Ministry of Health & Family Welfare
Government of India

INTEGRATED DISEASE SURVEILLANCE PROJECT (IDSP)

NON-COMMUNICABLE DISEASE RISK FACTORS SURVEY

2007-08

Kerala

Clinical Epidemiology Unit, Trivendrum
Medical College, Thiruvananthapuram

(State Survey Agency)

Sri Chitra Tirunal Institute for Medical Sciences
& Technology, Thiruvananthapuram

(Regional Resource Centre)

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(National Nodal Agency)

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New Delhi

(IDSP Central Surveillance Unit)

Indian Council of Medical Research
New Delhi

(National Implementing Agency)

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Foreword

Globally, non-communicable diseases (NCDs) are the major cause of morbidity and mortality. According to WHO Report 2004, they account for almost 60% of deaths and 47% of the global burden of disease. In India, estimated deaths due to non-communicable diseases were double than those from communicable diseases. A progressive rise in the disease pattern of NCD foretells a serious public health issue. The major risk factors for non-communicable diseases are tobacco and alcohol abuse, a sedentary lifestyle, and an unhealthy diet. It is believed that about half of non-communicable disease-related premature deaths could be prevented through healthy diet, regular physical activity and by avoiding tobacco and alcohol.

Envisaging the magnitude of the public health problem of chronic diseases, the Government of India through National Institute of Communicable Disease, MoHFW and Indian Council of Medical Research initiated NCD risk factors survey, phase-I in seven states of India. It is a well planned large community based survey providing state wise estimates of major NCD risk factors in different strata of population. It is needless to mention that the estimated NCD risk factors are important input for targeted prevention of NCD and effective health care planning. The National Technical Advisory Committee (NTAC) and National Monitoring Committee constituted by MoHFW, provided valuable technical guidance and support to complete the study.

The Indian Council of Medical Research through its Division of Non-communicable Diseases has implemented the study with all the partners including the National Institute of Medical Statistics as a National Nodal Agency, Regional Resource Centers and State Survey Agencies.

I congratulate the Team for successfully completing the survey and bringing out Phase-I report of NCD Risk Factors which would be of immense use for prevention and control of non-communicable diseases.

(Dr. V.M. Katoch)

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वैज्ञानिक 'जी' एवं प्रमुख
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Preface

Non-Communicable Diseases (NCD) account for a large proportion of morbidity and mortality amongst the adult population of our country. The high prevalence of major risk factors viz. tobacco and alcohol consumption, inappropriate diet, physical inactivity, high blood pressure, high blood glucose and dyslipidemias are driving the epidemic of NCDs. The Division of Non-Communicable Diseases at ICMR was identified as the nodal point for surveillance of NCDs and their risk factors by the World Health Organization, and multi-site studies helped us in developing a sound strategy for NCD risk factor surveys at the national level under IDSP. The survey methodology developed by ICMR was incorporated by IDSP into the overall survey protocol provided to ICMR for implementation.

The Indian Council of Medical Research signed a Memorandum of Understanding (MOU) with IDSP for the standardization and quality assurance of the NCD risk factor surveys under the World Bank funded IDSP on behalf of Ministry of Health, Govt. of India. As per IDSP plan, these surveys were to be carried out in three phases so as to cover all States and UTs of the country. In the present Phase I, the State based estimates of the risk factors in seven States (Andhra Pradesh, Kerala, Madhya Pradesh, Maharashtra, Mizoram, Tamil Nadu and Uttarakhand) were arrived at through the IDSP identified seven State Survey Agencies, five Regional Research Centers and a National Nodal Agency under the overall guidance and supervision of ICMR Headquarters through the National Technical Advisory Committee. I am grateful to the Director General, ICMR for supporting the Division of Noncommunicable Diseases ICMR to implement the surveys. The untiring effort of our partner agencies is commendable and is duly acknowledged.

This report marks an important milestone in surveillance activities for NCDs in the country. The results would be useful for planning and monitoring an effective response in a coordinated manner by the Government. It should also stimulate further analysis and research in the area.

(Dr. Bela Shah)

Acknowledgements

National Institute of Medical Statistics
ICMR, New Delhi

(*Arvind Pandey*)
Director

Definitions

Current Smoker / Smokeless Tobacco User: Some one who at the time of the survey, smokes / uses tobacco in any form either daily or occasionally.

Current Daily Smoker / Smokeless Tobacco User: Some one who smokes / uses tobacco everyday with rare exceptions such as not on days of religious fasting or during acute illness.

Past- Daily Smokers / Smokeless Tobacco User: These are those individuals who were smoking daily in past, but have not smoked ever in one year preceding the survey.

Non-Smoker / Never Used Smokeless Tobacco: These are those individuals who have never smoked / used smokeless tobacco in the lifetime.

Current Drinker: Those who consumed one or more than one drink of any alcohol in the year preceding the survey.

Former Drinker: Those who have consumed alcohol but those who did not consume one or more drink during the year preceding the survey.

Lifetime Abstainer: Those who have never consumed one or more drink of any type of alcohol in lifetime.

High Risk Drinker (Binge Drinker): Those who drink more than 5 (for women 4) standard drinks on any single day.

Standard Drink: It is defined as any standard drink with net alcohol content of 10 gm ethanol.

Standard Serving: One standard serving of fruits and vegetables is equivalent to 80 grams, translated into different units of cups depending on type of vegetables and fruits.

Metabolic Equivalent (MET): MET is the ratio of a person's working metabolic rate relative to the resting metabolic rate. One MET is defined as the energy cost of sitting quietly, and is equivalent to a caloric consumption of 1 kcal/kg/hour. It is estimated that, compared to sitting quietly, a person's caloric consumption is four times as high when being moderately active, and eight times as high when being vigorously active.

Central Obesity: Central obesity (measured as waist circumference or waist to hip ratio) is more strongly associated with coronary heart disease than BMI. Waist measurement is taken at the level of mid point between the inferior margin of the rib and crest of the ileum in the mid-axillary plane, using a non-stretchable tape, without clothing, that is, directly over the skin (or over light clothing). A cut-off level of 102 cms in males and 88 cms in females have been recommended for developed countries (ATP 3 Guidelines), however, much lower cut-off levels are appropriate for Indians of 90 cms in males and 80 cms in females (South Asia Pacific Guidelines).

Hypertensive Stage I: The upper and lower limit of the systolic and diastolic blood pressure for hypertensive stage I is 140-159 mm Hg systolic or 90-99 mm Hg for diastolic.

Hypertensive Stage II: The upper and lower limit of the systolic and diastolic blood pressure for hypertensive stage II is $\geq$160 mm Hg systolic or $\geq$100 mm Hg for diastolic.

Under Weight: The person with BMI less than 18.5 kg/m^2 is categorized as under weight.

Normal Weight: The person whose BMI is between 18.5 to 24.9 kg/m^2 is categorized as normal weight.

Over Weight: The person who's BMI is 25 kg/m^2 or more is categorized as over weight.

Acronyms

AYUSH	Ayurveda, Unani, Shidha and Homeopathy
BMI	Body Mass Index
BP	Blood Pressure
CEB	Census Enumeration Block
CETMC	Clinical Epidemiology Unit, Trivendrum Medical College
DHO	District Health Officer
ICMR	Indian Council of Medical Research
IDSP	Integrated Disease Surveillance Project
LPG	Liquid Petroleum Gas
MET	Metabolic Equivalent
NCD	Non-communicable Diseases
NICD	National Institute of Communicable Diseases
NIMS	National Institute of Medical Statistics
NMC	National Monitoring Committee
NNA	National Nodal Agency
NTAC	National Technical Advisory Committee
PSU	Primary Sampling Unit
RRC	Regional Resource Centre
SSA	State Survey Agency
SCTIMST	Sri Chitra Tirunal Institue for Medical Sciences & Technology
WC	Waist Circumference
WHO	World Health Organization
IEC	Information Education and Communication

Tables

Figures

IDSP-NCD Risk Factor Survey
Fact Sheet - Kerala

Population			*Any form of Tobacco use*	16
Household covered	4430		Male	29
Individual covered	4859		Female	3
Household Characteristics(%)			**Mean age of Initiation (in years)**	
Religion			*Smoking*	20
Hindu	56		Male	20
Muslim	23		Female	*
Access to drinking water	24		*Smokeless*	20
Well water	71		Male	19
Urban	53		Female	25
Rural	77		**Alcohol Consumption**	
Sanitation			*Consumed Alcohol (last 30 days)*	11
Flush Toilet	92		Male	24
Urban	97		Female	*
Rural	90		*Consumed Alcohol (last 12 Months)*	17
Source of Lighting			Male	36
Electricity	95		Female	*
Urban	97		**Consumed alcohol (in last 7 days)**	
Rural	94		*Binge Drinkers*	11
Type of House			Male	11
Pucca House	67		Female	*
Urban	73		**Mean age of Initiation Alcohol (in years)**	
Rural	64		Male	22
Semi-Pucca House	26		Female	26
Urban	23		**Fruits and Vegetables consumed**	
Rural	27		*Less than five servings per day*	87
Fuel use for Cooking			Male	82
LPG/Gas	38		Female	92
Urban	53		**Physical Activity**	
Rural	33		*Low physical activity*	76
Wood	61		Urban	79
Urban	46		Rural	75
Rural	66		**Hypertension**	
Separate Kitchen			*Pre Hypertension*	48
Urban	97		Urban	48
Rural	96		Rural	48
Own Agricultural land			*Stage I and II Hypertension*	18
Urban	6		Urban	19
Rural	18		Rural	18
Individual Characteristics(%)			**Physical Measurement - BMI**	
Education -literate	90		Under weight	15
Urban	92		Urban	14
Rural	88		Rural	16
Behavioural Information(%)			*Over weight (grade I,II,III)*	27
Current Tobacco Users			Urban	31
Smokers	13		Rural	26
Male	27		*Central Obesity*	43
Female	0.2		Urban	45
Smokeless tobacco users	5		Rural	42
Male	7			
Female	3			

*figure not shown, based on fewer than 25 unweighted cases

Executive Summary

Introduction

The Government of India through the Ministry of Health & Family Welfare (MOHFW) initiated a decentralized, state based Integrated Disease Surveillance Project (IDSP) in the country with the assistance of the World Bank in the year 2004. The component of non-communicable disease surveillance planned periodic community based surveys of population aged 15-64 to provide database on the risk factors. It is in line to help the state health administrators to plan strategies for the control of non communicable diseases by modifying the risk factors. All Indian states were proposed to be surveyed in a phased manner under the project. The first phase of the survey included seven states namely Andhra Pradesh, Kerala, Madhya Pradesh, Kerala, Mizoram, Tamil Nadu and Uttarakhand.

The overall objective of the NCD risk factors survey was to improve the information available to the Government health services and care providers on a set of high-priority risk factors, with a view to improve the quality health care and services. The survey also aimed to establish the baseline database of NCD risk factors needed to monitor trends in population health behavior and risk factors for chronic diseases over time. This would provide evidence for evolving strategies and interventions for identified risk factors in the community to reduce the burden of non-communicable diseases.

A National Technical Advisory Committee was constituted to provide the technical guidance to the survey and National Monitoring Committee for monitoring the overall progress of the project. Indian Council of Medical Research was the implementing agency while the National Institute of Medical Statistics (NIMS) was appointed as the National Nodal Agency (NNA) for coordinating the survey; the Sri Chitra Tirunal Institute for Medical Sciences & Technology, Thiruvananthapuram as a Regional Resource Centre (RRC) for monitoring the data collection and technical support to Clinical Epidemiology Unit, Trivendrum Medical College, Thiruvanathapuram, the State Survey Agency (SSA) in the state of Kerala.

