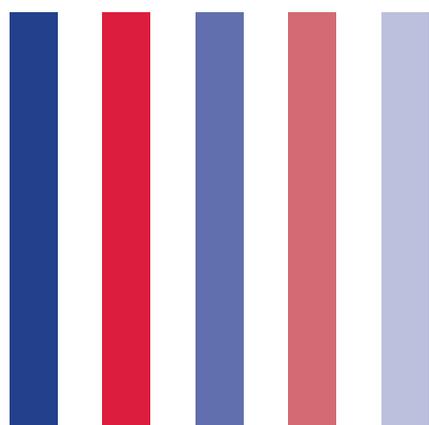


Appendices



The Nepal NCDI
Poverty Commission

*An Equity Initiative to
Address Noncommunicable
Diseases and Injuries*

National Report – 2018

THE NEPAL
NCDI
POVERTY
Commission

*Reframing Noncommunicable Diseases
and Injuries for the Poorest Billion*

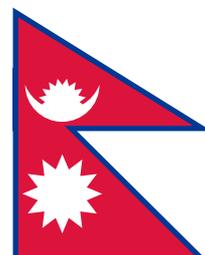




TABLE OF CONTENTS

1.0 Public Health Care Initiatives in Nepal	1
1.1 Detailed Schematics of Healthcare Structure and Organization in Nepal	1
1.2 Free health care policy (FHCP)	2
Impoverished Citizen Treatment Fund (Bipanna Nagarik Ausadhi Upachaar Cosh)	2
1.3 Package of Essential Non-communicable (PEN) Disease Interventions for Primary Health Care- Nepal	3
1.4 Mental Health Policy in Nepal	4
1.5 Anti-drink and drive campaign against road traffic accidents	4
1.6 Dialysis	4
1.7 Tobacco Control Program- Nepal	5
2.0 Detailed Methodology	7
2.1 Method of modelling poorest billion	7
2.2. Selection of 40 years as age cut-off to compare the burden of diseases	10
2.3. Global Burden of Disease levels of diseases or conditions	10
2.4 Risk Factor Profile for NCDI	11
2.5 Poverty based on Consumption quintile	11
2.6 Fiscal Space	13
2.7 Priority Setting for NCDI conditions and interventions: Disease Control & Priorities 3	13
3.0 Literature Review	14
3.1 Methodology of the Literature Review	14
3.2 Detailed Results of the Literature Review	14
3.2.1 Chronic respiratory diseases	16



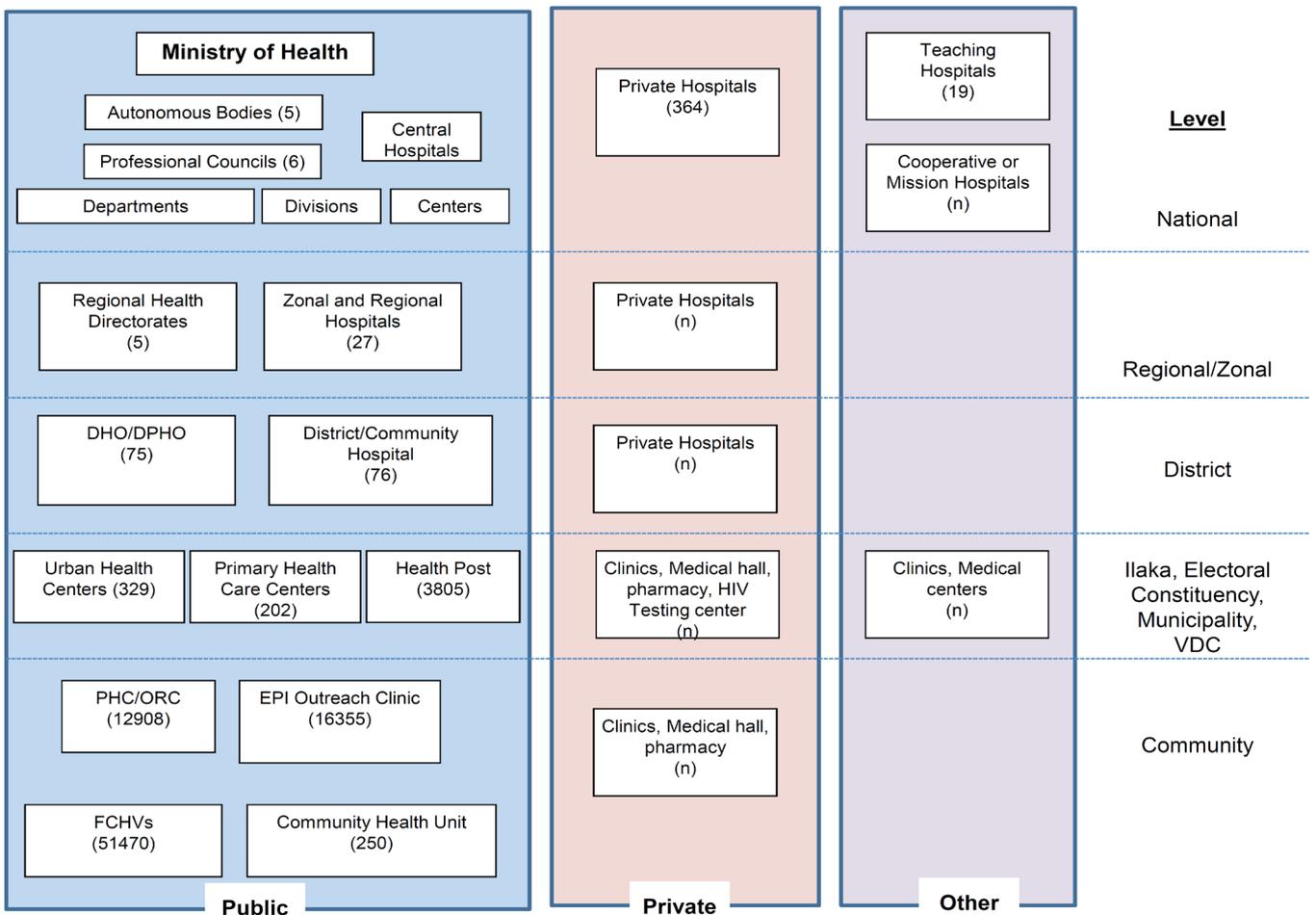
3.2.2 Cirrhosis	17
3.2.3 Cardiovascular Disease (CVD)	17
3.2.4 Diabetes, urogenital, endocrine, and blood disorders	20
3.2.5 Digestive disorders	21
3.2.6 Injuries	22
3.2.7 Mental & substance use disorders	26
3.2.8 Musculoskeletal	27
3.2.9 Neoplasms	28
3.2.10 Neurological	30
3.2.11 References for Literature Search	32
3.3 Key findings of selected NCDI	40
3.4 Literature Review Search Terms	43
3.5 Literature Review Variables Extracted	50
4.0 Global Burden of Disease Detailed Results and Reference Tables	52
5.0 Patient Narratives	55
References	56



1.0 Public Health Care Initiatives in Nepal

1.1 DETAILED SCHEMATICS OF HEALTHCARE STRUCTURE AND ORGANIZATION IN NEPAL

Health service infrastructure



(Source: NFHS 2015). Health facilities providing general care are shown.



Staffing and services at public health facilities based on type of facility

Level	Key staff	Key services
Central hospitals	20-200 specialist doctors and nurses	50-500 beds Provide either broad range of advanced services or specialized services
Regional hospitals	30-50 specialized doctors, medical officers and nurses	Final referral centers Provide broad range of services
Zonal hospitals	10-35 specialized doctors, medical officers, and nurses	Provide broad range of services
District hospitals	3 medical officers and 15 other health workers	~15-25 beds Diagnosis and treatment of illness (primary and secondary) Provide basic services (e.g., family planning, immunization)
Urban health centers	2-3 health workers	Diagnosis and treatment of illness (primary) Provide basic services (e.g., family planning, immunization)
PHCCs	1 medical officer and 8 other health workers	~3 beds and laboratory services Diagnosis and treatment of illness (primary) Provide basic services (e.g., family planning, immunization)
HPs	~4-5 health workers, with health assistant in charge	Only outpatient diagnosis and treatment of illness (primary) Provide basic services (e.g., family planning, immunization)
Stand-alone HIV testing centers	~2-3 testing and counseling staff	HIV counseling and testing
PHC/ORCs	1-2 health workers from facility on a mobile outreach basis	Deliver short-term family planning, antenatal care, and growth monitoring services on a monthly basis
EPI clinic	1-2 health workers from facility on a mobile outreach basis	Deliver childhood immunizations on a monthly basis
CHUs	1-2 health workers from facility on an outreach basis	Extension of health facility services in areas not fully reached by facilities

(Source: NHFS 2015)

1.2 FREE HEALTH CARE POLICY (FHCP)

Government of Nepal introduced free health care policy (FHCP) in 2007 under the second long term health plan 1997-2017 (SLTHP).¹ The free Essential Health Care Services (EHCS) comprises free registration, available basic health service and the free essential drugs. The government of Nepal planned to include the NCD drugs in the free essential drug list in the 2011.²³ The MoH has planned to revise the listed drugs and add the non-communicable drugs to the free essential drug list.⁴⁵ The MoH and Department of Drug administration signed a performance contract where one of the tasks of DDA is to revise the drugs list.⁶

Historically, however, the availability of medicines for NCDs has been low. As per the Rapid Assessment of Government Free Drug Supply of Health Services and its Implication-2009, there were 60% to 90% of free drugs were available during the survey and free drugs were out of stock at an average of about 17% to 28% during that time.⁷ The Nepal Health Facility Survey in 2015, found the overall availability of free of cost medicines for diabetes were glibenclamide (14%), injectable insulin (20%), metformin (34%) and the injectable glucose solution (55%). For CVD, the overall available free of cost drugs were thiazide diuretics (4%), aspirin or oxygen (less than 10%), calcium channel blockers (11%) and beta blockers (18%). Similarly, for chronic respiratory diseases, the overall available free of cost drugs were salbutamol inhalers (79%), hydrocortisone tablets (12%), injectable epinephrine or adrenaline (9%), prednisolone tablets (8%), oxygen (7%) and beclomethasone inhaler (5%). Many facilities lacked many essential medicines.⁸



IMPOVERISHED CITIZEN TREATMENT FUND (BIPANNA NAGARIK AUSADHI UPACHAAR COSH)

A fund was established in 2013 under the leadership of MoH, to support the poor who otherwise would not be able to access services. There is a provision of USD 1000 for each poor citizen (poor as verified by local bodies)⁹ during the treatment in the country. The treatment must be done at the government hospital or in the empaneled private hospitals in the country when the services are available. Treatment Support through this Fund are provided for the following conditions: Cancer, Renal diseases, Cardiac treatment, Parkinson's and Alzheimer's disease, Sickle cell anemia, Spinal Injuries, and Head Injuries. Recently, GoN has decided to add three conditions to the list: Thalassemia, Liver transplant, Bone marrow transplant. According to the annual financial report 2072-73, total 33,488 patients in the country suffering from the government listed non communicable diseases were benefitted from the program with total spending of \$9.4 million.¹⁰ In addition to this, there is a provision of free cardiac care for under 15 years of age (Children Assistance Program-CAP) and above 75 years of age (Senior Citizen Program-SCP). The age group in between 15 and 75 years receives the government fund of up to one lakh Nepalese rupees from the Bipanna nagarik aushadhi upachaar cosh. There is also a provision of free treatment for Rheumatic heart disease and free valve replacement in Shahid Gangalal hospital and Manmohan Cardiothoracic Center for the Rheumatic Heart Disease.^{11,12}

1.3 PACKAGE OF ESSENTIAL NON-COMMUNICABLE (PEN) DISEASE INTERVENTIONS FOR PRIMARY HEALTH CARE- NEPAL

The individuals with NCDs or at risk of NCDs require long-term care which should be patient-centered, community-based and is sustainable with efficient to work with limited health care resources and is efficient to provide basic care and have the organized referral system. This effective low technology interventions and care can be provided through the primary health care (PHC) (WHO 2010).¹³ The new national policy 2014¹⁴ of Nepal is also committed to strengthening health system through action plans where Nepal has developed the national Multi-sectoral Action Plan for prevention and control of Non-communicable diseases (2014-2020).^{15,16} One of the programs under the action plan is the WHO Package of Essential Non-communicable (PEN) disease interventions for primary health care in low-resource settings.¹⁷

According to the Nepal Health Sector Strategy-Implementation Plan (NHSS-IP)¹⁸, the full PEN package is being implemented in two districts (Ilam and Kailali) in the country since 2016. The package will be expanded to 10 other districts in the fiscal year 2016/2017 which will be followed by 30 total districts in second year of implementation. The package will cover 75 districts in 5 years period in the country and will continue providing access to the diagnostic services in the primary health care settings.¹⁹



1.4 MENTAL HEALTH POLICY IN NEPAL

In Nepal, mental health policy was formulated in 1995 with the background of around 20% of population suffering from mental illness, 5-39 bedded mental care services, 15 psychiatrists and few non-governmental mental health care programs. The policy ensures the availability and accessibility of mental health services for all population by 2000, increasing the mental health workforce, formulation of the appropriate legislation for human rights of mentally ill, and promotion of mental health with community participation.²⁰ The mental health system report by WHO in 2006 stated that the mental health services were unorganized regarding the service area in Nepal. The outpatient mental health service was 18 in total. The human workforce in mental health services including the private practices were 0.59 per 100,000 populations while most of the practices were concentrated in the urban area. None of the services were provided specifically for the children or adolescents. The out of pocket expenditure on the antipsychotic and anti-depression medication was NRs 9 per day. Mental health legislation was not started then and the human rights for the mentally ill were not implemented.²¹ The gradual change in the mental health services occurred by 2009 with the initiatives from the non-governmental organization and the private medical colleges which improved the treatment facilities, however, the implementation of the first goal of the policy of providing the minimal mental health services to all the population was still far behind.²² There has been a significant improvement by the year 2011 as per the situation analysis conducted by the Transcultural Psychosocial Organization. The total number of mental health workforce has increased with mental health beds of 1.5 per 100,000 population. The community based mental health programs have been initiated by the government and the non-government organizations. However, the mental health policy framework needs to be implemented as the specialist mental health services are limited to the Zonal or District level with no counseling and the psychotherapeutic services are least available in the primary health care level. Out of 75 districts only 7 districts provide mental health services.²³

