(eq(#4) outcome(#2) pr) post force
estimates restore noindexcmp1
eststo incnoindexcmp1_eq4o4: margins, dydx(*) predict(eq(#4) outcome(#4) pr) post force
estimates restore noindexcmp1
eststo incnoindexcmp1_eq4o5: margins, dydx(*) predict(eq(#4) outcome(#5) pr) post force
```

```
** Marginal effects after cmp (Indexed)
set more off
estimates restore indexcmp
eststo housingindexcmp_eq1o1: margins, dydx(*) predict(eq(#1) outcome(#1) pr) post force
estimates restore indexcmp
eststo housingindexcmp_eq1o2: margins, dydx(*) predict(eq(#1) outcome(#2) pr) post force
estimates restore indexcmp
eststo housingindexcmp_eq1o4: margins, dydx(*) predict(eq(#1) outcome(#4) pr) post force
estimates restore indexcmp
eststo housingindexcmp_eq1o5: margins, dydx(*) predict(eq(#1) outcome(#5) pr) post force

** Food
set more off
estimates restore indexcmp
eststo foodindexcmp_eq2o1: margins, dydx(*) predict(eq(#2) outcome(#1) pr) post force
estimates restore indexcmp
eststo foodindexcmp_eq2o2: margins, dydx(*) predict(eq(#2) outcome(#2) pr) post force
estimates restore indexcmp
eststo foodindexcmp_eq2o4: margins, dydx(*) predict(eq(#2) outcome(#4) pr) post force
estimates restore indexcmp
eststo foodindexcmp_eq2o5: margins, dydx(*) predict(eq(#2) outcome(#5) pr) post force

** Water
set more off
estimates restore indexcmp
eststo waterindexcmp_eq3o1: margins, dydx(*) predict(eq(#3) outcome(#1) pr) post force
estimates restore indexcmp
eststo waterindexcmp_eq3o2: margins, dydx(*) predict(eq(#3) outcome(#2) pr) post force
estimates restore indexcmp
eststo waterindexcmp_eq3o4: margins, dydx(*) predict(eq(#3) outcome(#4) pr) post force
estimates restore indexcmp
eststo waterindexcmp_eq3o5: margins, dydx(*) predict(eq(#3) outcome(#5) pr) post force

** Income
set more off
estimates restore indexcmp
eststo incindexcmp_eq4o1: margins, dydx(*) predict(eq(#4) outcome(#1) pr) post force
estimates restore indexcmp
eststo incindexcmp_eq4o2: margins, dydx(*) predict(eq(#4) outcome(#2) pr) post force
estimates restore indexcmp
eststo incindexcmp_eq4o4: margins, dydx(*) predict(eq(#4) outcome(#4) pr) post force
estimates restore indexcmp
eststo incindexcmp_eq4o5: margins, dydx(*) predict(eq(#4) outcome(#5) pr) post force
```

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