Survey Methodology

WHO STEPS methodology for NCD Risk Factor Surveillance has been adopted for the survey after carrying out suitable modifications, based on a multisite ICMR-WHO collaborative initiative for NCD risk factor surveillance[1]. The survey was designed to provide prevalence estimates of risk factors for each 10 years age group (15-24 through 55-64) by sex and place of residence (urban/rural). The survey used uniform sample design, bilingual schedules (English and Malayalam in case of Kerala), field protocol for data collection and physical measurements to facilitate comparability across states and also to ensure high quality data. Appropriate sampling weights for households were used for urban and rural areas of the state. From each selected household one member aged 15-54 was selected using the KISH Method and all members aged 55-64 were selected. Such post stratification was used for improvement of efficiency of the estimators. Post stratification weights for individuals were constructed using the state age distributions for both sexes, which are available on the population level.

Two types of questionnaire - one at household level and another for individual level were used for the survey. At household level, information was elicited on religion, household facilities, ownership of agricultural land and livestock, and possession of durable goods for each selected household. The Individual questionnaire collected the information from all the selected eligible household individuals regarding demographic, behavioral and physical measurements. The individual questionnaire was divided into two segments based on WHO Step methodology. The first section (Step 1) collected the demographic information of individuals including age, sex, marital status, education, and occupation. In the behavioural information section, information about tobacco use, alcohol consumption, diet, physical activity, history of raised blood pressure and history of diabetes were collected. In the second section (Step 2), physical measurements of individual such as height, weight, waist circumference (not measured for pregnant women), blood pressure and pulse rate were recorded.

Characteristics of survey population

A total of 5000 households were contacted in urban

and rural area of Kerala. Among them 4430 households completed the survey. The overall individual response rate for the survey was 96 percent. Of the surveyed households, fifty six percent of the households were Hindu, 23 percent were Muslim and about 20 % were Christian. Seventy one percent of the households had been using well water for drinking purpose and only 24% of the households had been drinking water from a piped or hand pump. All the households had flush or pit toilet facility. Ninety five percent of households had electricity. Only 38% of the households had been using LPG as cooking fuel. Majority of the household (61%) had been using wood as the cooking fuel. Only 15% of households possessed agricultural land.

Only 10% of the respondents were illiterate. About 77% of the respondents were currently married. Most of the females were engaged in domestic and manual work whereas males were engaged in manual work and executive/business work.

BEHAVIOURAL RISK FACTORS FOR NCD

Tobacco Smoking

As per the WHO STEPS guidelines, to measure the prevalence of smoking habit among the respondents, the smokers are categorized into three categories *Current Smokers, Current Daily Smokers, Past Daily Smokers* and those who have never smoked in lifetime are classified as *Non-Smokers*. While eliciting the information on smoking it was observed that about 27 percent of males in Kerala (24% of urban and 29% of rural male population) were current smokers. Very few females (0.2%) were currently smoking.

The average age of onset of smoking was 20 years
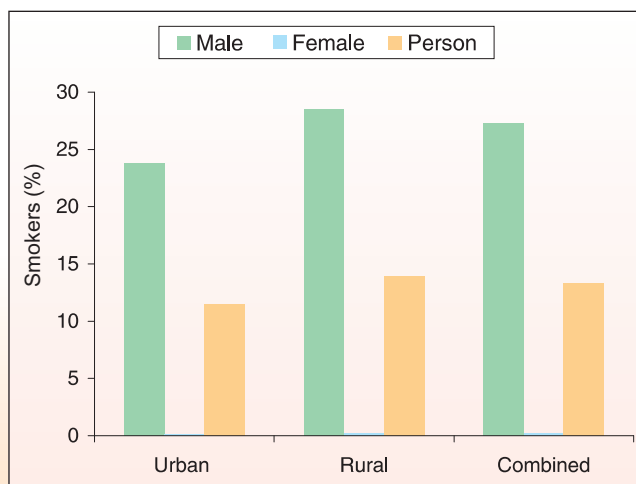
Figure 1. Current smokers (%) by sex and residence

in the young age group (15-34) respondents. On an average, a smoker smoked 5 bidis and 6 cigarettes daily. Among non-smokers about 23 percent were exposed to tobacco smoke at home or work. About 5% of males and only 3% of females were currently daily users of smokeless tobacco. The mean frequency of chewing pan with tobacco was around 4 (2 for males and 6 for females). The use of tobacco in any form was more prevalent among the males (29%) as compare to females (3%). Among male smokers, cigarettes or *beedi* smoking was very common.
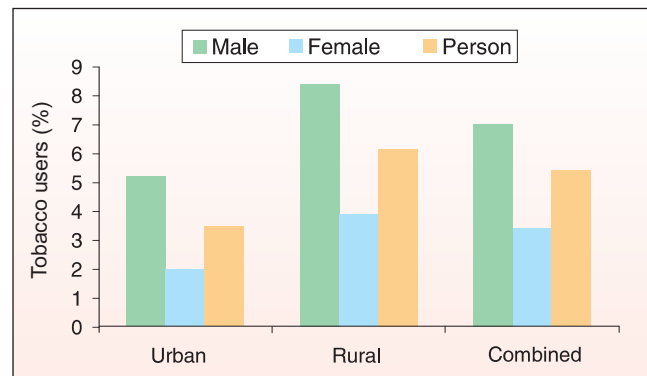
Figure 2. Current daily smokeless tobacco users (%) by sex and residence

Alcohol Consumption

Persons consuming alcohol are categorized as current drinker, former drinker and high-risk drinker (Binge Drinker). Persons who have never consumed alcohol in their lifetime are categorized as lifetime abstainers. Overall, 11% of the respondents with 24% among males, consumed alcohol in past 30 days and female alcohol users were negligible. The average number of drinks consumed on a drinking day was
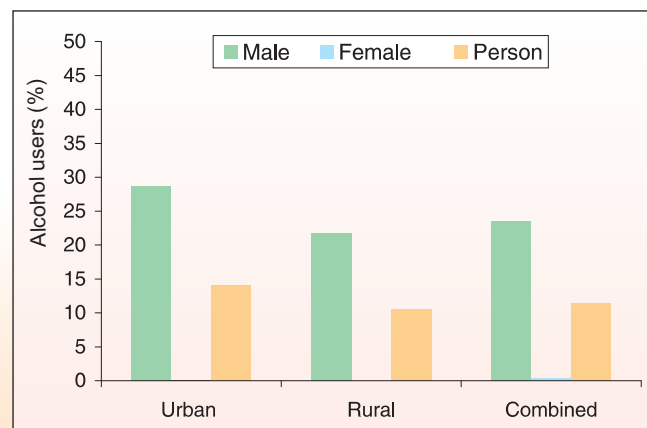
Figure 3. Alcohol Consumplion (%) by sex and residence

around 3 drinks. The age of initiation of regular alcohol consumption was around 22 years for male and 26 years for female in the 15-34 years age group. The role of education and occupation was related to the drinking habit. All those involved in manual work had high prevalence of drinking habit (59%) followed by executives or business class (17%).

Fruits and Vegetables Consumption

People in Kerala consumed fruits, on an average 3 days a week, where as vegetables were consumed on 5 days. Only 13% of the population consumed five or more servings of fruits and vegetables per day.
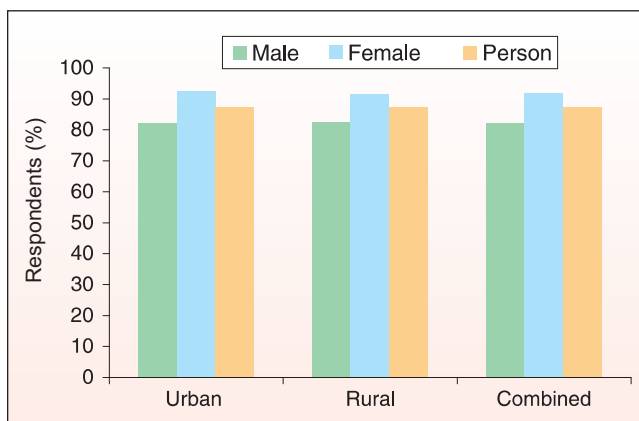
Figure 4. Less than 5 servings of fruits & vegetables (%) by sex and residence

Food and Oil Consumption

In respect of consumption of specific food habits, 42% of respondents consumed eggs, 30% consumed fish, 28% consumed chicken and fried local foods, 25% red meat, 17% consumed cakes, pastries and other bakery
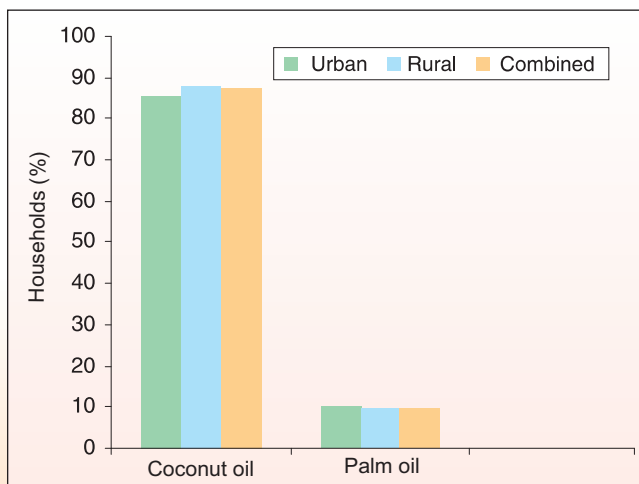
Figure 5. Major oil consumption among households (%) by residence

items and 16% consumed sweetened drinks at least once in a week. Fifty eight percent of the respondents eat fish and 15% of the respondents eat local fried food daily in Kerala.

Most common edible oil used for cooking among the households in Kerala was coconut oil (87%) followed by palm oil (10%).

Physical Activity

The lack of physical activity leads to obesity, hyperlipidemia, diabetes mellitus, hypertension and coronary heart disease. As regards work related physical activity, the mean time spent in different sub groups ranged from 128 to 174 minutes per day. Most of the time was spent on work related activity. Around 32 minutes per day was spent for travel and 15 minutes per day was spent for recreational related activities.
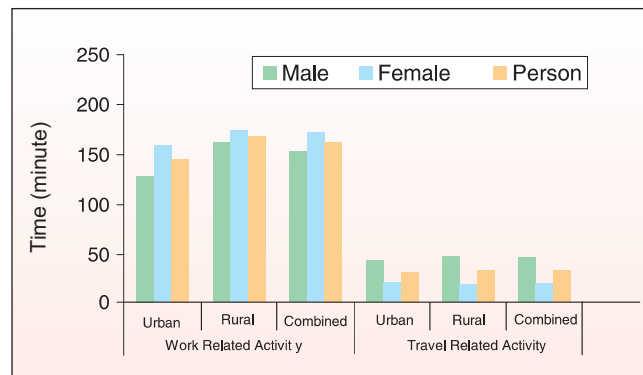
Figure 6. Mean time spent on physical activity per day (minutes) by sex and residence

As per the WHO guidelines, the total physical activity of the individual has been categorized as low, medium and high. About 76% of the population was in low physical activity. High level of physical activity was observed in 5% of urban and 8% of rural population.
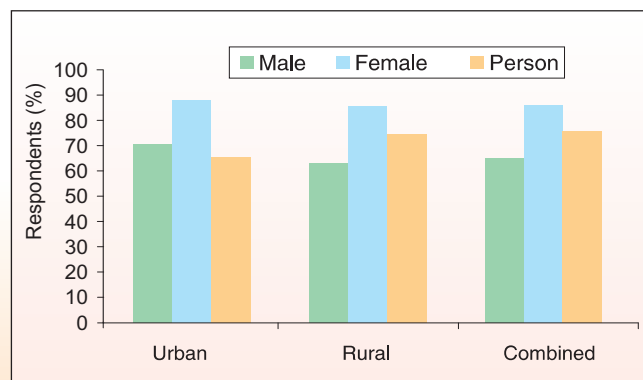
Figure 7. Low physical activity of respondents (%) by sex and residence

In the older age group (35-54), about 10% of the respondents were recorded in the high physical activity, as against 3% in younger age group (15-24).