1.5 ANTI-DRINK AND DRIVE CAMPAIGN AGAINST ROAD TRAFFIC ACCIDENTS

The anti-drink and drive campaign was started in December 2011 under “The vehicle and transport management” act 2049.²⁴ The traffic police have the authority to fine USD 10²⁵ and compel the offender to take the Traffic awareness classes.²⁶ The breathalyzer is used to estimate the blood alcohol content (BAC) from the breath sample. The campaign has become more effective in decreasing the injuries. The Nepal Traffic Police reports that the injuries caused by alcohol drinking have decreased by more than 50% in the Kathmandu valley.²⁷

1.6 DIALYSIS

In Nepal, estimated 3000 people develop kidney failure every year. The cost of dialysis in the country ranges from NRs 120,000²⁸ to 2, 40,000²⁹ per year



depending on the service center. There are currently 45 hemodialysis centers in Nepal and the number of services providing free hemodialysis in Nepal is 30 (11 in valley and 19 out of the valley). Patients can receive treatment equivalent to \$1000 for hemo-dialysis and peritoneal dialysis and \$2000 for the renal transplant. For those undergoing renal transplantation, \$1000 is provided for the medication for one year.³⁰

The Human Organ Transplant Center (HOTC) has served dialysis to 65346 patients over the past 5 years and out of them 45893 received free dialysis care. Similarly, 978 patients have received continuous ambulatory peritoneal dialysis (CAPD) (811 free and 167 paid). According to the medical record section in HOTC, 11878 received free dialysis in 2016 and 417 cases received CAPD in the last 6 months.³¹

1.7 TOBACCO CONTROL PROGRAM- NEPAL

Nepal joined and legally approved the WHO Framework Convention on Tobacco Control (WHO FCTC) in 2006³² and the regulation of Tobacco Products (Control and Regulatory) Act 2011³³ was introduced.

Tobacco-free initiatives were approved by The Council of Ministers of the Government of Nepal in 1992 and 2010. The initiatives included the implementation of health warnings on tobacco products; prohibition of smoking in public places, workplaces and on public transport; levy health tax from tobacco industries for the treatment of diseases caused by tobacco use; allocation of funds to disseminate information and conduct education and communication activities on the harmful effects of tobacco use; and enforce a ban on tobacco advertisements through hoardings.³⁴

MPOWER POLICY PACKAGE IN NEPAL

The NHEICC as the national focal point for tobacco control is implementing its activities in line with the six policies recommended in the WHO Report on the Global Tobacco Epidemic 2008.

SMOKE-FREE PLACES

The national law requires fines for smoking and the national policy prohibits smoking in public transport and in a specified list of public places, which includes most workplaces and public places.³⁵ The smoke-free legislation is under operation in the healthcare and educational facilities, government facilities and some indoor workplaces whereas the restaurants, cafes are poor at implementing the smoke-free legislation. A tobacco “Quit line” has been established in the Nepal Cancer Relief Society. Nicotine replacement therapy (NRT) are available on prescription in pharmacies. There was the (Practical Approach to Lung) PAL pilot project during the year 2007-2008 which provided an opportunity for enhanced tobacco control through tobacco counselling



and cessation activities among smokers suffering from tuberculosis, asthma, acute respiratory infections (ARI) and chronic obstructive pulmonary disease (COPD) but Tobacco cessation support activities are not widely available or conducted and Training of health personnel on cessation was not adequate. In addition, the pilot project of PAL needs to be continued to the other districts of Nepal.³⁶ There are no national regulations against e-cigarettes in the country.³⁷

HEALTH WARNINGS AND TOBACCO ADVERTISING

The law generally prohibits all tobacco advertising, promotion, and sponsorship. Health warnings are composed of both pictures and text and cover 90 percent of the upper front, upper back, and two sides of smoked tobacco product packaging and the upper front, upper back, and lids (where appropriate) of smokeless tobacco product packaging. With respect to rotation, the law specifies that the Ministry may change the required warnings within a year. Misleading packaging and labeling, including terms such as “less tar” and “light” and other signs, is prohibited.³⁸ According to the WHO report 2015, these provisions have been adopted but are not completely implemented in the country.³⁹

TAXES ON TOBACCO PRODUCTS

The policy of increasing the tobacco taxation is to raise revenue and to discourage the tobacco consumption and prevent the young ones from starting.⁴⁰ Nepal was the first country in the South-East Asia Region to impose a dedicated levy on tobacco products as a health tax. The levy is being used for tobacco control activities and treatment of cancer and other tobacco-related diseases.⁴¹ The health tax is one paisa per stick of cigarette since 1993 and the revenue generated from the tax are used for spending on prevention and treatment of Cancer, Tuberculosis, and other diseases. The government of Nepal in the year 1993 decided to use the 75% of the health tax to invest in the B.P Koirala Memorial Cancer Hospital, Chitwan and 25% to be used for the prevention of tuberculosis and other diseases. The health tax on the cigarette was doubled (two paisa per stick of cigarette) in the year 1994 and since then it has not been raised.⁴²

Currently, the price of most sold brands with the pack of 20 cigarettes is NRS 122.00 (USD 1.37) and the total percentage taxation on most sold brand is 28% of the retail price and total excise is 16%⁴³ while the Ministry of Health and Population recommends to increase the excise tax to more than 66 % of the retail price and to levy the tax as the health tax.⁴⁴ The taxation on all the tobacco products is not uniform and the Tobacco excise taxes are well below the recommendations of WHO.⁴⁵ There is no restrictions or tax on the import duties in both smoked and smokeless products.⁴⁶ A health tax evaluation study done in 2007 recommends that the health tax fund is mobilized proportionately to control major tobacco-related diseases which are –cancer, heart diseases, COPD



and asthma; and preventive activities.⁴⁷ There are several policies assigned by the Government of Nepal however, there are several gaps needed to be addressed to implement the policies and to strengthen the current strategies it includes but not limited to increasing the tax on tobacco products in accordance with the inflation rate.⁴⁸

2.0 Detailed Methodology

2.1 METHOD OF MODELLING POOREST BILLION

Given the limited amount of primary data with individual-level socioeconomic data to characterize patterns of disease burden among those in extreme poverty, ecological analysis can shed some light on the burden. Cross-country relationships between disease burden and poverty may not well represent individual-level, within-country variation. However, ecological modeling can create a rich dataset of what the disease burden in the poorest billion would look like if cross-country variation held true. Estimates can then be compared to individual-level associations from primary data when possible.

To create a comprehensive set of disease burden estimates, we downloaded publically available data from the Global Burden of Disease (GBD) Study 2015.⁴⁹ The available data contain population, incidence, prevalence, deaths, YLDs, YLLs, and DALYs for 20 age groups, by sex, and in 289 countries and aggregate locations.

For poverty estimates, this analysis uses a set of 8 indicators from the Multidimensional Poverty Index (MPI) created by the Oxford Poverty and Human Development Initiative (OPHI).⁵⁰ The ten indicators are shown in Table 1. Here, rather than using the typical MPI methodology, we define the poorest billion as those living in households deprived in 5 or more of the 8 categories that does not include the health indicators in order to avoid confounding. The data to create these indicators come from representative country surveys like the Demographic and Health Surveys.⁵¹ In total, we have estimates of the prevalence of the poorest billion populations in 102 countries from surveys, 83 from the last 5 years. The prevalence of the poorest billion populations is estimated by sex and for 5-year age groups to age 80 and over.⁵²

To create a comprehensive set of burden estimates for the poorest billion and non-poorest populations, we model the log rate of GBD measures (incidence, prevalence, deaths, Years with Life Lost (YLL) YLLs, Years Lived with Disability (YLDs), and Disability Adjusted Life Years (DALYs) for each cause, age, and sex combination on the percent of people in the corresponding age-sex group in each country who are in the poorest billion. The model example below shows the log of the prevalence rate for a given cause c , in a given country l , for



Table 1 – Indicators used in creating poorest billion definition

Dimension	Indicator	Deprivation cut-off
Health	Nutrition	Any adult or child in the household with nutritional information is undernourished
	Mortality	Any child has died in the household
Education	Schooling	No household member has completed five years of schooling
	Attendance	Any school-aged child in the household is not attending school up to class 8
Standard of living	Electricity	The household has no electricity
	Sanitation	The household's sanitation facility is not improved or it is shared with other households
	Water	The household does not have access to safe drinking water or safe water is more than a 30-minute walk, round trip
	Floor	The household has a dirt, sand, or dung floor
	Cooking fuel	The household cooks with dung, wood, or charcoal
	Assets	The household does not own more than one of the following: radio, TV, telephone, bike, motorbike, or refrigerator, and does not own a car or truck

a given age a and sex s as a function of the prevalence of people in the poorest billion in that country, age, and sex.

$$\log(\text{Prevalence rate}_{c,l,a,s}) = \beta_0 + \beta_1 \text{PPB}_{l,a,s} + \varepsilon$$

Once the above regression coefficients are estimated using the set of approximately 80 countries with a prevalence of the poorest billion populations over 2% in the given age-sex group, the rate is predicted for hypothetical groups in which 100% of the population is in the poorest billion and 0% of the population is in the poorest billion. These predicted rates are then rescaled as the poorest billion and non-poorest populations in each country to aggregate to the national GBD estimates. The below equation shows how a scalar is derived to rescale the rates for the poorest billion and non-poorest within each country such that they aggregate to the national estimates.

$$k(\text{Rate}_{l,a,s}^{pb} * \text{Pop}_{l,a,s}^{pb} + \text{Rate}_{l,a,s}^{npb} * \text{Pop}_{l,a,s}^{npb}) = \text{Count}_{l,a,s}^{GBD}$$

After solving for the scalar k , it is then multiplied by the poorest billion and non-poorest rates to calculate rates in the poorest billion and non-poorest populations in the given age and sex group that will then aggregate to the GBD national estimates for that age and sex group. This process is conducted for each of the GBD measures. This results in burden estimates for poorest billion and non-poorest within each country, including Nepal.



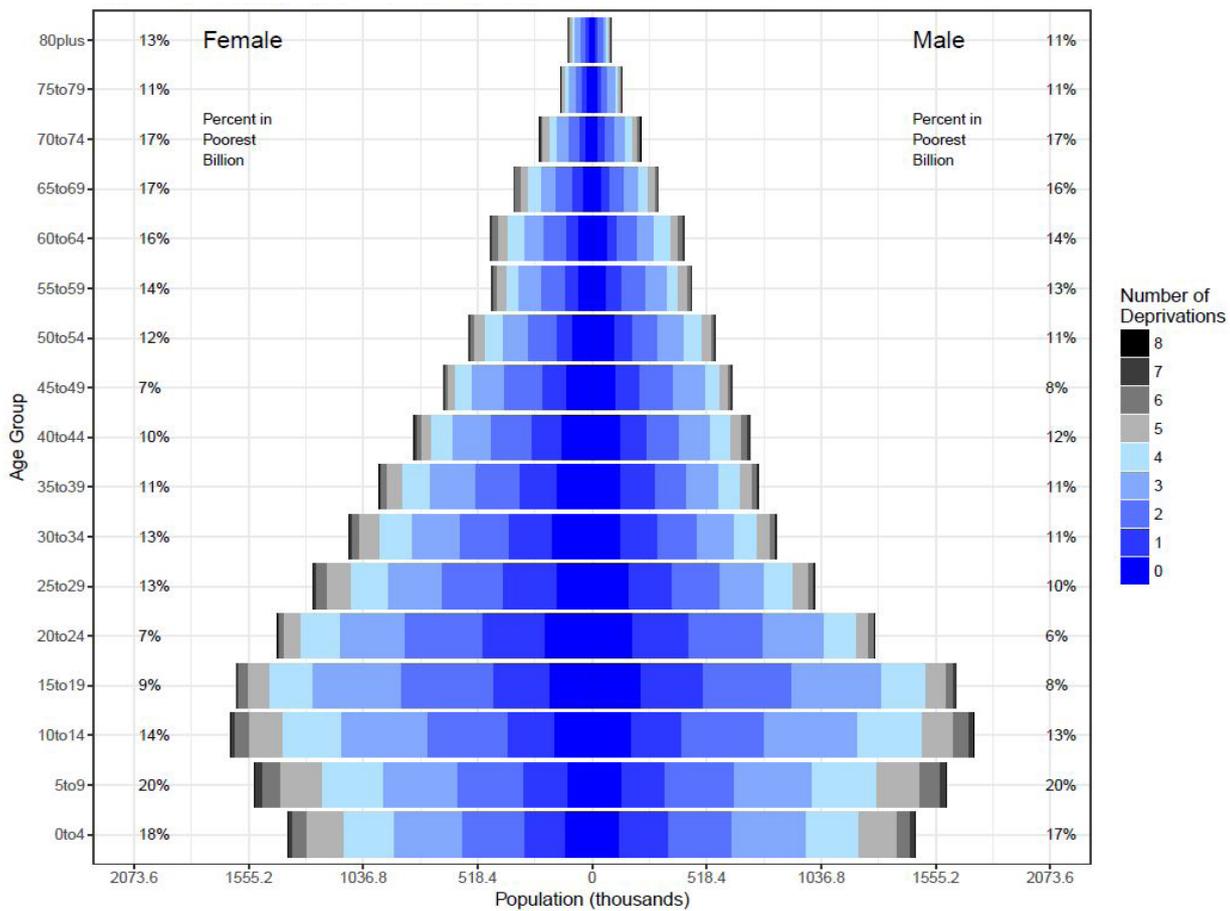
For global comparisons, we compare rates from the aggregated global poorest billion and non-poorest populations. The burden among the poorest population is aggregated across countries, and the burden among the non-poorest is aggregated, both from the countries with entirely non-poor populations and from the predicted non-poor burden in countries with a portion of the population in the poorest billion.

One of the intrinsic values of the GBD is that it creates internally consistent results, with prevalence, incidence, deaths, YLLs, YLDs, and DALYs that match each other. Using this approach of an ecologic regression for each measure, we cannot achieve the same level of internal consistency that the GBD achieves by estimating these metrics using epidemiological models. Here, we aimed to create as much consistency as possible in several ways. First, each of the analyses was done at the most specific level in terms of age, sex, and cause, and higher level causes or age groupings were created by aggregation. Second, the ecological regressions were conducted on prevalence and death rate, and each of the remaining metrics was predicted through a regression of a ratio to prevalence or death rate, or was directly calculated (e.g. DALYs = YLDs + YLLs). While not as internally consistent as an epidemiological SIR model, this enforces some degree of consistency in the measures. Last, each of the predicted measures for the poorest billion and non-poor is rescaled to the national-level GBD estimates of the given measure.

Given the relatively young population, the nature of population demographics is early-expanding in young age groups and converging towards older age groups (Figure below). The maximum number of population lies age groups 10-14 years and 15-19 years, each contributing 20% and 14% in females and 20% and 13% in males, respectively. The same age groups contributed the maximum of economic deprivation.



Nepal Population by age, sex, and deprivation



The legends are the number of deprivations. (Source: MPI)

2.2. SELECTION OF 40 YEARS AS AGE CUT-OFF TO COMPARE THE BURDEN OF DISEASES

The cut-off of 40 years is based on the 80x40x20 target for NCDs and injuries proposed by NCD Synergies⁵³ which was proposed with the approval of the global monitoring and evaluation framework for the prevention and control of non-communicable diseases (NCDs) in World Health Assembly, July 2013. It supports the DALYs of NCDs and Injuries are high below the age of 40.⁵⁴ The 80x40x20 target for NCDs and injuries is the agenda to reduce premature mortality from all NCDs and injuries (including neuropsychiatric disorders) by 80% in individuals younger than 40 years by the year 2020.

2.3. GLOBAL BURDEN OF DISEASE LEVELS OF DISEASES OR CONDITIONS

First we used the 2015 GBD data¹ to examine NCDI burden. We extracted data on the prevalence, deaths, DALYs, and the DALY rate per 100,000 of all NCDI conditions disaggregated by age and sex. Causes of death in GBD are described in three levels.



Level 1: It is the overall consolidated categories of diseases described in terms of Communicable, maternal, neonatal, and nutritional diseases; Non-communicable diseases; and Injuries

Level 2: Level 2 is the sub categories of the three categories of Level 1. The level 2 includes 4 sub causes for non-communicable diseases such as Cardiovascular diseases, Chronic respiratory diseases, Cirrhosis and other chronic liver diseases, Diabetes, urogenital, blood, and endocrine diseases, Digestive diseases, Mental and substance use disorders, Musculoskeletal disorders, Neoplasms, Neurological disorders, Other non-communicable diseases; and for injuries such as Forces of nature, war, and legal intervention, Self-harm and interpersonal violence, Transport injuries, and Unintentional injuries.

Level 3: Level 3 consist of all the Global Burden of Diseases listed diseases. These are the causes of each 14 conditions for non-communicable diseases and injuries. GBD has enlisted 190 conditions under Level 3 category.

2.4 RISK FACTOR PROFILE FOR NCDI

Risk factors are characterized as behavioral (i.e. smoking, diet low in whole grains, fruits or high in sodium and alcohol intake etc.), metabolic (i.e., high systolic blood pressure, fasting plasma glucose and body mass index etc.), and environmental (i.e., household air pollution from solid fuels, ambient particulate matter pollution and occupational economic factors etc.). The burden of disease that cannot be associated with any given risk factor in the data provided within GBD is considered “Unattributable”.

2.5 POVERTY BASED ON CONSUMPTION QUINTILE

We used National Living Standard Surveys (NLSSs)⁵⁵ to explain the average costing per condition. During the NLSS, chronic illness and Injury was used as the condition and the average cost per illness or injury was measured.

Chronic illness is a long-term suffering. Chronic illness includes the illness that is occurred due to oldness, bad consumption behavior, and tobacco and alcohol consumption such as heart disease, cancer, diabetes, liver diseases, pain related to joints (Rheumatic diseases), occupational related illness, etc. Household member may have one or more chronic illness. If they have more than one chronic illness, major one is included as chronic illness.⁵⁶ Injury data are based on last 30 days of injury. Injuries include any types of injuries such as major or minor.⁵⁷

All National Living Standard Surveys (NLSS) are nationally representative with the sampling unit at the household level and who have choice of providers being either of the public or private sector. All NLSSs also



include detail of health care costs namely medicine cost and total cost with consumption categories being food consumption, non-food consumption and home production. However, the sample sizes differ; it is respectively 3,388, 4,008 and 5,988 for NLSS 1, 2 and 3 respectively.

Out of Pocket (OOP) payment for chronic illness or injury includes health expenditure including consultation cost, medicine cost, made by the household while getting treatment.

Household Consumption data includes food and non- food consumption and home production for consumption. Individual weight was used while estimating the poverty. The time horizon was adjusted between OOP and household consumption data.

Impoverishment impact can be measured from the difference between poverty incidence before and after netting out the OOP payment for health care from consumptions. Health care is a basic necessity of life, which is as important as food, shelter, and clothing; however, the current practice of estimating poverty indicators in Nepal does not capture the basic health care cost. The absence of accounting OOP health payment into the poverty estimation gives a misleading trend in poverty over time. OOP health payments or medical costs lead to poverty. The measurement of hidden poverty, focuses on available resources to the household after deducting OOP health payment from household consumption as suggested in O' Donnel, et al (2008).⁵⁸ The official poverty lines defined by CBS (2011)⁵⁹ for survey years are used in this analysis. We used national poverty line while measuring impoverishment impact and average national poverty line of NRs 19261 per year at 2010/11 constant price was for our report.

A household is in poverty when household resources (total household consumption minus household OOP health payment) are less than the given poverty line. The study used similar method suggested by van et al (2006)⁶⁰ that informs on the marginal effect of OOP health payment on poverty and its impact on household wellbeing.

The impoverishment impact of health care payment is measured in term of poverty incidences and intensity. Poverty incidence (or head count index) quantifies the percentages of population pushed below the poverty line as a result of health care payment while the intensity of poverty measures the depth of poverty. The difference between the pre-payment and post-payment income poverty, gives an estimate of the poverty impact of health care payment on incidence and intensity (O' Donnel, et al 2008).⁶¹ The pre-payment poverty



index is estimated based on per capita income before deducting health care cost. While post-payment income poverty is based on the per capita income after deducting health care costs. Various methods are found in the literature to estimate the income poverty, among them, the Foster, Greer and Thorbecke (FGT) poverty estimation method is the most widely used (Chaubey 1995 p.33).⁶² They defined poverty index as:

$$\text{Poverty index} = \frac{1}{N} \sum_{i=1}^n \left[\frac{P_L - Y_{Pi}}{P_L} \right]^\lambda$$

Where, P_L = the poverty line income; Y_{Pi} = below poverty line income. Values for $\lambda = 0, 1,$ and $2,$ gives headcount index, normalized deficit (poverty gap) ratio and severity of poverty respectively. The index is sensitive to changes in income when $\lambda > 0$ and to the transfer to income when $\lambda > 1$. The square of the poverty gap measures the severity of poverty.

In this analysis we used poverty incidence only. STATA software was used while managing and analyzing the data.

2.6 FISCAL SPACE

The fiscal space is calculated based on the data sources from Ministry of finance (MOF) for fiscal year 2015/16; Government income expenditure statement produced by financial comptroller general office (various years) at MOF; National Health Account, Government red book published by MOF (various years); Annual report 2014/15 published by Department of health services.

We grouped and regrouped various expenditure data, disaggregated the data for fiscal years (2009-2015) as much as possible, if disaggregated data were available.

2.7 PRIORITY SETTING FOR NCDI CONDITIONS AND INTERVENTIONS: DISEASE CONTROL AND PRIORITIES 3

The methodology for the selection of health sector interventions for Universal Health Coverage is described in-depth in the following reference, and available at: <http://www.dcp-3.org/resources/working-papers> Watkins D, et al. Costs and Affordability of Essential Universal Health Coverage in Low- and Middle-Income Countries. Disease Control Priorities in Developing Countries, 3rd Edition Working Paper # 20. July 2017.



3.0 Literature Review

3.1 METHODOLOGY OF THE LITERATURE REVIEW

To study the burden of non-communicable diseases and injuries (NCDIs) in Nepal we extracted data from the 2015 Global Burden of Disease (GBD) estimates and conducted a literature review to examine existing estimates of the prevalence, incidence and hospital-based case count of NCDIs. In addition to assessing NCDI burden, a central goal of the literature review was to assess study design of NCDI research, and whether studies provided estimates of the NCDI burden disaggregated by socioeconomic status, gender, age, and ethnicity. We conducted a literature review of existing research with estimates of NCDI burden in Nepal. We searched PubMed in November 2016 for studies published between January 1st 2006 and July 31st 2016. Only studies published in English were included. Our strategy included search terms for each NCDI category (defined based on GBD 'level 2' NCDI categories) combined with the word "Nepal". Appendix 3.4, Search terms and GBD criteria describes the search terms and the corresponding GBD categories. Studies were included if they met any of the following criteria: (1) contained data on either prevalence, risk, mortality, incidence or hospital-based case counts for NCDIs; (2) contained estimates of NCDI burden stratified by socioeconomic status, gender, age, and ethnicity. Methods for this literature review have also been described elsewhere.²

Any study which did not report either the prevalence, risk, mortality, incidence or hospital-based case count for an NCDI was excluded. In addition, any study which met the following criteria was excluded: studies which assessed etiology, which examined associations between two variables, studies which examined the prevalence of the outcome among a sub-group of another outcome, studies on the effectiveness of medical treatments for outcomes, studies which examined awareness of disease conditions were excluded, and studies which developed statistical models to predict the future prevalence or incidence of disease.

Studies were initially included based on their title and abstract. Data on sample size, location, population, study design, outcome, disaggregate and point estimates were extracted for included studies. Appendix 3.5, describes the variables extracted.

3.2 DETAILED RESULTS OF THE LITERATURE REVIEW

For all the NCDI categories excluding 'other NCDs', a total of 3035 PubMed search results were retrieved. After an initial screen, and applying the exclusion criteria, 229 articles were included in the final review. A search for other NCDs resulted in 1346 articles, of which 610 were original and 47 met the inclusion



criteria. Table 1 in the report outlines the total number of articles, the types of outcome measures assessed, the location of studies, and the number of studies which provided estimates of the NCDI outcome disaggregated by socioeconomic status, gender, age, and ethnicity.

Of the total 229 articles includes, the majority of studies (64%) were hospital-based and 42 studies (18%) reported population estimates. Case counts were the most frequently reported outcome measure (51%) followed by community level or population level prevalence (41%). Only 3% of studies reported incidence. Although many studies disaggregated by age and sex and other sociodemographic, 21 studies disaggregated by income, 53 by caste/ethnicity, and 86 by other sociodemographic characteristics (e.g. education, urban/rural, religion).

Bibliometric of literature review

NCDI outcome	Number of studies			Study site (n)			Outcome measure (n)				Outcome disaggregated by socio-demographic characteristics (n)				
	Total	Included %	n	Popu- lation based	Hos- pital	Other	Prev-	Case	Inci-	Oth- er	In- come		Sex	Age	Oth- er
Chronic Resp.	40	9	4	3	4	2	7	2	0	0	0	3	6	4	5
Cirrhosis	17	2	1	0	2	0	0	1	0	1	0	0	0	0	0
CVD	346	35	15	18	14	3	24	7	2	2	4	11	22	26	13
Diabetes	596	30	13	3	19	8	14	14	0	2	1	3	17	20	8
Digestive	314	7	3	1	6	0	1	6	0	0	0	3	5	3	1
Mental & Substance Use	184	41	18	7	18	16	26	12	1	2	9	19	27	25	29
	151	4	2	0	4	0	0	4	0	0	0	0	1	1	0
Neoplasms	403	44	19	2	41	1	7	33	3	1	1	6	27	40	10
Neurological	578	13	6	3	10	0	3	10	0	0	1	1	8	10	4
Injuries	406	44	19	5	30	9	13	28	2	1	5	7	31	34	15
Total	3035	229		42	148	39	95	117	8	9	21	53	145	164	86
Other NCDs**	1346														

There were several large studies of multiple NCDI outcomes. Data from the Jhaukhel-Duwakot Health Demographic Surveillance Site in Bhaktapur (n=13669) showed that the most common cause of illness was respiratory problems, followed by heart disease, hypertension and gastric ailments. Age-adjusted multivariate analysis of the composite prevalence of the main four NCDs (i.e., heart disease, hypertension, cancer and diabetes) found that NCDs occur more frequently in females, Tibeto-Burman ethnic groups, agricultural workers or laborers, the illiterate and smokers.³ A cross sectional study (n=4000) which randomly selected patients from 31 health institutions found the chronic obstructive pulmonary disease (43%) was the most common NCD followed by cardiovascular disease (40%), diabetes mellitus (12%) and cancer



(5%). Ovarian (14%), stomach (14%) and lung cancer (10%) were the main cancers accounting for 38% of the distribution.⁴ Although we do not focus on risk factors in this review, data on risk factors is available from the 2013 STEPs survey which used a multistage cluster sampling method to randomly select the 4,200 respondents and identify risk factors for NCDs.⁵

Most of the studies which provided outcome estimates disaggregated by income and ethnicity were in three disease categories: CVD, mental & substance use, and injuries (all of which examined IPV as the primary outcome). Table 2 Research in these areas offers important lessons on how to measure the burden of NCDI among the poor in Nepal.