HYPERTENSION AND DIABETES

Hypertension

The blood pressure is an important determinant of risk of cardiovascular diseases, ischemic heart disease, congestive cardiac failure and renal failure. In the survey the blood pressure of the respondents was measured using automated blood pressure measuring instrument (OMRON®).

Overall, 9% respondents reported that they had been diagnosed as hypertensive by health professionals (8%
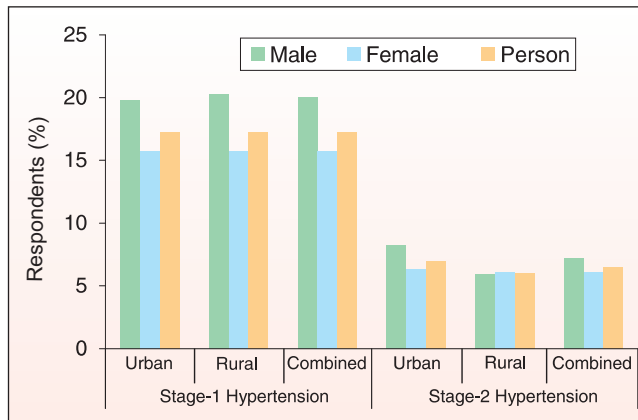
Figure 8. Stage-I & II hypertension (%) by sex and residence

for males and 10% for females; 10% of urban and 9% of rural) in the past one year. Among those who were diagnosed, 62% were on drugs, 61% were advised dietary modification, and 13% had consulted AYUSH practitioner. The survey group also carried out measurement of blood pressure as a part of Step-2 of individual questionnaire. In the categories of hypertension, only 34% of respondents were recorded in the normal, 48% were in pre hypertension, about 18% in stage-I or stage-II hypertension. This was a striking feature of the survey. This further emphasized the need to launch the program for the control of hypertension through modifiable life style, as this (hypertension) is one of the leading causes of non-communicable diseases.

Diabetes

Raised fasting blood sugar gives sufficient validity to estimate population changes in diabetes and related impairment of glucose tolerance. Diabetes mellitus is an important marker of risk for the arterial disease of

the coronary, cerebral and peripheral arterial trees, and for micro vascular disease leading to blindness and renal failure. The survey also included information on history of diabetes. Only 6% of the respondents had history of raised blood sugar, 14% of them were taking insulin and 69% were on oral drugs. About 14% (of the diagnosed) had consulted AYUSH practitioners for the elevated blood sugar levels and 67% of them were taking treatment from the system.
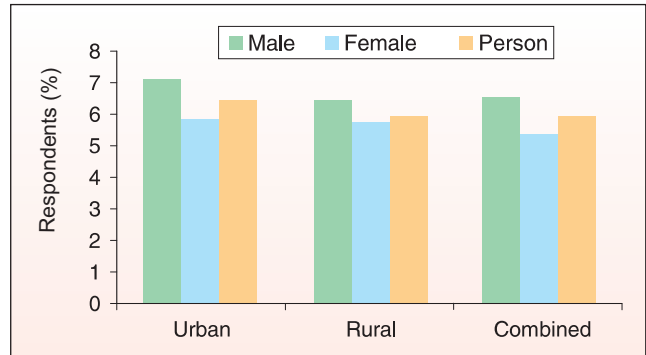
Figure 9. History of raised blood sugar (%) by sex and residence

PHYSICAL MEASUREMENTS

Body Mass Index (BMI)

Worldwide researches have shown that there is a strong association between BMI and health risk. The excess of adipose tissue in the adults is associated with excess morbidity and mortality from a large number of health conditions like diabetes, hypertension, hypercholesterolemia, carcinomas of colon & breast, gall bladder stones and osteoarthritis. On the other hand, low BMI is an indicator of risk to health, often being
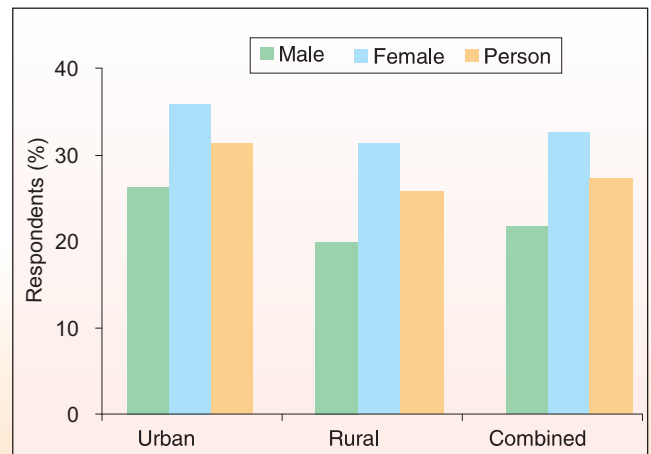
Figure 10. Overweight respondents (%) by sex and residence in Kerala

associated with tobacco and alcohol use and drug addiction.

As regards body measurements, the information was elicited on height, weight and waist circumference. The mean BMI as worked out was around 22 kg/m². As per the WHO guidelines the BMI has been categorized as underweight, normal, grade-1, grade-2 and grade-3 overweight. About 57% of the respondents were in the normal category of BMI, and 22% in grade I overweight. The grade 2 and grad 3 overweight was observed only in 5% of respondents. Around 16% of respondents were underweight. Under weight respondents were slightly higher in rural population compare to urban (16% in rural and 14% in urban). The problem of under weight was little higher in males compare to females (18% among males and 13% among females).

SOCIO-DEMOGRAPHIC DIFFRENTIALS

Tobacco is mainly used either in the form of smoking or non-smoking. The prevalence of smoking was high among urban as well as rural male population. The increasing pattern of prevalence of smoking was recorded with increasing age group of respondents. But, it was declining with increasing level of education. Prevalence of smoking among female respondents was very low compare with males across all the socio-demographic categories, which shows gender differentials. Occupation is an important socioeconomic indicator. The differences in prevalence of smoking were higher form one category of occupation to another. Prevalence of smoking in the occupational categories of agriculture and manual worker was high compare with domestic worker. A similar pattern of increasing in prevalence with age and decreasing with level of education was also observed with smokeless tobacco users. The prevalence of current alcohol drinkers was high among the adult male population (25-44) which was declining in the older age group(45-64). The habits of tobacco and alcohol use starts at early young age which contributes to the high risk of NCD at productive stage of life or as grown older with such habits.

The fruits and vegetable consumption and regular physical activity reduce the risk of non-communicable diseases. But, the study indicates high proportion of population taking inadequate amount of fruits and vegetables (less than five servings of fruits and vegetables per day). Prevalence of low consumption was high in all the age groups, level of education and occupation by sex and residence with marginal differences in between some of the groups. Besides that, three-fourth of the population was found in the category of doing low physical activity. The differences in the pattern of low physical activity by age, sex, education, occupation and residence were also observed. Among the older (55-64) and younger age group (15-24), the people were doing less physical activity as compare with other age groups. Female respondents were more in low physical activity compare with males across all the age groups. However, rural people were doing more physical work than urban, but similar pattern was observed across all age groups and sex. The physical activity by education was observed low among higher level education whereas it was comparatively high among lower level education people. Occupational difference in physical work activity was also observed across all the categories. The people whose occupation was agriculture or manual worker were doing more physical work compare with other occupational categories. Low physical activity was high among the domestic workers.

Hypertension is a major non-communicable disease risk factor especially related to cardiovascular disease. The increasing pattern of prevalence of hypertension (stage I & II) was recorded with increasing age group of people across all the subgroups of population (sex and urban-rural). It was prevalent in all the level of education with marginal differences with one another. Hypertension was prevalent in all the occupational categories across residence and sex with some differences between the subgroups.

Overweight (obesity) is a major risk factor of Non-communicable diseases. High prevalence of overweight was recorded in all the age groups except the younger age (15-24). Prevalence of overweight was higher among females compare with males across all the age groups. Prevalence was higher in urban population compare with rural. Low prevalence of overweight was recorded among illiterates. Low prevalence was recorded among the people whose occupation was agriculture or manual worker whereas it was high in other categories of occupation.

Overall, NCD risk factors were prevalent across all the socioeconomic and demographic categories of population in Kerala.

The results generated through this IDSP-NCD survey would certainly focus on major issues in bringing about changes or initiate various programmes related to control of non-communicable diseases.

Introduction

1.1 BACKGROUND OF SURVEY

In response to a long felt need expressed by various expert committees, the Government of India through the Ministry of Health & Family Welfare initiated a decentralized, state based Integrated Disease Surveillance Project (IDSP) in the country with the assistance of the World Bank in the year 2004.

The project envisaged detecting early warning signals of impending outbreaks; initiate an effective response in a timely manner. Unlike communicable diseases, most non-communicable diseases are latent type and they occur after a prolonged exposure to life style risk factors like smoking, raised blood sugar, raised blood pressure and hyper-cholestremia. Public health action would be primarily directed against preventive strategies for the disease and hence the priority was to monitor risk factors rather than non-communicable diseases themselves.

Periodic community based surveys covering representative adult population were planned under the IDSP to provide data on NCD risk factors at state level enabling states to develop strategies and activities to prevent and control the non-communicable diseases. It was taken up as a collaborative project of the Ministry of Health & Family Welfare, Govt. of India's National Institute of Communicable Diseases and the Indian Council of Medical Research with National Institute of Medical Statistics (NIMS) as the National Nodal Agency (NNA) and Sri Chitra Tirunal Institute for Medical Sciences & Technology, Thiruvananthapuram as the Regional Resource Centres (RRC). The Clinical Epidemiology Unit, Trivendrum Medical College, Thiruvananthapuram was identified as the State Survey Agencies (SSA) based on their experience and knowledge about the local conditions. The division of non-communicable at ICMR coordinated the overall activities and guided in the project development, implementation, monitoring and evaluation.

The NIMS provided the technical assistance at all stages of the survey including development of survey protocol, sampling methodology, survey questionnaire etc. with the approval of the National Technical Advisory Committee (NTAC). The survey was supervised and monitored by the RRCs for quality assurance. The RRCs were identified in order to provide training to the field investigators, monitoring of data collection and technical support to the field agencies particularly for the anthropometrical and blood pressure measurements. All states were proposed to be covered in a phased manner. The first phase states included Andhra Pradesh, Kerala, Madhya Pradesh, Maharashtra, Mizoram, Tamil Nadu and Uttarakhand. The present treatise is the survey report of the state of Kerala.