In what follows, we summarize relevant findings for each disease area, with the exception of 'other NCDIs'. This summary is illustrative, not exhaustive; it explores the scope of available literature as well as provides key estimates of disease burden.

3.2.1 CHRONIC RESPIRATORY DISEASES

Chronic respiratory diseases had one of the highest DALY rates, 2075 per 100,000, which was highest among children under five. The literature review identified nine studies, four of which were hospital based studies. Most studies examined asthma and COPD as primary outcomes. Most studies disaggregated outcomes by sex, and three studies disaggregated outcomes by ethnicity. No study disaggregated by income. Data from the Jhaukhel-Duwakot Health Demographic Surveillance Site in Bhaktapur (n= 13669) showed that the most common cause of illness was respiratory problems.³

Asthma: A population-based study among the elderly (n=705) in Bhaktapur Municipality and Sirutar Village Development Committee found that chronic bronchitis/asthma (32.4%) was one of ten common health problems, and prevalence was higher in urban areas (30.4%) compared to rural areas (21.7%).²² Two studies examined asthma among children: a longitudinal study of children aged 2-14 years attending the asthma clinic (n=104) found that the mean age of children presenting with asthma was 6.7 years, and the majority of children 49 (47.5%) were graded as mild persistent asthma.²³ A study of 2000 school going children in Sonapur VDC reported that 6% of children had symptoms of bronchial asthma.²⁴

COPD: A 2009 hospital based study with a sample of 4000 patients randomly selected from 31 selected health institutions across Nepal found that COPD (43%) was the most common NCD. COPD was more common in older age groups, 42% among males and 45% among females. It was also most common amongst dalits (50%) and religious minorities (53%).⁴ An analysis of COPD patients in the Mid Western Regional Hospital between 2006–2009 (n=313) showed more COP patients were women (60%) and the majority of cases were



found among those aged 50–79 years, with the highest prevalence of all COPD patients among those aged 60–69 years (37%). Those under 40 years of age accounted for less than 4% of all cases. Among the ethnic groups, the highest proportion of COPD patients were of the upper caste, followed by the Dalit and Janajati.²⁵ A hospital-based study with a population of the elderly (age 60 and above) found that acute exacerbation of chronic obstructive pulmonary disease (COPD) (20.4%) was one of the five most common diagnoses, and one of the most common reasons for admission.²⁶

Other: A study among children and young adults in Sarlahi District in the Terai (n= 5,430) found that wheezing prevalence during the previous year was 4.8% in participants aged 9–13 yrs and 6.6% in participants aged 14–23 yrs.²⁷ A cross-sectional study reported that both men and women exposed to biomass smoke reported more respiratory symptoms compared to those exposed to clean fuel. Women exposed to biomass were more likely to complain of ever wheeze (32.0 % vs. 23.5%;p = 0.004) and breathlessness (17.8% vs. 12.0%, p = 0.017) compared to males.²⁸

3.2.2 CIRRHOSIS

GBD estimates show that cirrhosis of the liver has one of the lowest DALY rate among NCDI conditions across all ages (553 per 100,000). However, this increases to 1746 per 100,000 among those 70 years and older. No population-level estimates, or estimates disaggregated by socioeconomic status were available for cirrhosis of the liver in the literature. Only two hospital-based studies from Dharan and Pokhara were identified. The first was conducted in a tertiary care hospital in Dharan between April 2004 and March 2005 and found 105 patients with cirrhosis, of which 90 patients were age 35 years or older, and most patients had alcohol related cirrhosis.²⁹ A study conducted between January 2009 and December 2010 in Manipal Teaching Hospital, Pokhara found that among a sample of 1200 patients assessed for Alpha Fetoprotein (AFP), 480 (40%) patients had liver cirrhosis.³⁰

3.2.3 CARDIOVASCULAR DISEASE (CVD)

CVD had the highest DALY rate among NCDIs for all ages (3502 per 100,000). Although other conditions had higher DALY rates among children and adults under 49 years, CVD had the highest DALY rate after age 50. The DALY rate remained higher among men throughout the life course. 35 studies with estimates of disease burden were included in the literature review, of which 18 studies provided population level estimates of CVD burden, 4 studies presented CVD outcomes disaggregated by income or socioeconomic position, and 11 studies examined differences in CVD by caste or ethnicity. The studies which examined the relationship between low income and hypertension, showed that the prevalence of hypertension was higher among the lowest-income groups.



A 2009 hospital based study with a sample of 4000 patients randomly selected from each of the 31 selected health institutions found that out of 1,660 CVD cases, 80% cases were diagnosed in non-specialist institutions and 20% in a specialist institution-Sahid Ganga Lal Heart Center. Most CVD cases were hypertension (47%) followed by cerebrovascular accident (16%), congestive cardiac failure (11%), ischemic heart disease (7%), rheumatic heart disease (5%) and myocardial infarction (2%).⁴

Stroke: A study in a teaching hospital in Kathmandu found 72 cases of stroke between 2000 and 2005: the mean age of first stroke was 61.7 years (SD 14.9 years).³¹ A study in Bharatpur hospital reported that 10 patients were admitted for stroke every month between April 2009 and July 2010.³² Another study (n=100) examined the stroke mortality rate and found that the 7-day mortality rate was 13 per 100 patients.³³ Finally, a hospital based study conducted in eastern Nepal between 2001 and 2002 found there were 150 patients with stroke (104 males and 46 females), aged 7 to 91 years.³⁴

Hypertension: The largest study on hypertension in Nepal was in a sample of women in Sarlahi District (n=15,934) with a mean age of 34.2 years. The prevalence of hypertension was 3.3%, and 14.4% had pre-hypertension. Lower SES, especially lower household farm assets and storage of food for long term consumption, was associated with increased odds of hypertension (OR = 1.14 for mid-level SES compared to high SES and OR = 1.40 for low SES compared to high SES).⁶ Another study in Sarlahi District (n=4729) reported a prevalence of hypertension of 4%–6%, found that 12% of people had high blood pressure, and females were at higher risk than males for high blood pressure (OR=1.9; 95% CI1.6–2.3). Further, Madheshi women with low farming assets and food storage had a significant 31% increased risk of hypertension compared to women of high status.³⁵ Heart disease, including hypertension was one of the common causes of morbidity (8.8%) in the Jhaukhel-Duwakot Health Demographic Surveillance Site (n= 13,669).³

Data from a repeated cross-sectional study in rural Kathmandu found a threefold increase in hypertension (from 6% in 1981 to 18% in 2006) over 25 years (when using HTN cut-offs from 1981).³⁶ A cross-sectional study (n=527) in a rural village in the central development region found a prevalence of hypertension of 22.4%, and bivariate analysis showed significant relationship of hypertension with gender, age, and literacy.³⁷ A study in Tinkanya Village Development Committee (VDC), Sindhuli between January and March, 2014 (n=406) reported a hypertension prevalence of 12.3%, and an inverse relationship between hypertension and education and socio-economic status: prevalence was 14.2% in the lowest socioeconomic group and 6.2% in the highest group.⁷ In Banepa Municipality, Kavre the prevalence of hypertension was 44.9 percent (47.75% in male and 42.73% in females), and only 32.9% percent of respondents had a prior diagnoses of hypertension.³⁸ In Sunsari



District, eastern Nepal (n=2006) the prevalence of hypertension was 38.8%: 25.2% were HTN1 and 6.5% were HTN II.⁹ A population-based study (n=641) in the Duwakot village of Bhaktapur District found that the prevalence of hypertension was 25.3% in the Tibeto-Burmans compared to the 14.0% in the Indo-Aryans.³⁹ A study among males (n=1000) in Dharan municipality reported a prevalence of hypertension of 22.7%; hypertension was 26.4% among those in the middle income group, 19.6% among those who were low income and 18.3% among those who were high income.⁸

The nationwide STEPS survey (n=4200) found that the prevalence of raised blood pressure, including those who were on medication for hypertension was 26%. Higher prevalence was observed among those aged 45–69 years (47%, 95% CI: 43.4–50.0) compared to those aged 15–29 years (13%, 95% CI: 10.7–16.4), and among men (31%, 95% CI: 27.8–34.6) compared to women (21%, 95% CI: 18.6–22.8).⁵ Another national population-based survey (n=2100) found that prevalence of eBP (>140/90 mmHg on >/=2 readings) was 15.1% and higher in males (21.7%) than females (10.5%). Among those surveyed, 10.9% were classified as Stage I hypertension and 4.2% as Stage II hypertension. The prevalence in the mountain area (29.5% [95% CI 22.6 - 36.4%]), was higher than the Terai. Although, there was some variation across developmental regions, prevalence was highest in the Western region (21.0% [95% CI 17.1 - 24.9%]), followed by the Central (16.9% [95% CI 13.3 - 20.5%]), and lowest in the Far-Western (10.5% [95% CI 7.6 - 13.4%]).⁴⁰ A study in seven wards of metropolitan and submetropolitan municipalities across Nepal (n=1012) found the age- and sex-standardized prevalence of hypertension (BP≥140/90 mmHg) was 22.7%.⁴¹ A study in the Sarlahi District of Nepal (n=4729) found that among aged 9–23 years, in rural Nepal, the prevalence of elevated blood pressure was between 11% and 13%.³⁵

Congenital Heart Disease (CHD): In one year (2006) in BPKIHS there were 84 were cases of CHD, of which 51 were male patients and 33 were female patients. The incidence of CHD was 5.8 per thousand hospitalized children.⁴² A study in Kanti Children's Hospital (2004–2005) among children with heart disease attending the cardiac unit (n=728) found 166 (50.3%) children had a CHD diagnosis.⁴³ A two year study of the cardiac diseases in children attending the Paediatric OPD of Manipal Teaching Hospital, Pokhara found 107 cases of heart diseases of which 51% were CHD and 25% were rheumatic heart disease RHD.⁴⁴

Other: A study among patients diagnosed with Rheumatic Heart Disease between June 1999 and February 2011 found that among 10 860 transthoracic echocardiography studies, 1055 female and 658 male patients were diagnosed with RHD, 25.7% of the patients being below 20 years of age.⁴⁵



3.2.4 DIABETES, UROGENITAL, ENDOCRINE, AND BLOOD DISORDERS

The DALY rate was 1617 per 100,000 and increased after 50 years of age. 30 studies were included in the literature review of which 19 were conducted in hospitals. Only one study reported outcomes disaggregated by income. A review of existing studies found that the prevalence of type 2 diabetes ranged from a minimum of 1.4% to a maximum of 19.0% and the pooled prevalence of type 2 diabetes was 8.4% (95% CI: 6.2-10.5%). The prevalence of type 2 diabetes in urban populations was 8.1% (95% CI: 7.3-8.9%) and 1.0% (95% CI: 0.7%-1.3%) in rural populations.⁴⁶

Diabetes: In a study in seven wards of metropolitan and submetropolitan municipalities of Nepal (n= 1012) the age and sex standardized prevalence of diabetes (known and newly diagnosed) was 19.0%. Of the total population, 30.5% (37.8% of men and 25.3% of women) had some abnormality of glucose tolerance, and 54.4% were undiagnosed. The prevalence of diabetes increased with age and was higher in men than in women (P < 0.001).⁴¹ A large study in Sarlahi District (n=4729) found that elevated fasting glucose or HbA1c was nearly absent (< 1%).³⁵ The nationwide STEPS survey (n=4200) found that 4% percent of the study participants had raised blood glucose; prevalence was higher among those aged 45–69 years (9%, 95% CI, 7.1–10.6) compared to those aged 15–29 years (1%, 95% CI: 0.4– 2.0), and among residents from urban areas (7%, 95% CI: 4.5–9.1) compared to rural areas (3%, 95% CI: 2.3–3.8).⁵

In a community-based screening of 3218 people ≥20 years in Dharan, Nepal, 7.5% of respondents were diabetic. The mean age of all diabetics was 55.5±14.4 years, and the prevalence of diabetes increased with age.⁴⁷ In another community-based screening study in a semi-urban community of Kathmandu (n=1475) the prevalence of diabetes mellitus was 4.1%, but 6.4% had abnormal blood sugar levels.⁴⁸ Another study in a semi-urban population in Kathmandu valley (n=740) found that the prevalence of type two diabetes was 9.5% in the whole population. The prevalence of type two diabetes was higher in men (11.8%) than in women (7.9%), and increased with age.⁴⁹ In a study among the elderly (aged above 60 years) in three districts in Kathmandu, diabetes prevalence was 25.9%.⁵⁰ In Sunsari District, eastern Nepal (n=2006), among urban participants (n = 736) with no history of diabetes 70 (9.5%) had hyperglycemia and 143 (19.4%) had glucose intolerance (IFG and IGT). Of rural participants (n = 1,270) 114 (9.0%) had HGY and 176 (13.9%) had glucose intolerance. The prevalence of diabetes was 55% among the poorest compared to 14.9% among the wealthiest, and the odds of HGY were lower among individuals with medium compared to low socioeconomic position (0.878; CI 0.543-1.868) and higher among high compared to low socioeconomic position (1.405; CI 0.798-2.474).⁹

Several other outcomes were also examined. A one year hospital based study



of pregnant women in three rural districts representing mountain, hill and Terai belts of Nepal (n= 564) found 2.5% of pregnant women had GDM according to WHO criteria while it was 6.6% according to IADPSG criteria.⁵¹ A one year study (2012-13) of renal disease in a pediatric population (age 1 month-15 years) found renal diseases accounted for 206 cases (6.9%) of total annual pediatric admissions, of which (58%) were male and (42%) female.⁵² A study in Tilganga Eye Centre, Nepal (n=371) reported that the prevalence of Diabetic Retinopathy was 44.7% (166).⁵³ A one year study in the Thyroid lab of the BPKIHS (n=1714) 26% of cases had raised TSH levels and 20.42 % had subclinical hypothyroid dysfunction which included 84 (4.901 %) males and 266 (15.519%) females.⁵⁴ A one year study (n=472) in Kantipur Hospital with patients examined for thyroid disease found that the prevalence of thyroid dysfunction was 36.0% (n=170).⁵⁵

Renal disease: A five year study in Bir Hospital, Kathmandu found the total number of patients with end stage renal disease was 802 of which 510 were male and 282 were female. The mean age of the patients was 42 years.⁵⁶ In BPKIHS, Dharan, 10,396 children were admitted between April 2002 and March 2007, of which 651 (6.3%) children had renal disease.⁵⁷

3.2.5 DIGESTIVE DISORDERS

GBD estimates show that digestive disorders have one of the lowest DALY rate among NCDI conditions across all ages (635 per 100,000). However, the DALY rate increases to 2898 per 100,000 among those aged 70 and above. The literature review found seven studies with estimates of disease burden, of which only one was conducted at the population level. The remaining studies were hospital-based. No studies disaggregated by income; however three studies examined differences by ethnic group.

The population-level study (n= 13669) was based on 2010 data from the Jhaukhel-Duwakot Health Demographic Surveillance Site in Bhaktapur district and found 13.9% of people reported gastrointestinal problems.³ A four-year (2004-2008) hospital-based study in Kathmandu Medical College Teaching Hospital (n=2761) of patients between 8 and 95 years found there were 983 patients (35.60%) with peptic disease. The prevalence of peptic disease with or without ulcer was more common in patients aged 20- 49 years (n= 764, 27.67%).⁵⁸ A one year hospital-based study (2013-14) on acute Upper Gastrointestinal Bleeding (n=120) found a higher case count among men (75%) and that the age of patients ranged from 14 to 88 years.⁵⁹ A study in Dulikhel hospital between 2007 January to 2009 October for patients who underwent oesophago-gastro-duodenoscopic examination for upper GI bleeding (n=90) found there were (64.4%) males and 32 (35.6%) females with upper GI bleeding, and the mean age of the population was 45.32 +18.47 years. Among the ethnic groups, Aryan (51%) was the most common group to have upper GI bleeding followed by Newars (27%). 52.2% of upper GI cases was among patients aged 15-45 years and 33.3% among patients aged 46 to 65 years.⁶⁰



3.2.6 INJURIES

GBD data measures forces of nature, war, and legal intervention, self-harm and interpersonal violence, transport injuries, and unintentional injuries to estimate the overall burden of injuries. Appendix 1, Figure 2 shows the DALY rate for these conditions by age. Forces of nature, war, and legal intervention has one of the highest DALY rates in Nepal (2122 per 100,000), is highest among children under five (2778 per 100,000) and decreases across the life course. The DALY rate for unintentional injuries is also high (1146 per 100,000), and most substantial among children under five and adults above 50 years. 44 studies were included with estimates of the injury burden, or which five included estimates disaggregated by income.

A review of the injuries literature conducted in 2009 included 23 articles and found that the incidence of injuries was twice as common in male as in female with the ratio of 2.1:1, and most affected the population between ages 20-50 years. Road traffic injuries were the most common injuries, most of which (42.5%) involved motorcycles, and pedestrians (48.6%) were most affected. Falls (48.9%) were the most common cause of neuro traumatic accidents.⁶¹

The results from a cross sectional survey in 15 districts using the Surgeons Overseas Assessment of Surgical Need (SOSAS) (n=2695) reported 379 injuries in 354 individuals (13.1%) with a mean age of 32.6 years. The prevalence of injury was higher among those with primary or secondary education compared to a tertiary or graduate-level education. Injuries from falls were the most common (37.5%), followed by road traffic injuries (19.8%) and burns (14.2%).⁶² A one year study (2001-12) on physical trauma in the Kathmandu University Hospital emergency department also reported that most trauma victims were between 15 to 49 years, and also reported that falls were the most common followed by road traffic accidents. This study also found that 2205 (19.9%) of injury cases were reported in the hospital, while (6.12%) cases were reported in community outreach centers.⁶³

A study reviewed one year of medical records of all the victims of road traffic accidents attending the emergency department of Kathmandu Medical College Teaching Hospital: there were a total of 757 road traffic victims which were 6.66% of all the cases in the emergency department. The majority of cases (49.93%) occurred among 21-40 year olds. Most accidents affected pedestrians (56.54%) and the motorcycle was the vehicle that was most often involved (55.09%).⁶⁴ A one month study across six clinics in Kathmandu and Bhaktapur reported similar findings. Among the 505 injury cases, 42.5% occurred in roads, 34.1% at home, and 65% of road traffic injuries involved motorcycles.⁶⁵

A three year study in a Hospital in Pokhara found that 1100 cases of physical assault had been reported. The male to female ratio was 3.6:1 and case counts were higher among males aged 16-25 years and females aged 26-35 years.



Contusion (28.7%) was the most common type of injury followed by incised wounds (25.7%). Assaultants for females were most commonly spouse (40%) and in-laws (14%) and for males it was unspecified known individuals (18%) followed by neighbours (11%).⁶⁶

There were two studies conducted only among the pediatric population. A household survey in Makwanpur district in the Central Region of Nepal (n=3441 households) identified a total of 193 (2.5%) children with non-fatal injuries in the previous 12 months. The overall incidence rate was higher among boys (32.5/1000) compared to girls (16.8/1000), and the non-fatal injury rate was highest among 5–9 years and lowest among 15–17 years.⁶⁷ A school-based study in 14 schools in Kathmandu (n=1557) found that among students in grades 6–8, falls (65%) and cuts (63%) were the most common injuries, followed by transport-related injuries (36%) and burns (22%).⁶⁸ A three year study (2001-04) in Tribhuvan University Teaching Hospital found 416 cases of acute neurological trauma among the pediatric population of which 228 (65%) were boys and falls were the leading cause of injuries overall (61%) and in all age groups, and the most common type of injury requiring admission to the neurosurgical service was mild head injury (57%).⁶⁹

One study used surveillance data on civilian injuries to estimate fatalities due to landmines, victim-activated improvised explosive devices (IED) and other explosive remnants of war (ERW) between July 2006 and June 2010. Of 307 total casualties, 94 (31%) were female and 169 (55%) were children under 18 years of age. The case fatality ratio was 14%. Most casualties were among 10-14 year olds.⁷⁰

Intimate Partner Violence (IPV): An analysis of the 2011 Nepal Demographic and Health Survey reported a national IPV prevalence of 32.4% (physical; 23.4%, sexual; 14.7%, and emotional; 17.5%). Household economic status, and both the woman's education and husband/partner's education was inversely associated with IPV. The prevalence of any IPV was 39.9% among the poorest households compared to 18.9% among the richest households.¹⁷ A second analysis of the 2011 DHS survey (n=3373) showed that 28.31% of the population experienced IPV in the past year, and that illiteracy and low economic status were associated with IPV: 33.8% of poor women had experienced IPV in the past 12 months compared to 20.6% of rich women.¹⁸

A cross-sectional survey, carried out in four districts - Dolkha, Sindhupalchowk, Dang and Kapilvastu - (n=1296) found that more than half of young married women (51.9%) reported having ever experienced some type of violence from their husbands; 46.2% reported sexual violence and 25.3% reported physical violence. Almost 25% of Brahmin/Chhetri women experienced violence in the past 12 months while 47.2% of Tharu women experienced violence, and 34.2% of women who had no earnings or were



housewives experienced violence in the past 12 months compared to 19.3% of women who worked in service or had small businesses.¹⁹ A study among women in Kathmandu (n=905) showed that the prevalence of physical IPV was 33.8% among the urban poor population (n = 225) and 19.9% among the general population (n = 680; p < .01). Across the sample, 38.2% of women in the lowest wealth quintile had experienced physical violence compared to 10.8% of women in the highest wealth quintile.²⁰

A cross-sectional survey of 475 women with a disability aged 16 years and above in Bhaktapur, Kaski and Jhapa found that over the lifetime, 57.7% of women reported they had ever experienced violence, including emotional violence (55.2%); physical violence (34%); and sexual violence (21.5%), and 43% of women reported experiencing violence in the last 12 months. The prevalence of both lifetime and past year violence was higher among women from disadvantaged indigenous groups compared to upper caste groups, and among women in the lowest compared to highest wealth quintile.²¹

Suicide: A recent commentary in the Lancet, compared suicides prior to, and following, the 2015 earthquake: between Jan 15 to April 13, 965 people had taken their own lives, however, this rose to 1363 in the three months after the disaster. Suicide was found to be the single leading cause of death in the 2008 Maternal Mortality and Morbidity Study by the Department of Health Services, accounting for 16% of deaths, an increase of 10% from 1998.⁷¹ A four year study (2000-04) examined all violent and traumatic death autopsies (n= 4383) conducted by the Department of Forensic Medicine in Kathmandu and found 1072 (25%) cases of suicide, 380 (9%) of homicide, and 1399 (32%) were accidental deaths. The number of males was almost twice that of females (sex ratio 2.2:1), and mortality was highest between 15 and 44 years (65.4%).⁷²

Burn injuries: A systematic review of burn injuries in Nepal included eight studies and found that mortality ranged from 4.5 to 23.5%, with highest mortality among the flame burn patients. The average hospital stay among the burn victims ranged from 13 to 60 days.⁷³ Findings from the 15 districts included in the SOSAS study (n=2695) showed a 2.0% (95% CI 1.5–2.6%) prevalence of burn injuries, with a mean age of 30.6 years: the largest proportion of burns among 25–54 year olds (2.22%), followed by 0–14 year olds (2.08%).⁷⁴ A case count of burn injuries in Bir Hospital between 2002-2013, Kathmandu found a total of 1148 burn admissions of which 329 (29%) were for intentional burn, 293 (26%) were self-inflicted and 36 (3%) were due to assault. Mortality rates for intentional burns were approximately three times those for unintentional burns (60 vs. 22%). When compared to unintentional burns, patients with intentional burns were more likely to be female (79 vs. 48%), married (84 vs. 67%) and younger (25 vs. 30 years). Intentional burns were more likely to occur at home (95 vs. 67%), be caused by fire (96 vs. 77%), and kerosene was the most common accelerant (91 vs. 31%).⁷⁵ Another study in the



same hospital examined the 819 cases of unintentional burn injury admissions, of which 428 (52%) were male. 58% of unintentional burn admissions were among those under 35 years of age.⁷⁶ A two-year study (2014-2015) in Kirtipur Hospital found a total of 284 patients: case counts were higher among females, and those between 16 and 59 years. Overall mortality was 25.4% (n = 72).⁷⁷

Among the pediatric population: out of 7,556 major surgical procedures performed in the Hospital and Rehabilitation Centre for Disabled Children from 1996 to 2006, there were 1,400 cases of burn contractures which was 19% of the surgical volume. The average age at presentation was 9 years (range, 1-22).⁷⁸

Eye injuries: A one-year retrospective review of medical records in the Himalaya Eye Hospital, Pokhara found 1069 patients with ocular trauma, which was higher among males (741, 69.3 %) than females (328, 30.1 %). The average age of patients with ocular trauma was 28.28 ± 18.29 years.³⁰ Another one year study (2006) in the same hospital examined the pediatric population below 16 years with history of ocular injury: of 6,829 pediatric patients, 554 (8.1 %) had ocular trauma which was more prevalent (38.1 %) among of 5-10 year olds followed by 10-15 years (16.6 %), and higher among boys (62%) than girls (38%).⁷⁹

Poisoning: A six year study in Nepal Medical College Teaching Hospital (2005-11) found 354 cases of poisoning: the Male: Female ratio was 1:1.6, and most patients were 20-29 years of age. Brahman/ Chhetri (150, 42.4%) were the main sufferers of poisoning, followed by Newars (41, 11.6%). Deliberate self-harm was the cause for poisoning in most patients (156, 44.1%), followed by depression (64, 18.1%) and accidental poisoning (42, 11.9%).⁸⁰ Three one year hospital based studies on poisoning were also included. First, a study in the Emergency Department of Kathmandu Medical College Teaching Hospital reported 148 cases of poisoning: the overall male to female ratio was 1.05:1, poisoning was most common in the age group 21-30 years (40.5%). The most common causes of poisoning in adults were organophosphorous compounds and in children was kerosene oil.⁸¹ A one year study in Dhulikhel Hospital found that 54 patients were admitted to the emergency department with acute poisoning: the female-to-male ratio was 1.34:1, poisoning was most frequent among those above 40 years, 40.38% of the cases were farmers, and only 35.29% of the patients were illiterate. 79.24% of patients intentionally consumed the poison (organ phosphorus poisoning (OP) was the most common poisoning) and 5.55% of acute poisoning cases were fatal.⁸² A one year study using records from the emergency department of the Mahendra Adarsha Chikitsalaya hospital, Chitwan reported 921 cases of poisoning: the female to male ratio was 1.17:1, poisoning was most common among 15-24 year olds, snake bite was the most common form of poisoning, and 46.0% of cases were farmers.⁸³



Snakebite: A three year study (2008–2010) from 10 snakebite treatment centers in the Western Development Region reported a total of 6,993 snakebites of which only 857 victims were reported having first aid treatment. Case counts were higher among 11–20 year olds and among females. The overall, case fatality rate was 13%.⁸⁴

3.2.7 MENTAL & SUBSTANCE USE DISORDERS

The DALY rate for Mental & substance use disorders was 1709 per 100,000. Among those aged 15-49 years, mental & substance use disorders had the highest DALY rate of any NCDI condition (2270 per 100,000). The literature review revealed 7 population-level studies and 18 hospital-based studies. 7 studies were conducted in rural areas, 5 were conducted only among a pediatric population and only one study was conducted in an elderly population. Most studies disaggregated by age and sex, 9 studies disaggregated outcome data by income and 19 by caste or ethnicity.