1.2 OBJECTIVES

The overall objective of the NCD-risk factors survey was to improve the information available to the Government health services and care providers on a set of high-priority risk factors, with a view to improve on-the-ground responses to such risk factors. It also aimed to provide essential data to monitor progress of on going disease control programs and reallocate health resources more optimally. The specific objectives of the survey were to:

1. Assess the prevalence of NCD risk factors in different strata of population in the states;

2. Establish a baseline database of NCD risk factors needed to monitor trends in population health behavior and risk factors for chronic diseases over a period of time in the states ; and

3. Provide evidence for evolving strategies and interventions for identified risk factors in the community to reduce the burden of Non-Communicable Diseases in the population

1.3 NON-COMMUNICABLE DISEASE (NCD) RISK FACTORS

A "risk factor" refers to any attribute, characteristic, or exposure of an individual, which increases the likelihood of developing a non-

communicable disease. The major (modifiable) behavioural risk factors identified in the World Health Report 2002[2] are tobacco use, harmful alcohol use, unhealthy diet (low fruit and vegetable consumption) and physical inactivity. On the other hand, the major biological risk factors identified are overweight and obesity, raised blood pressure, raised blood glucose and raised total cholesterol. These major behavioural and biological risk factors were included in non-communicable disease risk factors survey except raised blood sugar and total cholesterol, because they have the greatest impact on non-communicable disease mortality and morbidity, and modification is possible through effective prevention.

vegetables are associated with several health benefits, including a decreased risk for some types of cancer. Low consumption of fruit and vegetables has been identified as a risk factor in the development of a range of chronic diseases, including coronary heart disease, stroke and many forms of cancer. Research has indicated that the required intake of fruit for optimal health benefits is five daily servings of fruit and vegetable.

Lack of physical activity leads to obesity, dyslipidemia (lower high-density lipoprotein levels), insulin resistance, diabetes mellitus and high blood pressure levels. Physical inactivity is a well-established risk factor for coronary heart disease (CHD) and is associated with about a twofold increase in risk of CHD.

RISK FACTORS COMMON TO MAJOR NCD'S

Risk factor	Non-communicable Disease			
	CVD	Diabetes	Cancer	Respiratory
Smoking/tobacco	+	+	+	+
Alcohol	+		+	
Smoking/tobacco	+	+	+	+
Alcohol	+		+	
Nutrition	+	+	+	+
PhysicalInactivity	+	+	+	+
Raised BP	+	+	+	
Raised bloodSugar	+	+		
Obesity	+	+	+	+
Blood lipids*	+	+	+	

+ Corresponds to Risk Factor;

* Not being included in Phase I; CVD – Cardiovascular Disease

Tobacco use is a known or probable cause of about 25 diseases including heart disease; cancer, stroke, chronic obstructive pulmonary disease and digestive tract disease, as well as, has significant adverse effects on pregnancy. Smokeless tobacco use causes oral cancer in the lip, tongue, mouth, and throat areas and digestive system cancers. The relationship between alcohol consumption and health and social outcomes is complex and multi-dimensional. Alcohol consumption is linked to more than 60 disease conditions including liver cirrhosis, several cancers (liver, laryngeal, esophageal and oropharyngeal cancers), injuries and hemorrhagic strokes.

Consumption of fruits and vegetables reduces the risk of NCDs, like cancers and cardiovascular diseases. Dietary patterns that include higher intakes of fruits and

1.4 HEALTH PROFILE OF THE STATE

The state of Kerala is a small state, tucked away in the south west corner of India. It is separated from the rest of the peninsula by natural geographic boundaries. Bounded on the east by the Western Ghats and the west by the Arabian Sea, it had long periods of insular existence. It has an area of 38,863 sq. km. and a population of 33535 people (in thousand).[2] There are 14 districts, 152 blocks and 1364 villages in the state. The population density is 819 per sq. km. (as against the national average of 325). The population of the state has been growing with the decadal growth rate of 9.43% against 21.52% for the country. The key population and health indicators for Kerala are presented in Table 1.1 and Table 1.2.

Table 1.1. Demographic and Socioeconomic profile of Kerala as compared to India

S. No	Indicator	Kerala	India
1	Total Population (in thousand)*	33535	1128521
2	Population Ratio (Urban /1000 Rural)*	351	385
3	Decadal Growth Rate*	9.43	21.52
4	Crude Birth Rate (Per 1000 Population) **	14.9	23.5
5	Crude Death Rate (Per 1000 Population) **	6.5	7.5
6	Life Expectancy at Birth**	71.3(M)76.3(F)	62.3(M)63.9(F)
7	Total Fertility Rate***	1.7	2.9
8	Infant Mortality Rate (Per 1000 Live Births)**	15	57
9	Maternal Mortality Ratio (Per 100000 Live Births) †	110	301
10	Sex Ratio (Females/1000 Males)*	1058	933
11	Mean Age at Marriage (Female)††	22.9	20.2
12	Population Below Poverty Line†††	15.0	27.5%
13	Literacy Rate*	90.9	64.8%

Source: National Health Profile 2007, Central Bureau of Health Intelligence[4] (*Registrar General, India; **SRS Bulletin, October 2007; †Statistical Report, RGI 2004; ††Statistical Report RGI, 2005; RGI; PCA; †††Planning Commission of India).

Table 1.2. Health Infrastructure, Human Resource available and Health Expenditure

S. No	Indicator	Kerala	India
1	Number of Allopathic Doctors with recognized medical qualifications and registered with State Medical Council *	-	696747
2	Dental Surgeons Registered **	5735	72497
3	Number of Government Allopathic Doctors ***	3315	76542
4	Average Population served/Doctor ***	10116	-
5	Number of Registered AYUSH Doctors †	25731	725338
6	Total Number of Registered Nurses ††	119058	1509196
7	Number of Doctors at the PHCs †††	1151	22273
8	Total CHCs Specialists at CHCs †††	115	3979
9	Health Assistant (Male & Female) †††	1536	35330
10	Health Worker (Male & Female) †††	9738	215206

Source: National Health Profile 2007, Central Bureau of Health Intelligence, MOHFW

(* Medical Council of India; ** Dental Council of India; *** Directorate of state health services; † Department of AYUSH, MOH&FW/GOI; †† Indian Nursing Council, Pharmacy Council of India; ††† Bulletin on Rural Health Statistics in India, 2006 – Special Revised Edition, MOHFW)

1.5 SURVEY DESIGN AND IMPLEMENTATION

Sample Size

In order to achieve the aforesaid objectives, it was assumed that we should be able to estimate a parameter that has a level of 15% in a subgroup of population, with a relative precision of 30%, design effect as 1.25 and we would be able to achieve a response rate of 90%. Assuming that NCD risk factors are concentrated in 15-64 years for both males and females, the required sample size for each sex in 10-years age groups was estimated to be about 280. It is a known fact that the proportion of population in the 10 year age groups decrease with increase in age. In any population, the proportion of population in the age-group 55-64 is lowest and varies in the range of 5-7 percent depending upon the level fertility (it is at the lower end, i.e., 5% in high fertility states, e.g. Uttar Pradesh, Madhya Pradesh, Bihar and Rajasthan, in the middle, i.e. 6% in moderate fertility states and at the upper end, i.e. 7% in low fertility states). Keeping such scenario of population composition in view and in order to have targeted 280 females and 280 males in age group 55-64, a sample of 5000 households was considered to be adequate for the survey.

Sample Design

A uniform sample design with equal allocation in urban and rural area was adopted and same was followed

in Kerala. In the state, the rural sample was selected in two stages: the selection of Primary Sampling Units (PSUs), which are villages with probability proportional to population size (PPS) at the first stage, followed by the random selection of households within each PSUs at second stage using systematic random sampling. In urban areas, a three-stage procedure was followed. In the first stage, wards were selected with PPS sampling. In the second stage, one Census Enumeration Block (CEB) was randomly selected from each sample ward. In the final stage households were randomly selected within each CEB using the systematic random sampling procedure. From each selected PSU in rural area and from each selected Census Enumeration Block (CEB) in urban area, 50 households were selected. From each selected household, one individual was selected from those who fall in the 15-54 age range by using KISH method[5] whereas all who fall in the age group 55-64 were included in the sample.

Sample Selection in Rural Areas

In rural area, the 2001 Census list of villages served as the sampling frame[3]. The list was stratified by a number of variables. The first level of stratification was geographic with villages classified into five contiguous regions. In each region, villages were further stratified by village size and the percentage of the population belonging to scheduled castes or scheduled tribes. The final level of stratification was implicit for all strata consisting of an ordering of villages within each stratum in ascending and descending order alternatively by the level of female literacy. From the list of villages so arranged, villages were selected systematically with probability proportional to the population of the village. Small villages with <75 households were linked with one or more adjoining villages to form PSUs. Villages with fewer than 5 households were excluded from the sampling frame.

In each selected sample PSU, a mapping and household listing was carried out prior to the data collection that provided the necessary frame for selecting households at the second stage. The household listing operation involved preparing up-to-date location map and layout sketch maps of each selected PSU, assigning numbers to structures, recording addresses or the location of these structures, identifying residential structures, and listing the names of the heads of all the households in residential structures in selected PSUs. The household listing operation was carried out by independent teams.

A complete listing of households was carried out in the villages with households up to 400 households. In case of villages with more than 400 households were divided into at least three segments of 150-300 households as average size of each segment and two segments were randomly selected for household listing. In each selected PSU, 50 households were selected from the household list using systematic random sampling.

Sample Selection in Urban Areas

The 2001 Census list of wards was used as the sampling frame. All wards were stratified by geographic regions, size of ward and percentage of SC/ST population. Female literacy was used for implicit stratification. A sample of wards was selected systematically with probability proportional of ward. One Census Enumeration Block (CEB), consisting of approximately 150-200 households, was selected from each selected ward using the PPS sampling method. The household listing operation was carried out in each selected census enumeration block similarly as in the village in rural area, which provided the necessary frame for selecting 50 households from the CEB.

Sample Weights

Appropriate sampling weights for households were used for urban and rural areas of the state. In urban sector it consisted of factors reflecting ward selection probabilities, Census enumeration block (CEB) selection probabilities within wards; and household selection probabilities within CEB; and household non-response adjustments. In rural sector, the element of weight consisted of factors reflecting probability of selection of PSU, household selection probability within the PSU, and household non-response adjustments.

From each selected household one member aged 15-54 was selected using the KISH method and all members aged 55-64 were selected. Since objective of the study was to obtain estimates for each age group (15-24 through 55-64) and by sex, post stratification was used for improvement of efficiency of the estimators. Post stratification weights for individuals are constructed using the state age distributions for both sexes of the urban and rural sector, which are available on the population level (Appendix-A)[6].

Sample Implementation

During the survey, information collected from a random sample of 4430 households covering 2235 households from rural and 2195 from urban areas. From

these households, a total of 5067 individuals were contacted out of which 4906 completed the Step-1, and 4859 completed the Step-2 survey. The overall individual non-response rate for the survey was less than 5%. (Table 1.3)

in each sample household. For each listed members, survey collected basic information on age, sex and relationship to the head of the household. The residential status (whether present in the household or temporary away from household) was gathered. The

Table 1.3 Sample coverage and response rate of household, step-1 and step-2 individual response rate by place of residence, Kerala, 2007- 08

Response	Residence		
	Urban	Rural	Combined
Households interview			
Households contacted	2500	2500	5000
Households interviewed	2195	2235	4430
Households response rate (%)	87.8	89.4	88.6
Eligible Participants Step-1			
Individual contacted	2605	2462	5067
Individual interviewed	2508	2398	4906
Response rate (%)	96.3	97.4	96.8
Eligible Participants Step-2			
Step-2 completed	2489	2370	4859
Overall Individual response rate(%)	95.5	96.3	95.9

Against the target sample size of 280, there is low turnout in certain age groups and high turn out in other (it may be seen in the subsequent table 2.2). It might be due to either misreporting of age or replacement of the individual who was selected but not available at the time of interview affecting the use of Kish method to give the required sample size. In fact, the Kish method was used in each selected household to select one respondent amongst those who were aged 15-54. It was done by the field investigator after listing of members of the household and arranging them according to age, sex and then selecting one respondent for the interview. There is possibility that some respondents in the age group15-54 particularly males were not available at home during the survey (10AM to 5 PM) and thereby might have been replaced by those household members who were present at the time of survey.

1.6 SURVEY INSTRUMENTS

The survey used two types of questionnaire, the Household Questionnaire and the Individual Questionnaire (Appendix-B). The overall content and format of the questionnaires were determined through a series of workshops and meetings held in 2006-07. The questionnaires for each state were bilingual with questions in both the English and principal language of the state which was Malayalam in the present case. It first listed all usual residents age 12 years and above,

above information were used to identify the eligible individual for the survey in the age group 15-64 years, for administering individual questionnaire. The Household Questionnaire also collected information on religion, ownership of a house, type of house with number of rooms, main source of drinking water, type of toilet facility, main source of lighting, types of cooking fuel, type of oil/cooking medium, ownership of agricultural land, ownership of livestock and possession of durable goods.

The Individual Questionnaire included questions seeking information from all the selected individuals (men and women) in the age group 15-64. The Individual Questionnaire covered information on demographic, behavioural and physical measurements under Step- 1 and Step-2 with a number of sections into them. The first section of Step-1 included questions regarding the demographic information of individual, viz., age, sex, marital status, education, and occupation. The behavioural information section included questions on tobacco use, alcohol consumption, diet, physical activity, history of raised blood pressure and history of diabetes.

Tobacco Use (Smoking & Smokeless): Questionnaire was used to elicit information on current and past use of tobacco (smoking & smokeless), age when used tobacco for first time, past history of tobacco use, and age when stopped using tobacco.

Alcohol use: Questionnaire collected information on whether the individual was currently consuming alcohol, use of alcohol in past 12 months, frequency of drinks in past 12 months, average number of drinks consumed in one day, alcohol consumed within past 30 days, number of standard alcoholic drinks consumed per day in past 7 days, past history of alcohol consumption, and age when started consuming alcohol regularly.

The contents and format of these questionnaires were though largely governed by the WHO STEPS guidelines but they were finalized through a series of consultative meetings held at the Indian Council of Medical Research.

Diet: Questions were asked to collect information on number of days in a week when fruits were consumed, number of servings of fruits consumed in a day, number of days in a week when vegetables were consumed, number of serving of vegetables consumed in a day, frequency of consumption of cheese and butter, fried local food, red meat, eggs, chicken, fish, aerated soda, sweetened drinks, pizza/burger/French fries, cakes/pastries or other bakery items, chips/*namkeen*.

Physical Activity: Questions were asked about the intensity of physical activity in the daily work, frequency of doing physical activity of varying intensity, time spent in doing physical activity of varying intensity per day, mode of travel to and from places, time spent walking or bicycling, type of vigorous/moderate intensity sports for recreation being practiced, frequency of doing such vigorous/moderate intensity sports in a week, time spent doing vigorous/moderate intensity sports per day, practice of yoga, frequency of practicing yoga, duration of time spent per day in yoga, time spent sitting or reclining etc.

History of Raised Blood Pressure: Questions were asked on history of hypertension, medicines prescribed by a doctor and the advice given regarding diet, weight loss, smoking and nature of physical activity undertaken.

History of Diabetes: Questions covering history of diabetes, medicines prescribed by a doctor and advice given regarding diet, weight lose, smoking and physical activities were asked.

Individual questionnaire included several biomarker measurements in Step-2. The height of the eligible individual participant was taken in centimeter by using a portable height measuring board and also measured weight in kilogram using a portable electronic weighting scale. Waist circumference (not measured for pregnant women) was taken two times to provide additional information on overweight and obesity. Constant tension tape (Figure finder tape) measure was used for waist circumference measurements. The measurement was taken without clothing, that is, directly over the skin or over light clothing. The privacy area was maintained for this measurement.

Blood pressure of the individual participants was taken three times using automated blood pressure measuring instrument (OMRON®) and pulse rate was also measured three times using an automated blood pressure device.

1.7 TRAINING

In order to maintain uniform survey procedure across the country, a manual dealing with various aspects of the survey were prepared by NIMS, ICMR. There are five sections: (1) Project Protocol, (2) Survey Methodology, (3) Coordinator's Guide, (4) Trainers Guide and (5) Interviewer's Guide. The Interviewer's Guide consists of guidelines to the interviewers regarding interviewing procedure, field procedures and method on asking each question and recording answers. The Coordinator's Guide contains a detail description of the role and responsibilities of the state coordinators. The Trainer's Guide include training guidelines for the training of the field staff including survey methodology, survey instruments, mapping and list of households, preparation and collection of data.

The representatives of State Survey Agencies (SSAs) and Regional Resource Centres (RRCs) were trained in the Training of Trainers workshop and Data Entry & Management Workshop organized by NIMS at the beginning of the data collection (18-20 July 2007). The purpose of the former workshop was to explain the objective of the NCD Risk Factors Survey and ensure uniform application of survey material to collect good quality of data. The survey documents such as training manuals, survey instruments, list of selected rural and urban PSUs etc. was provided to them for conducting the survey. The equipments required for survey was procured centrally by ICMR and distributed to the SSAs and RRCs. The personnel trained in these workshops subsequently trained the field staff in their respective states.

Training of Field Staff

The training was conducted for the field staff involved in data collection. The field staff recruited for the survey was trained by department of CERTC, Medical College, and supervised the training process. The

training was conducted from 6th - 8th October, 2007 at CERTC, Medical College, Thiruvananthapuram and officials of NIMS New Delhi and Sri Chitra Tirunal Institute for Medical Sciences & Technology, Trivendrum supervised the training. The training consisted of lectures, classroom training, demonstration, practice interviews and field based training. A total of 30 participants were trained, of these 25 trainees 22 were part of the 5 survey teams and 5 were the supervisors for the survey teams. It was ensured that each survey team comprised of one male and one female member.

Each trainee was given a training kit at the beginning of training, the training kit comprised of an interviewers guide, household and individual schedules, consent form, IEC message, set of Show Cards (e.g. Diet chart, Alcohol chart) and reference forms (e.g. Kish table, Table of random numbers), flow chart of activities in field, identity card and supporting letters from Government mentioning purpose of visit. A field visit to village Uliyazhathura, Thiruvananthapuiram district was also arranged aspart of practical training of investigators in field activities and procedure for conducting a survey and as part of pre-test. After the completion of training, letters were issued through Directorate of Health Services to DHOs, Municipal corporations and Municipalities across the State, and Deputy Director of Health Services requesting their cooperation in smooth conduct of the survey.

Data Entry Training

Data entry software in Epi-Info with its manual was developed by the NIMS, ICMR. A two-day data entry workshop cum hands on training was organized by NIMS, ICMR during 10-11 December 2007 for the statisticians and date entry personnel of the state survey agencies (SSAs). The purpose of the workshop was to familiarize the participants with the software. Emphasis was made on double data entry in order to ensure high accuracy in data entry and to minimize data entry errors. All the participants were provided with the Data Entry Software and its Manual.

1.8 DATA PROCESSING AND ANALYSIS

Following the data entry by the state survey agency (SSA), the validity and consistency check was carried out by the NIMS, ICMR for final analysis. Analysis plan in terms of dummy tables was finalized in consultation with ICMR Review Group.

Prevalence of current smokers, current daily smokers and past daily smokers was calculated among the respondents by sex and place of residence. Those who smoke tobacco daily, the mean number of tobacco products (*beedi, cigarettes, pipes, cigars,* etc.,) used daily was calculated taking denominator as all daily smokers. Though the age of initiation of smoking was collected from all daily smokers in completed years but for the past smokers it was calculated by imputation because it was not recorded. Finally average age of initiation of smoking was calculated in two age groups of smokers, 15-34 years and 35-64 years. The same procedure was followed for the calculation of average age of initiation of smokeless tobacco. Prevalence of alcohol consumption was calculated for last twelve months, last thirty days and last seven days and presented as percentage. The mean age of initiation of alcohol consumption was also calculated. Mean number of servings fruit, vegetables, and combined (fruit and vegetables) consumed per day was computed.

Mean physical activity per day was computed by combining all types of physical activity (vigorous, moderate-intensity, travel and recreational) using METs (Metabolic Equivalent) score. Prevalence of reported cases of blood pressure and diabetes were also calculated. Measurement of height, weight and waist circumference of individual respondent was used to compute BMI (body mass index) and central obesity.

1.9 QUALITY CONTROL MEASURES

A uniform project protocol, survey methodology, training manuals, survey instruments and data-management modules were developed and adopted across all the states including Kerala. It was executed by the Clinical Epidemiology Unit of Trivendrum Medical College, Thiruvananthapuram (SSA) and was monitored by Sri Chitra Tirunal Institute for Medical Sciences & Technology, Thiruvananthapuram (RRC). The over all coordination and supervision of the survey was done by the Division of Non-Communicable Diseases, Indian Council of Medical Research and the National Institute of Medical Statistics. In addition, an independent check by collecting data in randomly drawn sample of 10% of PSUs was carried by the RRCs. High concordance was recorded between the survey by SSA and independent checked by RRC on some key indicators like smoking, alcohol consumption and physical activity and varied from 95 to 99%. Various activities hitherto were to maintain the highest level of the quality of data.

CHAPTER 2

Background Characteristics of the Households and Respondents

This chapter presents the demographic and socio-economic characteristics of the sample households and the respondents from these households in the survey population of Kerala. It also describes facilities in the households.

2.1 HOUSEHOLD CHARACTERISTICS

Table 2.1 provides the percentage distribution of households in rural and urban areas by various characteristics of the surveyed households. Majority of the households (56%) were Hindu followed by Muslim (23%) and Christian (20%). Hindu constituted 59% of urban households and 55% of rural households. Seventy one percent of sample households had well as drinking water source followed by 24% from piped drinking water and a small fraction (4%) had hand pump as drinking water supply. It was found that 42% of urban households

and 18% of rural households had piped drinking water supply. Regarding the sanitation facility, all the urban and rural households had either flush toilets or pit toilets in Kerala.

Over ninety five percent (95%) of households used electricity as main source of lighting, which was slightly higher in urban area (97%) than that in the rural area (94%). In the state, 67% households had *pucca* house, 26% households had *semi-pucca* house and 7% households had *kaccha* house. The percentage of *pucca* houses was high (73%) in urban compare to rural households (64%). Several types of fuels were used for cooking in Kerala, with wood as the most common type (66%) among the rural households, L.P.G. was the most common (53%) among urban households. In the state as a whole, 61% households used wood followed by L.P.G. (38%) .