Studies showed higher anxiety, depression and PTSD among female survivors of trafficking,⁸⁵ torture survivors,⁸⁶ and former child soldiers.⁸⁷ A study in Jumla found an increase in depression and anxiety after the conflict and large differences by household income. After the conflict, having no household income was associated with a 2.49 (1.65–3.76) odds of depression and a 1.19 (0.77–1.85) odds of anxiety compared to ‘any income’.¹⁰ Another study (n=720) which examined the effects of conflict on mental health in Chitwan, Tanahu and Dang found that 27.5% met threshold for depression, 22.9% for anxiety, and 9.6% for PTSD. Prevalence rates were higher among women and the elderly.⁸⁸

Depression, anxiety, PTSD: Several hospital-based studies examined mental health outcomes. A one year study among patients admitted to the mental hospital in Lagankhel (n=852) found that the most common diagnoses were schizophrenia (50.1%), mood disorders (33.5%) and substance use disorder (9.3%). 58% percent of patients were males, and more than 60% of the patients were aged between 21 and 40 years.⁸⁹ Another one year study in a Psychiatric ward in Manimal Teaching hospital found 210 cases of Schizophrenia: 78.6% were less than 40 years of age, 61.9% were male, 86.7% unemployed and 80.5% had a monthly income less than 10000 NPR. The majority of patients with schizophrenia were Dalit (26.2%) followed by Chettri (23.8%), and 46.2% of the patients were students.¹¹ A one year study in Dhulikhel Hospital (n=385) among patients referred to the Department of Psychiatry found the most common psychiatric diagnosis was depression 123 (31.9%).⁹⁰ A study in Chitwan (n=400) found that women experienced a slightly higher prevalence of mental disorders than men; 8.51% of women ever experienced any disorder, but only 7.88% of men ever experienced any disorder.⁹¹



Alcohol and substance use: Several studies examined alcohol and substance use. The prevalence of current drinking among a sample of the urban poor in Kathmandu (n=422) was 39.81% (95% CI: 32.4-47.2), of which 66.70% were frequent drinkers.⁹² A study in BPKIHS (n=1068) found that 32.2% of drinkers were dependent drinkers, and the prevalence of hazardous drinking was 67.1%.⁹³ A national study (n=1002) found a 43.6% population prevalence of betel quid dependence among men and 34.9% prevalence among women.⁹⁴ One study was conducted among a population of street children in Dharan (n=48) and revealed 87.5% of children smoked, 50% consumed alcohol, and 72.9% consumed dendrite (glue sniffing).⁹⁵

Pregnancy and mental health: There was a range of literature on antenatal and postnatal mental health outcomes. A review of existing studies found that the prevalence of for antenatal and postnatal depression was 9.8% in rural Nepal, and facility level prevalence ranged from 3.1 to 19.4%.⁹⁶ A study in the rural areas of Dhanusha district in the central Terai region of Nepal (n=9078) found that prevalence of postnatal psychological distress in the study population was 9.8% and associated with asset score, caste, maternal education, husband's education, ethnicity and food security; the poorest mothers were more likely to experience psychological distress compared to the wealthiest.¹² A study in Patan (n=426) found the overall prevalence of depressive symptoms in the postnatal period was 4.9% (95% CI 2.9-7.0), and the prevalence of mental distress was 3.1% (95% CI 1.4-4.7).⁹⁷ A study in the Paropakar Maternity and Women's Hospital reported a higher prevalence and found that out of 346 post-partum mothers, 105 (30.3%) had depressive symptoms: prevalence was 48% among mothers whose husbands were illiterate and 41.7% among mothers with low socioeconomic status.¹³ In Dhulikhel hospital (n=100) the prevalence of depressive symptoms in the postnatal period was 29% (95% CI 20.1%-37.8%) and in this sample post natal depression was not associated with family income.⁹⁸ A hospital based study among primiparous mothers who were followed at 5-6 weeks after delivery (n=216) in Kathmandu found that 24.04% had moderate to severe anxiety and reported significant associations between anxiety and education and income: mothers who were middle income had higher levels of post-natal anxiety than low and higher income mothers.¹⁴

3.2.8 MUSCULOSKELETAL

GBD data revealed a 1949 per 100,00 DALY rate of musculoskeletal disorders, and higher rates among women throughout the life course. Four studies hospital-based studies were included from the literature review all of which reported case counts. There was no literature on estimates of disease burden disaggregated by SES or ethnicity.

One hospital-based study examined MRIs for patients with low back pain during May 2012 to October 2012 and found 301 MRIs met the inclusion



criteria out of which 75.74% were young adults and 24.25% were elderly adults. Degenerative changes and disc bulge was more common in elderly. Disc herniations including disc prolapse was more common in young adults.⁹⁹

Two studies reported estimates of musculoskeletal disorders in children. First, a review of hospital records from the Hospital and Rehabilitation for Disabled Children, Banepa, Nepal between 1996 and 2006 to categorize all major surgical procedures found among 7,556 major surgical procedures 91% were: congenital (38%), burn contracture (19%), posttraumatic (14%), neuromuscular (10%), and infection (10%). The most common diagnosis was congenital clubfoot, which accounted for 2,348 cases (31%). The second most common diagnosis was cerebral palsy, which accounted for 134 cases. The sequelae of musculoskeletal sepsis represented 731 cases (10%). The authors estimated that approximately 837 infants will be born with clubfoot each year in Nepal.⁷⁸ Second, a two year study in the cardiology unit of Kanti Children's Hospital, Kathmandu found that of the 233 patients admitted to the paediatric cardiology unit, 26% had Rheumatic fever. The median age (range) of the 51 patients was 11 (5-14) years, and the male:female ratio was 1.6:1.¹⁰⁰

3.2.9 NEOPLASMS

The DALY rate for neoplasms was 1115 per 100,000 and increased to 4018 among 50-69 years and 6033 among 70+ years. The literature review found 44 studies of which 41 were hospital based. Most studies disaggregated outcomes by age and sex. Only one study disaggregated outcomes by SES and six studies by caste or ethnicity. In a cross sectional study (n=4000) which randomly selected patients from 31 health institutions the major cancers were of lungs, breast, cervix, ovary, oesophagus, gall bladder, rectum. Out of 829 cancer cases, 18% cases were diagnosed in nonspecialist institutions and 82% in specialist centers.⁴ A one year study in the seven major cancer service hospitals (BP Koirala Memorial Cancer Hospital, Bhaktapur cancer hospital, Bir, TU Teaching, Kanti Children Hospitals, BPK Institute of Health Science, Manipal Teaching hospital) found 7,212 cancer cases in 2012. Female cancer cases (54.4%) were more common than in males (45.6%). Most cancer cases were registered in BP Koirala Memorial Cancer Hospital followed by Bhaktapur Cancer Hospital and Bir Hospital. In the youngest age group (0-15 years) lymphomas and leukemia and connective tissue tumors were the most prevalent, as well as nervous tissue lesions. The most common forms of cancer in males were bronchus and lung (17.6%) followed by stomach (7.3%), larynx (5.2%) and non Hodgkins lymphoma (4.5%). In females, common cancers included: cervix uteri (19.1%) and breast (16.3%) followed by bronchus and lung (10.2%), ovary (6.1%) and stomach (3.8%).¹⁰¹ Table 6 shows these findings.

In Manipal Teaching Hospital, Pokhara there were a total of 957 cancer cases between 2003 and 2005. The median age of male and female patients was



63 and 60 years, respectively. Tobacco-related cancers constituted 48% of all cancers among males and 28% among females. For males the leading cancers were lung (22.2%), larynx (9.8%) and stomach (9%). For females the most prevalent cancers were lung (20%), cervix (19.7%) and breast (7.8%).¹⁰²

Breast cancer: A national survey in 15 districts using a validated population based survey of surgical needs found that among 955 women over age 18 surveyed, 15 reported a breast mass (1.6%, 95% CI 1.0% to 2.6%). The mean age was 39.7 (SD 12.7).¹⁰³ Several hospital-based studies were conducted with breast cancer as the primary outcome. A study in Tribhuvan University Teaching Hospital, Kathmandu showed there were 944 breast cancer patients admitted between November 1997 and October 2012 of which 263 (27.9%) were <40 years.¹⁰⁴ A four year study (2000-2004) in BP Koirala Memorial Cancer Hospital found that among all 2246 patients who underwent fine-needle aspiration, 348 were diagnosed as malignant.¹⁰⁵ A two-year (2014-16) study conducted in Nepal cancer hospital found that among 3270 cancer patients, the prevalence of breast cancer was 5.59%. Prevalence was higher among Newars, and between age 40-49. Stage II (49.1 %) was the most common stage at diagnosis.¹⁰⁶ Finally, a study in BP Koirala Cancer Center Hospital examined 1141 cases of breast cancer between 1999 to 2006 and found that the mean age of presentation of breast cancer was 47.30 (+/- 11.57) years, and there were 123 (10.78%) stage I, 281 (24.62%) stage II, 466 (40.84%) stage III, and 271 (23.75%) stage IV patients.¹⁰⁷

HPV and cervical cancer: Hospital-based statistics from Kathmandu, Bhaktapur and Bharatpur indicate that cervical cancer accounts for 20% of all female cancers.¹⁰⁸ In 2010, hospital records showed that 505 cases in B.P. Koirala memorial cancer hospital and 122 cases in Bhaktapur cancer hospital were diagnosed as cervical cancer.¹⁰⁹ A 10 year study (1999-2008) in BP Koirala Cancer Memorial Hospital. Found that out of 11,469 cases diagnosed as cancer, 3372 cases (29%) were cervical carcinoma, and case counts for cervical carcinoma had risen during the ten year period. The median age of the patients was 45 years and most cases (33%) were found in the age group 40 to 49 years. 40% of cases were squamous cell carcinoma.¹¹⁰ In a community-based study in semi-urban districts of Bharatpur, Chitawan (n=932), the prevalence of abnormal Pap smears was 3.6% and HPV prevalence was 8.6%.¹¹¹

Ovarian cancer: A two-year study (2006-08) of all the cases of ovarian tumors operated in Nepal Medical College Teaching Hospital found the incidence of ovarian tumour was 16.7% among total gynaecological admissions, out of which malignant ovarian tumour was 9.5%. The age of patients ranged from 18 to 70 years.¹¹²

Lung cancer: A case-control study (n=209 cases and 313 controls) in B.P. Koirala Memorial Cancer Hospital found that Rai, Limbu and Magar groups had a higher risk of lung cancer than Brahmins (OR=3.11, 95% CI=1.55-6.23), and



an inverse association was observed between education and lung cancer risk (p for trend=0.0008). There were greater proportions of late stage cancers among women compared to men, in the Rai/Limbu/Magar ethnic groups, in individuals with lower education, and in older age groups.¹⁵ A one year study in Kathmandu found 100 cases of lung cancer presented at the Thoracic Surgery Unit. 72% of patients were aged 60-80 years, and the male to female ratio was 2:1. Seventy-six patients presented with locally advanced disease while 21 had metastases.¹¹³

Prostate cancer: A one year study among males above 50 years visiting the Surgical Outpatient Department in BPKIHS ($n=1,521$) found abnormal prostatic specific antigen (PSA) (>4 ng/ml) in 58 (3.8%) patients. Abnormal digital rectal examination was found in 26 (1.72%) patients. DRE and PSA were both abnormal in 26 (1.72%) patients.¹¹⁴

3.2.10 NEUROLOGICAL

GBD data showed a 1142 per 100,000 DALY rate for neurological disorders. 13 studies were included with estimates of neurological disorders, of which three were conducted at the population level, and the remaining reported hospital-based case counts. Seven studies examined neurological disorders in pediatric populations. Most studies disaggregated outcome data by age. Three studies provided sex-disaggregated estimates, and only one study provided estimates disaggregated by SES.

Headache disorder: All three population-level studies reported estimates of headache disorders in Nepal using data from a nationwide cross-sectional study ($n=2100$), a representative sample of adults (18–65 years) were randomly selected by stratified multistage cluster sampling. One study found that 85.4%; prevalence was higher among females (61.6%) than males (38.4%) and the mean age was 36.1 ± 12.6 years, and all aspects of symptom burden (frequency, intensity and duration) were greater among females ($p < 0.001$).¹¹⁵ Another study estimated the 1-year prevalence of any headache was 85.4 ± 1.5 % (gender- and age-adjusted 84.9 %) and none of the headache disorders was associated with household consumption.¹⁶

Seizures: Several studies examined seizure. A five-year (2004-2009) study in the Department of Pediatrics, Manipal Teaching Hospital, Pokhara found 678 patients were admitted for seizures; out of which 109 patients were diagnosed as having neurocysticercosis (16%). Among these patients, 66 (60.5%) were males and 43 (39.4%) were females. The mean age of presentation was 9.77 years (range 18 months to 16 years). Case counts were higher among Brahmins (36.6%) followed by Chhetris (18.3%) and Dalits (16.5%).¹¹⁶ A four year study (2007-2011) in Manipal Teaching found a total of 551 patients were admitted for seizures with 61.3% males and 38.7% females. Among these patients 57.5% of children were less than 5 years of age.¹¹⁷ A study in BPKIHS, Dharan examined



children with afebrile seizures (n=308). Median age at first seizure was 39 (inter quartile range 12-96) months.¹¹⁸ Electroencephalographic reports of 634 children from 2006 to 2009 were analyzed in BPKIHS: the most frequent EEG abnormality was seizure disorder (n=370, 59.39%), followed by febrile seizure (n=94, 15.08%).¹¹⁹



3.2.11 REFERENCES FOR LITERATURE SEARCH

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3.3 KEY FINDINGS OF SELECTED NCDI

Key findings of selected NCDI published studies with socioeconomic disaggregation.