Table 2.1 Percentage distribution of households in rural and urban area according to the background characteristics, Kerala, 2007- 08

Characteristics	Residence		Combined
	Urban	Rural	
Religion of household head			
Hindu	59.4	55.3	56.3
Muslim	21.0	24.2	23.4
Christian	19.6	20.5	20.3
Total	100.0	100.0	100.0
Source of drinking water			
Piped	42.0	18.2	24.2
Hand pump	3.0	3.7	3.5
Surface water	0.0	0.4	0.3
Well water	53.4	76.9	70.9
Other	1.6	0.8	1.1
Total	100.0	100.0	100.0
Sanitation facility			
Flush toilet	97.0	90.0	92.0
Pit toilet	3.2	9.7	8.0
Total	100.0	100.0	100.0
Main source of lighting			
Electricity	97.2	94.2	94.9
Kerosene	2.6	5.8	5.0

Gas/Oil	0.1	0.0	0.1
Total	100.0	100.0	100.0
Type of house			
Pucca	72.9	64.3	66.5
Semi-Pucca	22.8	27.3	26.2
Kachha	4.3	8.3	7.3
Total	100.0	100.0	100.0
Cooking fuel			
LPG	53.1	32.7	37.8
Wood	45.7	66.4	61.2
Kerosene	0.6	0.3	0.4
Others	0.6	0.6	0.6
Total	100.0	100.0	100.0
Separate kitchen room			
Yes	97.4	96.2	96.5
No	2.6	3.8	3.5
Total	100.0	100.0	100.0
Agriculture land			
Own agriculture land (%)	6.1	17.9	15.0
Number	2195	2235	4430

Five out of six households in Kerala had no own agricultural land. Four-fifth households in rural area had no own agricultural land compared to 94% in urban area. The proportion of households having separate kitchen was 97%.

2.2 AGE AND SEX COMPOSITION

A total of 4838 with 1710 males and 3128 females from urban and rural areas were contacted in the survey. They are presented in 10 years age groups 15-24, 25-34, 35-44, 45-54 and 55-64. The distribution of the number of respondents across the five age groups is depicted for both males and females as well as for both sexes together, separately for urban and rural areas and combined in Table 2.2. It may be seen that the number of respondents was least, i.e. 728 in the age group 15-24 and maximum, i.e. 1126 in age group 55-64 years.

2.3 EDUCATION LEVEL

Table 2.3 presents the percentage of the respondents according to their literacy levels by sex and place of residence. Ten percent of the total respondents were illiterate whereas 25% were with primary or middle, 55.6% were secondary or in higher secondary and 14% were educated up to college and above. In the sample, 13% females and 5% males were illiterate. The proportion of illiterate respondents among rural females (16%) was higher than that among urban females (11%). A slightly higher percentage of males than of females had completed almost each level of schooling.

2.4 MARITAL STATUS

The second panel of Table 2.3 shows the percentage of respondents according to the three marital categories by sex and place of residence. More than three quarter of the respondents, both male and female were currently

Table 2.2 Age and Gender-wise distribution of respondents by type of residence (unweighted), Kerala, 2007- 08

	Residence								
	Urban			Rural			Combined		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total
15 – 24	161	196	357	156	215	371	317	411	728
25 – 34	146	353	499	128	361	489	274	714	988
35 – 44	193	346	539	136	327	463	329	673	1002
45 – 54	158	321	479	154	361	515	312	682	994
55 – 64	266	349	615	212	299	511	478	648	1126
15 - 64	924	1565	2489	786	1563	2349	1710	3128	4838

married, 6% were widowed and 16% were never married, divorced or separated. The proportion of respondents who were currently married did not vary for urban and rural residents.

2.5 OCCUPATION

Table 2.3 presents information on the current occupation status of the respondents. Majority of the females (42.4%) were engaged in domestic work where as 36% of males were engaged in manual work and 21% in executive/business. Similar pattern was observed in both sex of rural and urban respondents. Nine percent of males and 3% of females were involved in agricultural work. Only 3% individuals were engaged in work related to sales and services.

Table 2.3 Percentage of respondents according to background characteristics, gender and place of residence, Kerala, 2007- 08

| Characteristic | Residence | | | | | | Combined | | |
| | Urban | | | Rural | | | | | |
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Education									
Illiterate	4.8	10.7	8.5	5.8	15.7	12.3	5.2	13.2	10.4
Primary	10.0	9.4	9.6	12.5	9.5	10.5	11.1	9.4	10.0
Middle	16.3	13.1	14.3	16.5	15.8	16.1	16.4	14.5	15.1
Secondary	37.9	35.7	36.6	39.6	34.9	36.5	38.7	35.3	36.5
Higher Secondary	13.9	14.1	14.0	14.6	14.2	14.3	14.2	14.1	14.1
College & above	17.2	16.9	17.0	11.1	10.0	10.3	14.4	13.5	13.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Marital status									
Never married	26.6	10.7	16.6	27.6	10.1	16.0	27.1	10.4	16.3
Married	72.4	80.0	77.2	72.1	80.2	77.4	72.2	80.1	77.3
Widowed/Divorced/ Separated	10.0	9.3	6.2	0.4	9.7	6.6	0.7	9.5	6.
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Occupation									
Executive/Business	23.8	4.5	11.6	16.5	2.3	7.7	20.5	3.4	9.4
Agriculture	7.5	2.1	4.1	10.7	3.1	5.6	9.0	2.6	4.8
Domestic Work	0.3	43.7	27.6	0.1	41.0	27.3	0.2	42.4	27.5
Services/Sales	5.2	2.9	3.8	3.7	1.7	2.4	4.5	2.3	3.1
Manual Worker	34.2	3.5	14.9	38.2	5.8	16.0	36.0	4.6	15.7
Other	29.0	43.3	38.0	30.8	46.1	41.0	29.8	44.7	39.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number	924	1565	2489	798	1572	2370	1722	3137	4859

Behavioural Risk Factors

This chapter presents the prevalence of certain behavioural risk factors for the non-communicable diseases in the survey population. The survey questionnaire asked questions about certain life style of respondents which could be considered as the behavioural risk factors for non-communicable diseases.

and 13% of rural respondents were current daily smokers. The past daily smokers were only 10% among males and 63% of male respondents never smoked tobacco.

Table 3.1.2 presents the mean number of tobacco products smoked per day among those respondents who were current daily smokers of any form of tobacco.

Table 3.1.1 Percentage of respondents classified by smoking status across sex and place of residence, Kerala, 2007- 08

Residence/ Sex	Smoking Status							
	Current smokers		Current Daily smokers		Past Daily smokers		Never Smoked	
	P (%)	95% CI	P (%)	95% CI	P (%)	95% CI	P (%)	95% CI
Urban								
Male	23.8	(20.7, 27.2)	21.6	(18.6, 25.0)	9.8	(7.6, 12.5)	66.4	(62.9, 69.5)
Female	0.1	(0.0, 0.2)	*	*	*	*	99.9	(99.6, 100.0)
Total	11.5	(9.9, 13.4)	10.5	(8.9, 12.3)	4.8	(3.8, 6.1)	83.7	(81.7, 85.4)
Rural								
Male	28.5	(24.9, 32.4)	26.5	(23.1, 30.2)	10.0	(7.7, 13.0)	61.5	(56.9, 65.8
Female	0.2	(0.1, 0.9)	*	*	*	*	99.8	(99.1, 99.9)
Total	13.9	(12.1, 15.9)	12.8	(11.1, 14.7)	4.9	(3.8, 6.2)	81.2	(79.0, 83.3)
Combined								
Male	27.3	(24.5, 30.2)	25.2	(22.6, 28.0)	10.0	(8.1, 12.2)	62.7	(59.3, 66.0)
Female	0.2	(0.0, 0.6)	*	*	*	*	99.8	(99.4, 99.9)
Total	13.3	(11.9, 14.8)	12.2	(10.9, 13.6)	4.8	(4.0, 5.9)	81.9	(80.2, 83.5)

*No observation

3.1 TOBACCO SMOKING AND CHEWING

As per the WHO STEPS guidelines to measure the prevalence of smoking habit among the respondents, the smokers are categorized as c*urrent smokers*, c*urrent daily smokers*, p*ast daily smokers* and those who have never smoked in lifetime are classified as n*on-smokers*.

Table 3.1.1 presents the percentage of respondents, both males and females as well as combined in various categories of smokers and non-smokers according to the place of residence (rural or urban). Thirteen percent respondents were current smokers. They were mostly current daily smokers. The prevalence of current daily smokers among men was 25% while among women it was not observed. Eleven percent of urban respondents

Among those men who were current daily smokers of different products of tobacco, the mean number of smoking per day was 5 in case of *beedi* and 6 for manufactured cigarettes. There was no much difference between urban and rural respondents in the frequency of smoking being *beedi* or manufactured cigarette.

Table 3.1.3 presents the mean age of initiation, age at stopped smoking and the percentage of non-smoker respondents exposed to tobacco smoke by sex and the place of residence.

The mean age for initiation of smoking among young respondents aged 15-34 years was 20 years and among all respondents aged 35-64 years it was 22 years. The mean age of cessation of smoking for all those who

Table 3.1.2 Mean number of tobacco products smoked (per day) by daily smokers according to sex and place of residence, Kerala, 2007- 08

Residence/ Sex	Type of smoking			
	Bidi		Manufactured Cigarettes	
	Mean	95% CI	Mean	95% CI
Urban				
Male	4.0	(2.4,5.7)	6.0	(5.1,7.0)
Female	*	*	*	*
Total	4.0	(2.4,5.6)	6.0	(5.1,6.9)
Rural				
Male	4.6	(3.6,5.6)	5.8	(4.7,7.0)
Female	*	*	*	*
Total	4.6	(3.6,5.6)	5.8	(4.7,7.0)
Combined				
Male	4.5	(3.6,5.3)	5.9	(5.0,6.8)
Female	*	*	*	*
Total	4.5	(3.6,5.3)	5.9	(5.0,6.8)

*Figure not shown ; based on fewer than 25 unweighted cases.

Table 3.1.3 Mean age of initiation, age at stopped smoking and percentage of respondents (non-smokers) exposed to tobacco smoke by sex and place of residence, Kerala, 2007- 08

Residence/ Sex	Smokers						Non-smokers	
	Age of Initiation (15-34 years)		Age of Initiation (35-64 years)		Age at Stopped		Exposed to tobacco smoke at Home or Work	
	Mean	95% CI	Mean	95% CI	Mean	95% CI	P (%)	95% CI
Urban								
Male	20	(19.5,22.5)	22	(20.5,23.5)	35	(32.9, 37.2)	23	(17.0, 30.0)
Female	*		*		*		18	(14.3, 22.0)
Total	20	(19.5,21.5)	22	(20.5,23.5	35	(33.0, 37.3)	20	(16.3, 24.4)
Rural								
Male	20	(19.5,22.5)	22	(20.5,23.5)	34	(32.0, 37.2)	25	(20.0, 31.7)
Female	*		*		*		23	(19.1, 28.1)
Total	20	(19.5,21.5)	22	(20.5,23.5)	34	(32.0, 37.2)	24	(20.3, 28.7)
Combined								
Male	20	(19.5,21.5)	22	(20.5,23.5)	34	(32.8, 36.6)	25	(20.7, 29.7)
Female	*		*		*		22	(18.8, 25.5)
Total	20	(19.5,21.5)	22	(20.5,23.3)	34	(32.8, 36.7)	23	(20.2, 26.6)

*Figure not shown ; based on fewer than 25 unweighted cases

stopped smoking was 34 years. There was no difference in the mean age of initiation of smoking between urban and rural respondents in Kerala. About 23% respondents of those who never smoked were exposed to tobacco smoke at home or work place. It was over 25% in case of men against 22% in case of women. Over 20% of the urban respondents and 24% of the rural respondents were exposed to tobacco smoke at home or work place.

Table 3.1.4 provides percentage of smokeless tobacco users by sex and place of residence of the respondents.

Only 5% of the respondents were current user of smokeless tobacco with 7% among men and 3% among women. A small percentage of men and women (less than 2%) were found to be past daily users. The prevalence of smokeless tobacco use was higher for rural respondents (6%) as compared to that for the urban respondents (4%). More men (5% of men with, 6% of rural male and 4% of urban male respondents) than women (3.2% of females with, 4% in rural and 2% in

Table 3.1.4 Percentage of smokeless tobacco users by sex and place of residence, Kerala, 2007- 08

Residence/ Sex	Smokeless tobacco user							
	Current user		Current daily user		Past daily user		Never used	
	P (%)	95% CI	P (%)	95% CI	P (%)	95% CI	P (%)	95% CI
Urban								
Male	5.2	(3.7,74)	4.0	(2.7,6.1)	2.4	(1.5,3.7)	92.4	(91.2,95.2)
Female	2.0	(1.2,3.2)	1.8	(1.1,2.9)	0.1	(0.0,0.2)	97.9	(97.1,98.9)
Total	3.5	(2.6,4.7)	2.9	(2.1,3.9)	1.2	(0.7,1.8)	95.3	(94.7,96.8)
Rural								
Male	8.4	(5.8,12.1)	6.1	(4.1,9.1)	3.7	(2.4,5.7)	87.9	(86.8,92.8)
Female	3.9	(2.2,6.8)	3.7	(2.0,6.6)	0.4	(0.2,0.8)	94.7	(93.1,97.6)
Total	6.1	(4.2,8.8)	4.7	(3.1,7.5)	2.0	(1.3,3.0)	91.9	90.6,95.1)
Combined								
Male	7.0	(5.6,12.2)	5.3	(4.0,7.7)	3.0	(2.3,4.8)	90.0	(88.6,93.0)
Female	3.4	(2.1,5.4)	3.2	(1.9,5.2)	0.3	(0.1,0.6)	96.3	(94.5,97.8)
Total	5.4	(4.0,7.4))	4.3	(3.0,6.2)	1.8	(1.2,2.5)	92.8	(92.0,95.3)

urban female respondents) were current daily users of smokeless tobacco.

The mean number of times per day various smokeless tobacco products used such as tobacco chewing and pan with tobacco were provided in Table 3.1.5. The mean number of times chewing tobacco per day in Kerala was less than one. For those who chew pan with tobacco, the mean number of times respondents chew pan with tobacco per day was about 4 (2 for male and 6 for female). There was no urban-rural differential in frequency of chewing pan with tobacco among men whereas it varied by place of residence among women. The mean number of times chew pan with tobacco per day was 7 for urban and 5 for rural females.

The mean age of initiation and age at stopped using of smokeless tobacco by sex and place of residence of respondents is provided in Table 3.1.6. The mean age of initiation of smokeless tobacco use among those who use smokeless tobacco and were aged 15-34 years, was 20 years. Rural male appeared to initiate use of smokeless tobacco slightly earlier (18 years) than urban male (19 years). The mean age of initiation of smokeless tobacco use was 30 years for both male and female in the age group 35-64 years. Urban male appeared to initiate use of smokeless tobacco earlier (29 years) than urban females (35 years). The mean age of quitting smokeless tobacco use was 34 years where as it was 33 years in case of men and 48 years in case of women. The mean age of quitting smokeless tobacco use for urban respondents was 33 years against 34 years for rural respondents.

Table 3.1.5 Mean frequency of smokeless tobacco use (per day) by the daily smokeless tobacco users according to sex and place of residence, Kerala, 2007- 08

Residence/ Sex	Type of smokless tobacco			
	Chewing tobacco		Pan with tobacco	
	Mean	95% CI	Mean	95% CI
Urban				
Male	1.0	(0.4.1.5)	1.9	(1.2,2.5)
Female	*	*	6.7	(4.4,8.9)
Total	0.6	(0.2,1.0),	3.4	(2.2,4.6)
Rural				
Male	0.6	(0.2,0.9)	2.4	(1.0,3.7)
Female	1.0	(0.0,2.0)	5.3	(4.4,6.2)
Total	0.7	(0.2,1.3)	3.5	(2.6,4.4)
Combined				
Male	0.6	(0.3,1.0)	2.2	(1.2,3.3)
Female	0.8	(0.0,1.8)	5.5	(4.7,6.4)
Total	0.7	(0.3,1.1)	3.5	(2.7,4.2)

* Figure not shown ; based on fewer than 25 unweighted cases

Table 3.1.6 Mean age of initiation, age at stopped smokeless tobacco use by daily smokeless tobacco user according to sex and place of residence, Kerala, 2007- 08

Residence/ Sex	Smokeless tobacco users					
	Age of Initiation (15-34 years)		Age of Initiation (35-64 years)		Age at Stopped	
	Mean	95% CI	Mean	95% CI	Mean	95% CI
Urban						
Male	19	(15.5,24.5)	29	(20.5,40.5)	33	(27.7, 38.6)
Female	*	*	35	(25.5,40.5)	46	(39.9, 52.1)
Total	22	(15.5,25.5)	34	(25.5,38.5)	33	(28.1, 38.8)
Rural						
Male	18	(16.5,21.5)	30	(23.5,36.5)	33	(28.3, 37.8)
Female	*	*	30	(25.5,40.5)	49	(41.6, 56.3)
Total	20	(16.5,22.5)	30	(25.5,35.5)	34	(29.9, 39.2)
Combined						
Male	19	(16.5,22.5)	29	(23.5,35.5)	33	(29.2, 37.0)
Female	*	*	30	(25.5,35.5)	48	(42.0, 55.6)
Total	20	(17.5,22.5)	30	(25.5,35.5)	34	(30.6, 38.2)

*figure not shown ; based on fewer than 10 unweighted cases

Table 3.1.7 presents the percentage of smokers and smokeless tobacco users by sex and the place of residence. It shows that 16% of respondents were using either smoking or smokeless tobacco whereas 1% of the respondents were using both forms of tobacco, i.e. smoking and also smokeless tobacco. The percentage of respondents either smoking or using smokeless tobacco was 13% in urban as compared to 17% in rural population. The use of both the forms of tobacco (smoking as well as smokeless tobacco) was only one percent where as it was higher (2%) among rural males. The percentage of respondents either smoking or using smokeless tobacco among men (29%) was as high as about ten times that among women (3%).

Some key observations of tobacco use in Kerala was that one-fourth of male population smoked tobacco daily whereas smoking among females was low. Overall, 5% of the population use smokeless tobacco whereas 7% of men and 3% of women used smokeless tobacco. Sixteen percent of population in Kerala used tobacco in any form (i.e. smoking or smokeless). This prevalence was 29% among males and 3% among females. The mean age of initiation of tobacco use among young age (15-34 years) people was 20 years for male smokers, and 19 years for male smokeless tobacco users. These findings emphasize the need of implementing the tobacco control programme for prevention of NCD.

Table 3.1.7 Percentage of tobacco users by sex and place of residence, Kerala, 2007- 08

Residence/ Sex	Tobacco Use							
	Smokeless tobacco users only		Smokers only		Both(Smoking and smokeless)		Either(Smoking or smokeless)	
	P (%)	95% CI	P(%)	95% CI	P (%)	95% CI	P (%)	95% CI
Urban								
Male	3.0	(2.0, 4.6)	21.6	(18.7, 24.8)	1.4	(0.8, 2.5)	24.3	(21.1, 27.8)
Female	2.0	(1.2, 3.2)	0.1	(0.0, 0.2)	*	*	1.8	(1.1, 2.9)
Total	2.5	(1.8, 3.3)	10.5	(8.9, 12.3)	0.7	(0.4, 1.2)	12.7	(10.9, 14.6)
Rural								
Male	5.2	(3.7, 7.2)	25.3	(22.6, 28.1)	2.4	(1.0, 5.7)	30.3	(26.6, 34.2)
Female	3.9	(2.2, 6.8)	0.2	(0.0, 0.9)	*	*	3.7	(2.0, 6.6)
Total	4.5	(3.3, 6.1)	12.3	(10.9, 13.9)	1.1	(0.5, 2.8)	16.5	(14.1, 19.3)
Combined								
Male	4.6	(3.5, 6.1)	24.3	(22.2, 26.5)	2.1	(1.0, 4.3)	28.7	(25.9, 31.6)
Female	3.4	(2.1, 5.4)	0.2	(0.0, 0.6)	*	*	3.2	(1.9, 5.2)
Total	4.0	(3.1, 5.1)	11.8	(10.7, 13.0)	1.0	(0.5, 2.1)	15.5	(13.6, 17.6)

*Percentage not shown; based on fewer than 25 unweighted cases

3.2 ALCOHOL CONSUMPTION

Table 3.2.1 presents the percentage of respondents who consumed alcohol in past 30 days and 12 months by sex and place of residence. About 11% respondents had consumed alcohol in past 30 days and 17% consumed in past 12 months. Only 4% respondents were past drinker. Twenty four percent men consumed alcohol in past 30 days and about 36% men consumed in past 12 months. Percentage of lifetime abstainer to alcohol was higher for rural men (59%) as compared to that for urban men(53%). Urban men were more likely to consume alcohol (29% in past 30 days and 40% in past 12 months) than rural men (22% in past 30 days and 34% in past 12 months).

Table 3.2.2 presents the percentage of those who consumed alcohol, according to frequency of consuming alcohol in past 12 months, mean number of standard drinks consumed on a drinking day,

frequency of consuming alcohol in past one week and the average standard drinks per day. Of the current drinkers, 28% of urban, 35% of rural and 33% of the combined sample consumed alcohol on less than one occasion in a month. Further, 31% urban respondents and 32% rural respondents consumed alcohol 1-3 days per month in past one year. In urban and rural area, 34% and 24% of current drinkers consumed alcohol 1-4 days every week; 7% of the urban and 10% of the rural drinkers consumed alcohol 5-7 days per week in the past one-year. The average numbers of drinks consumed on a drinking day was about 3 drinks.