NCDI category	Key findings on NCDI Disaggregated by Socioeconomic Status
Chronic Respiratory Diseases (0)	- No data on the burden of chronic respiratory disease among the poor
Cirrhosis (0)	- No data on the burden of cirrhosis among the poor
Cardiovascular Diseases (4)	<ul style="list-style-type: none"> - Among a sample of women in Sarlahi District (n=15,934) with a mean age of 34.2 years, the prevalence of hypertension was 3.3%, and 14.4% had pre-hypertension. Lower SES was associated with increased odds of hypertension (OR = 1.14 for mid-level SES and OR = 1.40 for low SES compared to high SES).⁶ - A study in Tinkanya VDC, Sindhuli in 2014 (n=406) reported an average hypertension prevalence of 12.3%; 14.2% in the lowest socioeconomic group and 6.2% in the highest group.⁷ - A study among males (n=1000) in Dharan municipality reported a prevalence of hypertension of 22.7%; prevalence was 26.4% in the middle income group, 19.6% in the low income group and 18.3% in the high income group.⁸
Diabetes (1)	<ul style="list-style-type: none"> - A study in Sunsari District, eastern Nepal (n=2006), among urban participants (n = 736) with no history of diabetes, 70 (9.5%) had hyperglycemia and 143 (19.4%) had glucose intolerance (IFG and IGT). Of rural participants (n = 1,270) 114 (9.0%) had HGY and 176 (13.9%) had glucose intolerance. An increase in HGY was seen with - increasing SEP (χ^2 48.5, p= 0.001). The prevalence of IFG was lowest in subjects with a medium SEP.⁹
Digestive (0)	- No data on the burden of digestive diseases among the poor



NCDI category	Key findings on NCDI Disaggregated by Socioeconomic Status
Mental & Substance Use (9)	<ul style="list-style-type: none"> - A study in Jumla found an increase in depression and anxiety after the conflict and large differences by household income; after the conflict, having no household income was associated with a 2.49 (1.65–3.76) odds of depression and a 1.19 (0.77–1.85) odds of anxiety compared to ‘any income’.¹⁰ - A one year study in a Psychiatric ward in Manipal Teaching hospital found 210 cases of Schizophrenia: 78.6% were less than 40 years of age, 61.9% were male, 86.7% unemployed and 80.5% had a monthly income less than 10000 NPR. The majority of patients with schizophrenia were Dalit (26.2%) followed by Chettri (23.8%), and 46.2% of the patients were students.¹¹ - A study in the rural areas of Dhanusha district in the central Terai region of Nepal (n=9078) found that prevalence of postnatal psychological distress in the study population was 9.8% and associated with asset score, caste, maternal education, husband’s education, ethnicity and food security; the poorest mothers were more likely to experience psychological distress compared to the wealthiest.¹² - A study among post-partum mothers in the Paropakar Maternity and Women’s Hospital (n=346) found that 105 (30.3%) had depressive symptoms. Prevalence was 48% among mothers whose husbands were illiterate and 41.7% among mothers with low socioeconomic status.¹³ - A hospital based study among primiparous mothers who were followed at 5-6 weeks after delivery (n=216) in Kathmandu found that 24.04% had moderate to severe anxiety and reported significant associations between anxiety and education and income: mothers who were middle income had higher levels of post-natal anxiety than low and higher income mothers.¹⁴
Musculoskeletal (0)	<ul style="list-style-type: none"> - No data on the burden of musculoskeletal diseases among the poor
Neoplasms (1)	<ul style="list-style-type: none"> - A case-control study (n=209 cases and 313 controls) in B.P. Koirala Memorial Cancer Hospital found that Rai, Limbu and Magar groups had a higher risk of lung cancer than Brahmins (OR=3.11, 95%CI=1.55-6.23), and an inverse association was observed between education and lung cancer risk (p for trend=0.0008).¹⁵
Neurological (1)	<ul style="list-style-type: none"> - A study estimated the 1-year prevalence of any headache was 85.4 ± 1.5 % (gender- and age-adjusted 84.9 %) and none of the headache disorders was associated with household consumption.¹⁶



NCDI category	Key findings on NCDI Disaggregated by Socioeconomic Status
Injuries (5)	<ul style="list-style-type: none"> - An analysis of the 2011 Nepal Demographic and Health Survey reported a national IPV prevalence of 32.4% (physical; 23.4%, sexual; 14.7%, and emotional; 17.5%). Household economic status, and both the woman’s education and husband/partner’s education was inversely associated with IPV. The prevalence of any IPV was 39.9% among the poorest households compared to 18.9% among the richest households.¹⁷ - A second analysis of the 2011 DHS survey (n=3373) showed that 28.31% of the population experienced IPV in the past year, and that illiteracy and low economic status we associated with IPV: 33.8% of poor women had experienced IPV in the past 12 months compared to 20.6% of rich women.¹⁸ - A cross-sectional survey, carried out in four districts - Dolkha, Sindhupalchowk, Dang and Kapilvastu - (n=1296) found that more than half of young married women (51.9%) reported having ever experienced some type of violence from their husbands; 46.2% reported sexual violence and 25.3% reported physical violence. Almost 25% of Brahmin/Chhetri women experienced violence in the past 12 months while 47.2% of Tharu women experienced violence, and 34.2% of women who had no earnings or were housewives experienced violence in the past 12 months compared to 19.3% of women who worked in service or had small businesses.¹⁹ - A study among women in Kathmandu (n=905) showed that the prevalence of physical IPV was 33.8% among the urban poor population (n = 225) and 19.9% among the general population (n = 680; p < .01). Across the sample, 38.2% of women in the lowest wealth quintile had experienced physical violence compared to 10.8% of women in the highest wealth quintile.²⁰ - A cross-sectional survey of 475 women with a disability aged 16 years and above in Bhaktapur, Kaski and Jhapa found that over the lifetime, 57.7% of women reported they had ever experienced violence, including emotional violence (55.2%); physical violence (34%); and sexual violence (21.5%), and 43% of women reported experiencing violence in the last 12 months. The prevalence of both lifetime and past year violence was higher among women from disadvantaged indigenous groups compared to upper caste groups, and among women in the lowest compared to highest wealth quintile.²¹



3.4 LITERATURE REVIEW SEARCH TERMS

Search terms and GBD criteria

Category	GBD	MeSH terms
Neoplasms	Esophageal cancer; Stomach cancer; Liver cancer; Liver cancer secondary to hepatitis B; Liver cancer secondary to hepatitis C; Liver cancer secondary to alcohol use; Other liver cancer; Larynx cancer; Trachea, bronchus, and lung cancers; Breast cancer; Cervical cancer; Uterine cancer; Prostate cancer; Colon and rectum cancers; Mouth cancer; Nasopharynx cancer; Cancer of other part of pharynx and oropharynx; Gallbladder and biliary tract cancer; Pancreatic cancer; Malignant melanoma of skin; Non-melanoma skin cancer; Ovarian cancer; Testicular cancer; Kidney and other urinary organ cancers; Bladder cancer; Brain and nervous system cancers; Thyroid cancer; Hodgkin’s disease; Non-Hodgkin lymphoma; Multiple myeloma; Leukemia; Other neoplasms	“Nepal” AND “neoplasms”[MeSH Terms] AND (“2006/01/01”[PDAT] : “2016/07/31”[PDAT]) AND “humans”[MeSH Terms])



Category	GBD	MeSH terms
Cardiovascular diseases	Rheumatic heart disease; Ischemic heart disease; Cerebrovascular disease; Ischemic stroke; Hemorrhagic and other non-ischemic stroke; Hypertensive heart disease; Cardiomyopathy and myocarditis; Atrial fibrillation and flutter; Aortic aneurysm; Peripheral vascular disease; Endocarditis; Other cardiovascular and circulatory diseases	“Nepal” AND “Cardiovascular diseases”[MeSH Terms] AND (“2006/01/01”[PDAT] : “2016/07/31”[PDAT]) AND “humans”[MeSH Terms])
Injuries	Transport injuries; Unintentional injuries other than transport injuries; Falls Drowning; Fire, heat and hot substances; Poisonings; Exposure to mechanical forces; Adverse effects of medical treatment; Animal contact; Unintentional injuries not classified elsewhere; Self-harm and interpersonal violence; Assault by firearm Assault by sharp object; Assault by other means; Forces of nature, war, and legal intervention; Collective violence and legal intervention	“Nepal” AND (“Wounds and injuries”[MeSH Terms] or “self-injurious behavior”[MeSH Terms] or “accidents”[MeSH Terms] or “violence”[MeSH Terms]) AND (“2006/01/01”[PDAT] : “2016/07/31”[PDAT]) AND “humans”[MeSH Terms])



Category	GBD	MeSH terms
Chronic respiratory diseases	Chronic obstructive pulmonary disease; Pneumoconiosis; Asthma; Interstitial lung disease and pulmonary sarcoidosis; Other chronic respiratory diseases	<p>“Nepal” AND (“asthma”[All Fields] OR “chronic obstructive pulmonary disease”[All Fields] OR “pulmonary disease, chronic obstructive”[MeSH Terms] OR “pneumoconiosis”[All Fields] OR “interstitial lung disease”[All Fields] OR “lung diseases, interstitial”[MeSH Terms] OR “pulmonary sarcoidosis”[All Fields] OR “sarcoidosis, pulmonary”[Mesh Terms] OR “chronic respiratory disease”[All Fields] OR (chronic[All Fields] AND “respiration disorders”[MeSH Terms])) AND (“2006/01/01”[PDAT] : “2016/07/31”[PDAT]) AND “humans”[MeSH Terms])</p>



Category	GBD	MeSH terms
Mental & substance use disorders	Schizophrenia; Alcohol use disorders; Drug use disorders; Opioid use disorders; Cocaine use disorders; Amphetamine use disorders; Other drug use disorders; Major depressive disorder; Dysthymia; Bipolar affective disorder; Anxiety disorders; Eating disorders; Autism; Asperger’s syndrome; Attention-deficit hyperactivity disorder; Conduct disorder; Idiopathic intellectual disability; Other mental and behavioral disorders	“Nepal” AND “mental disorders”[MeSH Terms] AND ((“2006/01/01”[PDAT] : “2016/07/31”[PDAT]) AND “humans”[MeSH Terms])
Digestive disorders	Peptic ulcer disease; Gastritis and duodenitis; Appendicitis; Paralytic ileus and intestinal obstruction without hernia; Inguinal or femoral hernia; Non-infective inflammatory bowel disease; Vascular disorders of intestine; Gall bladder and bile duct disease; Pancreatitis; Other digestive diseases	“Nepal” AND (((“digestive system diseases”[MeSH Terms]) NOT (“liver cirrhosis”[MeSH Terms] OR “fibrosis”[MeSH Terms]))) AND ((“2006/01/01”[PDAT] : “2016/07/31”[PDAT]) AND “humans”[MeSH Terms])
Neurological disorders	Alzheimer’s disease and other dementias; Parkinson’s disease; Epilepsy; Multiple sclerosis; Migraine; Tension-type headache; Other neurological disorders	“Nepal” AND “nervous system diseases”[MeSH Terms] AND ((“2006/01/01”[PDAT] : “2016/07/31”[PDAT]) AND “humans”[MeSH Terms])



Category	GBD	MeSH terms
Cirrhosis	Cirrhosis of the liver secondary to hepatitis B; Cirrhosis of the liver secondary to hepatitis C; Cirrhosis of the liver secondary to alcohol use; Other cirrhosis of the liver	"Nepal" AND ("Liver cirrhosis"[MeSH Terms] or "fibrosis"[MeSH Terms]) AND (("2006/01/01"[PDAT] : "2016/07/31"[PDAT]) AND "humans"[MeSH Terms])
Musculoskeletal disorders	Rheumatoid arthritis; Osteoarthritis; Low back pain; Neck pain; Gout; Other musculoskeletal disorders	"Nepal" AND "musculoskeletal diseases"[MeSH Terms] AND (("2006/01/01"[PDAT] : "2016/07/31"[PDAT]) AND "humans"[MeSH Terms])



Category	GBD	MeSH terms
Diabetes, urogenital, blood & endocrine disorders	Diabetes mellitus; Acute glomerulonephritis; Chronic kidney diseases; Chronic kidney disease due to diabetes mellitus; Chronic kidney disease due to hypertension; Chronic kidney disease unspecified; Urinary diseases and male infertility; Tubulointerstitial nephritis, pyelonephritis, and urinary tract infections; Urolithiasis; Benign prostatic hyperplasia; Male infertility; Other urinary diseases; Gynecological diseases; Uterine fibroids; Polycystic ovarian syndrome; Female infertility; Endometriosis; Genital prolapse; Premenstrual syndrome; Other gynecological diseases; Hemoglobinopathies and hemolytic anemias; Thalassemias; Sickle cell disorders; G6PD deficiency; Other hemoglobinopathies and hemolytic anemias; Other endocrine, nutritional, blood, and immune disorders	"Nepal" AND ("diabetes mellitus"[MeSH Terms] OR "female urogenital diseases"[MeSH Terms] OR "male urogenital diseases"[MeSH Terms] OR "hemic and lymphatic diseases"[MeSH Terms] OR "endocrine system diseases"[MeSH Terms]) AND (("2006/01/01"[PDAT] : "2016/07/31"[PDAT]) AND "humans"[MeSH Terms])



Category	GBD	MeSH terms
Other NCDs	Congenital anomalies; Neural tube defects; Congenital heart anomalies; Cleft lip and cleft palate; Down's syndrome; Other chromosomal abnormalities; Other congenital anomalies; Skin and subcutaneous diseases; Eczema; Psoriasis; Cellulitis; Abscess, impetigo, and other bacterial skin diseases; Scabies; Fungal skin diseases; Viral skin diseases; Acne vulgaris; Alopecia areata; Pruritus; Urticaria; Decubitus ulcer; Other skin and subcutaneous diseases; Glaucoma; Cataracts; Macular degeneration; Refraction and accommodation disorders; Other hearing loss; Other vision loss; Dental caries; Periodontal disease; Edentulism; Sudden infant death syndrome	"Nepal" AND ("congenital abnormalities"[MeSH Terms] OR "genetic diseases, inborn"[MeSH Terms] OR "Otorhinolaryngologic Diseases"[MeSH Terms] OR "skin diseases"[MeSH Terms] OR "sense organs"[MeSH Terms] OR "stomatognathic diseases"[MeSH Terms] OR "eye diseases"[MeSH Terms] OR "occupational diseases"[MeSH Terms] OR "immune system diseases"[MeSH Terms] OR "metabolic diseases"[MeSH Terms]) AND (("2006/01/01"[PDAT] : "2016/07/31"[PDAT]) AND "humans"[MeSH Terms])



Criteria	Definition
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3.5 LITERATURE REVIEW VARIABLES EXTRACTED

Literature Review Variables Extracted

Criteria	Definition
Reference information	Author, year, journal
Article type	Population based (sampling frame which allowed a population estimate); community-based (researchers defined a community and sampled subjects); hospital/clinic; literature review
Cross sectional or longitudinal	Cross sectional Retrospective or prospective if available Repeated cross sections Longitudinal
Time period (if relevant)	Time period of study/follow up
Sample size	Sample size
Location	Exact location -- hospital name, district, region, city
Geography type	Urban Rural Both (either both, or location criteria not explicitly defined) Referral hospital (for hospital based studies only)
Age of population	Children (below 18) Adults (above 18) Elderly (based on authors definition) All ages (all ages, or age criteria not explicitly defined)
Gender of pop (Male/female/both)	Male Female Both (either both, or inclusion criteria not explicitly defined)
Outcome	Name of outcome
Outcome type	Prevalence Case count Incidence Mortality Severity Blank/NA when no outcome measure was calculated



Criteria	Definition
Outcome disaggregated by Income	Yes/No
Outcome disaggregated by ethnicity	Yes/No
Outcome disaggregated by gender	Yes/No
Outcome disaggregated by age	Yes/No
Outcome disaggregated by other	[list - e.g. education, religion, region, marital status]
Point Estimate(s)	Point estimate of outcome (as defined earlier) and any other outcomes
Significant findings	Abstract or summary of findings
Comments	



4.0 Global Burden of Disease Detailed Results and Reference Tables

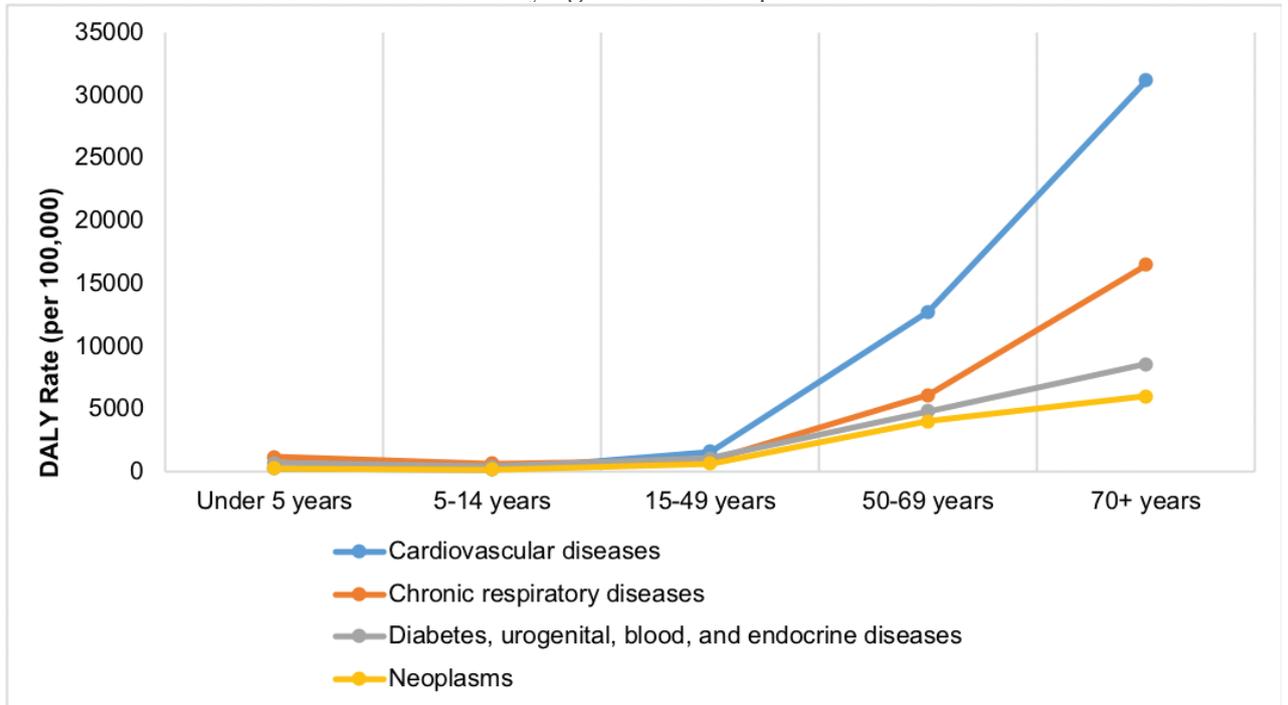
NCDI DALY Rate by age, Nepal 2015

NCDI	DALY Rate (per 100,000)					
	All ages	Under 5 years	5-14 years	15-49 years	50-69 years	70+ years
Cardiovascular diseases	3502	305	170	1618	12736	31179
Chronic respiratory diseases	2075	1175	688	973	6132	16505
Cirrhosis and other chronic liver diseases	553	177	102	497	1600	1746
Diabetes, urogenital, blood, and endocrine diseases	1617	719	423	1108	4813	8568
Digestive diseases	635	174	181	538	1651	2898
Forces of nature, war, and legal intervention	2122	2778	2368	2067	1575	1366
Mental and substance use disorders	1709	139	900	2270	2137	1658
Musculoskeletal disorders	1949	0	244	2168	4810	5439
Neoplasms	1115	268	179	683	4018	6033
Neurological disorders	1142	287	539	1260	1557	4523
Other non-communicable diseases	2143	4230	1313	1490	3505	6689
Self-harm and interpersonal violence	430	51	70	678	387	338
Transport injuries	898	623	305	1009	1460	2005
Unintentional injuries	1146	1412	558	1150	1579	2736

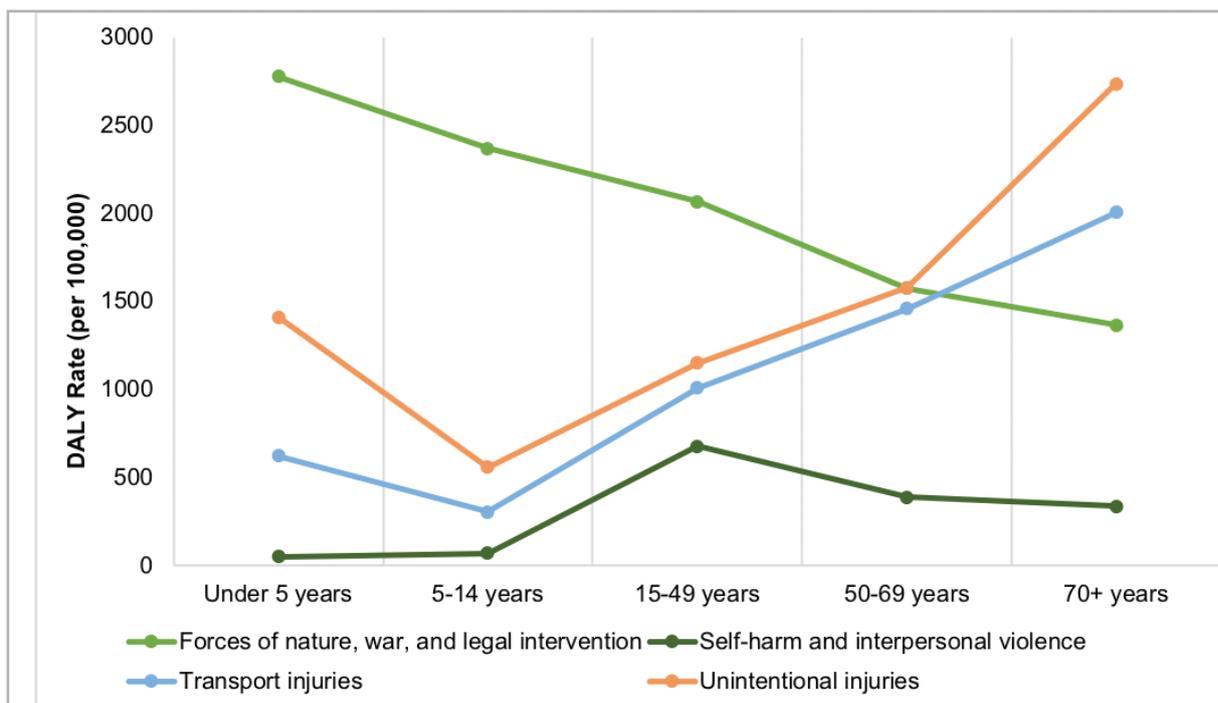


2015 DALY Rate in Nepal for four NCDs with the highest global burden of disease

NCDI DALY Rate by age and sex, Nepal 2015

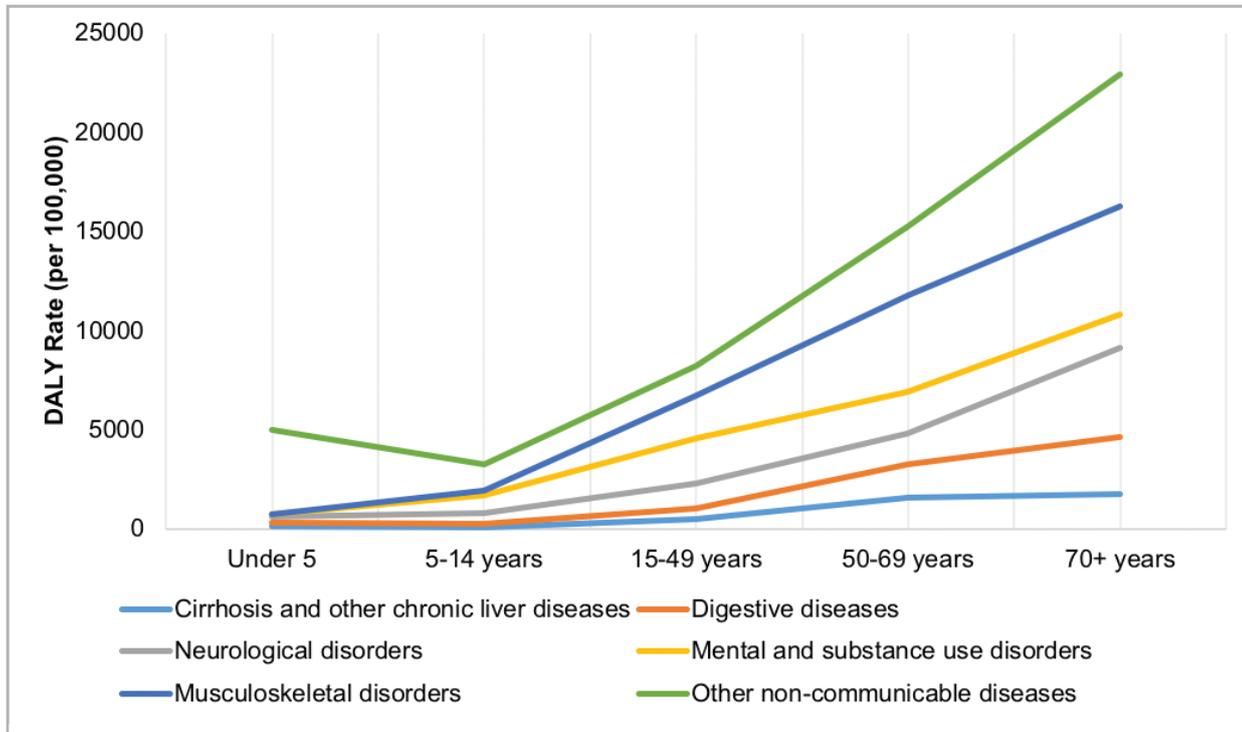


GBD DALY Rate for injuries, Nepal 2015





GBD DALY Rate for other NCDs, Nepal 2015





5.0 Patient Narratives

We interviewed some patients with NCDI from various regions of the country. Challenging in accessing services was univocally the main problem faced by these patients. Along with the problem of accessibility, they have the common financial issues during the treatment. The detailed patient narratives are added to the appendix.

Kumari Shrestha is a 44 years old female lives in Ramechhap, Vuji VDC and she is suffering from Rheumatic Heart Disease. She was diagnosed four years back but since she had to treat her son who is also suffering from an RHD, she had to wait for her treatment. “The operation was free for my child but still we spent \$1500 for treatment including logistics.” “We are staying in here (Kathmandu) because there are no specialist doctors in the village and if we have to come from home by ambulance it will cost \$150 to 200”. “Child is okay after the treatment”. “I was told that it will cost around \$ 4000 to get two valves replaced”. “We need to get the recommendation from the VDC to get the government fund”. “We are praying that we will be able to collect up to \$1000. “No one in the community will help us.”

Dil Kumar Maden, is from Taplejung. Maden could not study the subject he liked due to the financial problem “I might have studied up to the third year (bachelor), I could have cleared the final exam but my father died during that time.” He discontinued his study and later tried to join the British army to earn. “When I applied for the British Army, they did not recruit me and they told me that my blood pressure was very high.” “I was told that the size of my heart is big.” “We just had a small land and we did not even have crops sufficient for 3 months. How could I manage for the treatment? That was the problem.” “If I opt for the treatment my brothers would have to face the debts for life, it would be better if I do not get treated, there would not be anyone to cry after me even if I die except for my mother.” He saw the doctor who told him that one heart operation is not sufficient; two to three operations should be done. “I received 1 lakh Rupees from the government. Similarly, I got help from my brothers and the far relatives, and one year back I got operated. We spent all that we collected. We spent 6, 7 to 8 lakhs (\$6-8K).” “I had my second operation, this is called Elephant trunk replacement, We spent around one hundred and fifty thousand Rupees (\$1500)” “I am told that I need to operate for the arteries behind the abdomen and for that, Sirs (the surgeons) are gathering the things needed for the operation because we cannot buy and gather the things, we have spent in lakhs.” “I had relatives and other people and because of them I had successful treatment but there are people dying in Taplejung and in the western part of Nepal, because they could not get treated for heart diseases, not even being able to see the general practitioner or know if it is heart disease or lung disease. If we have government services related to the heart in the villages, it would be of great help to the people”.



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