The respondents who were current drinker, were also asked about their behaviour in terms of the number of days and number of drinks per day they took in the past 7 days preceding the survey. The survey found that among them 16% of urban respondents, 22% of rural respondents and 20% of combined sample respondents

Table 3.2.1 Percentage of Alcohol consumption by sex and place of residence, Kerala, 2007- 08

Residence/ Sex	Alcohol Consumption							
	Consumed alcohol (Last 30 days)		Consumed alcohol (Last 12 months)		Past drinker		Life time abstainer	
	P (%)	95% CI	P (%)	95% CI	P (%)	95% CI	P (%)	95% CI
Urban								
Male	28.7	(23.5,34.7)	40.4	(34.2,47.1)	6.4	(4.8, 8.6)	53.2	(46.9,59.7)
Female	*	*	*	*	2.4	(1.1, 5.5)	97.6	(94.4,98.8)
Total	14.0	(11.2,17.3)	19.6	(16.3,23.4)	4.4	(3.0, 6.2)	76.0	(71.8,80.0)
Rural								
Male	21.7	(17.3,23.5)	34.3	(29.3,41.1)	7.0	(5.0, 9.8)	58.7	(52.0,63.8)
Female	*	*	*	*	0.9	(0.3, 2.5)	99.1	(97.3,99.6)
Total	10.4	(8.3,13.3)	16.6	(14.1,20.3)	3.9	(2.8, 5.4)	79.5	(75.5,82.4)
Combined								
Male	23.6	(20.1,27.6)	35.9	(31.5,40.7)	6.9	(5.3, 8.9)	57.2	(52.0,61.3)
Female	*	*	*	*	1.3	(0.7, 2.5)	98.7	(97.3,99.2)
Total	11.4	(9.6,13.6)	17.4	(15.4,20.2)	4.0	(3.1, 5.1)	78.6	(75.5,80.9)

*Percentage not shown, based on fewer than 25 unweighted cases.

Table 3.2.2 Percentage of drinkers (past 12 months) according to the frequency of drinking, mean number of standard drinks per day and pattern of drinking in the last seven days by gender and place of residence, Kerala, 2007- 08

Alcohol consumption	Residence						Combined		
	Urban			Rural					
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Frequency of drinking in past 12 months									
5-7 days per week	7.1	*	7.1	9.6	*	9.6	8.9	*	8.8
1-4 days per week	33.5	*	33.5	23.7	*	23.6	26.6	*	26.5
1-3 days per month	31.4	*	31.2	31.9	*	31.7	31.7	*	31.6
Less than once per month	28.0	*	28.4	34.9	*	35.1	32.8	*	33.1

Mean number of drinks on a drinking day	2.8	0.9	2.8	2.8	1.1	2.8	2.8	1.0	2.8
Drinks during last 7 days									
Alcohol consumed on 4+days (%)	15.3	*	15.7	21.9	*	21.9	19.8	*	19.9
**Binge drinking on any day (%)	8.1	*	8.1	11.6	*	11.6	10.5	*	10.5
20+ drinks in 7 days (%)	3.0	*	3.0	9.6	*	9.6	7.5	*	7.5
Average standard drinks per day	0.9	*	0.9	1.2	*	1.2	1.1	*	1.1

*Percentage not shown; based on fewer than 25 unweighted cases. **5+ Drinks on any day for male; and 4+ drinks on any day for female

consumed alcohol at least 4 days a week. About one-tenth of current drinkers were in high risk drinking zone (binge drinking); it was about 12% in rural against 8% in urban population and concentrated among men. The average standard drink consumed per day was calculated using the data collected for alcohol consumption by current drinkers in the week preceding the survey, which was about one.

Table 3.2.3 presents the mean age of initiation of alcohol use by sex and the place of residence among current drinkers and past drinkers in the age group 15-34 year and 35-64 years. The mean age of initiation of alcohol consumption regularly in the age group of 15-34 years was 22 years (22 years for men and 26 for women). The mean age of initiation of alcohol consumption regularly in the age group of 15-34 years was 22 years for both urban and rural male respondents. The mean age of initiation of alcohol use

in the age group 35-64 years was 30 years.

Table 3.2.4 presents the percentage of current daily smokers and smokeless tobacco users and current drinkers by age, education and occupation. The percentage of daily smokers was high in the age group 35-44 years (30%), among secondary education (37%) and the respondents who were engaged in service/sale fifty nine percent. Similarly, percentage of smokeless tobacco users was highest in the age group 55-64 years (27%), among illiterate (31%) and service/sale (51%). The percentage of current drinkers was high (33%) in the age group 35-44, among secondary (45%) and those who reported their occupation as service/sale (59%).

Interesting observations of alcohol consumption was that about 36% of men consumed alcohol at least once in last one year whereas 24% of men in last one month. The alcohol consumption among females was very low. Those who consumed alcohol in last seven days,

Table 3.2.3 Mean age of initiation of alcohol use by sex and place of residence, Kerala, 2007-08

Residence/ Sex	Alcohol users			
	Age of Initiation (15-34 years)		Age of Initiation (35-64 years)	
	Mean	95% CI	Mean	95% CI
Urban				
Male	22	(21.5,23.5)	27	(25.5,30.5)
Female	*	*	47	(41.5,55.5)
Total	22	(21.5,23.5)	29	(26.5,30.5)
Rural				
Male	22	(20.5,23.5)	33	(30.5,35.5)
Female	*	*	*	*
Total	22	(20.5,24.5)	35	(30.5,36.5)
Combined				
Male	22	(21.5,23.5)	30	(28.5,30.5)
Female	26	(20.5,29.5)	50	(43.5,56.5)
Total	22	(21.5,23.5)	30	(28.5,32.5)

*figure not shown ; based on fewer than 25 unweighted cases

Table 3.2.4 Percentage of current daily smokers, daily smokeless tobacco users and current drinkers across age, education and occupation, Kerala, 2007- 08

Characteristic	Smoker	Smokeless tobacco user	Current drinker
Age group			
15-24	6.4	14.4	8.1
25-34	23.4	19.4	27.9
35-44	29.8	16.6	32.7
45-54	23.3	22.2	19.3
55-64	17.1	27.4	12.0
Total	100.0	100.0	100.0
Education			
Illiterate	9.6	31.0	6.5
Primary	17.0	14.8	11.0
Middle	24.2	19.1	18.8
Secondary	37.0	22.6	44.8
Higher Secondary	6.1	7.0	10.5
College & above	6.0	5.5	8.4
Total	100.0	100.0	100.0
Occupation			
Executive/Business	14.6	6.8	17.3
Clerical/Sales	10.0	5.8	6.4
Agriculture	0.0	13.5	0.0
Domestic Work	3.4	1.6	5.4
Services/Sales	58.5	50.9	58.6
Manual Worker	13.5	21.4	12.2
Other	6.4	14.4	8.1
Total	100.0	100.0	100.0
Number	485	231	459

11% of them were binge drinkers. The mean age of initiation of alcohol consumption by young age (15-34 years) men was 22 years. These are the important findings of study for intervention.

3.3 FRUITS AND VEGETABLES CONSUMPTION

Survey asked questions about the number of days a week on which fruits and vegetables were consumed by the respondents and the number of servings of fruits and vegetables consumed on one of those days. Table 3.3.1 presents mean number of days of such consumptions by sex and place of residence. People in Kerala consumed vegetables for about 6 days a week and fruits for 3 days a week. It was almost same in urban and rural areas and for both males and females.

More than 85% of respondents reported that they had less than five servings of fruits and vegetables per

Table 3.3.1 Mean number of days in a week fruit and vegetable consumed by the respondents according to gender and place of residence, Kerala, 2007- 08

Fruits and vegetables consumption per week	Residence						Combined		
	Urban			Rural					
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Mean number of days fruits consumed	3.2	3.1	3.1	3.0	2.7	2.9	3.1	2.8	2.9
Mean number of days Vegetables consumed	5.4	5.5	5.4	5.4	5.5	5.5	5.4	5.5	5.5
Less than five serving of fruits & vegetables consumed per day(%)	82.1	92.5	87.4	82.4	91.7	87.3	82.3	91.3	87.3

day on those days when they consumed it. It was almost same for urban and rural.

From Table 3.3.2, it can be seen that the mean number of servings of fruits and vegetables in one particular day was 2 across sex and place of residence.

foods, red meat, eggs, chicken, aerated soda, sweetened drinks, pizza/burger/French fries, cakes/ pastries or other bakery items, chips/*namkeen* etc. Over 42% population consumed eggs, 30% consumed fish, 28% consumed chicken or fried local foods, 25% consumed red meat and 24% consumed chips, Namkeen etc. at

Table 3.3.2 Mean number of servings of fruits, vegetables consumed in one particular day by gender and place of residence Kerala, 2007- 08

Number of servings of fruits/vegetables/both per day	Residence						Combined		
	Urban			Rural					
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Servings of fruit	0.8	0.7	0.7	0.9	0.7	0.7	0.9	0.7	0.8
Servings of vegetable	1.4	1.2	1.3	1.2	1.2	1.2	1.3	1.2	1.2
Servings of fruit and vegetable	2.3	1.9	2.1	2.2	1.9	2.0	2.2	1.9	2.0

Nutritional inadequacy is the major risk factor of many non-communicable diseases. Overall, 87% of adult population in Kerala consumed less than five servings of fruits and vegetables per day, which was inadequate as per WHO recommended standards. This is an important health issues and needs to be address with more emphatically.

Food and Oil Consumption

The percentage of respondents according to the intake of specific food items at least once a week by sex and place of residence was provided in Table 3.3.3. The specific food items include cheese/butter, fried local

least once a week. Fifty eight percent of the respondents consumed fish daily, 15% consumed fried local foods and about 5% consumed eggs, cakes, Pastries or other bakery items daily. The pattern was almost similar for urban and rural.

Table 3.3.4 presents the type of edible oil used for cooking by the sample households by the place of residence. It shows that the use of coconut oil for cooking was high (87% households with 85% of urban and 88% of rural households) followed by palm oil (10% households with both urban and rural) and sunflower oil (2% households with 4% of urban and 2% of rural households).

Table 3.3.3 Percentage of respondents according to the intake of specific food items by place of residence, Kerala, 2007- 08

Specific Food Items	Residence				Combined	
	Urban		Rural			
	Daily	At least once in a week	Daily	At least once in a week	Daily	At least once in a week
Cheese/ Butter	0.6	5.8	1.0	4.8	0.9	5.1
Fried local foods	13.0	28.1	15.3	27.7	14.7	27.8
Red Meat	1.2	24.9	1.6	24.9	1.5	24.9
Eggs	6.6	45.0	6.0	41.3	6.2	42.3
Chicken	0.5	28.1	1.2	28.1	1.0	28.1
Fish	58.2	29.0	58.5	30.4	58.4	30.0
Aerated Soda	2.7	7.4	2.5	7.7	2.6	7.6
Sweetened drinks	3.7	15.9	4.4	15.4	4.2	15.5
Pizza/ burgers/ French fries etc.	0.3	1.5	0.4	1.8	0.3	1.8
Cakes, Pastries or other bakery items	3.6	16.8	5.3	16.4	4.9	16.5
Chips, Namkeen etc.	7.3	25.8	5.5	23.7	6.0	24.2

Table 3.3.4 Percentage of households according to type of oil consumption, Kerala, 2007- 08

Type of oil	Residence		Combined
	Urban	Rural	
Mustard oil	0.5	0.1	0.2
Coconut oil	85.4	87.8	87.2
Groundnut oil	0.1	0.4	0.3
Sunflower oil	3.7	1.7	2.3
Soyabean oil	0.0	0.0	0.0
Palm oil	10.0	9.9	9.9
Vanaspati oil	0.1	0.0	0.0
Others	0.1	0.1	0.1
Total	100.0	100.0	100.0

3.4   PHYSICAL ACTIVITY

It is well known that lack of physical activity leads to obesity, hyperlipidemia, diabetes mellitus, hypertension and coronary heart disease. An account of physical activities of respondents in terms mean time spent (in minutes) in doing physical activity at work, while traveling for work and recreation by sex and the place of residence, is provided in Table 3.4.1. On an average, people in Kerala, do some or the other physical activity for duration of 1033 MET minutes per day, 907 MET minutes per day for urban and 1078 MET minutes per day for rural respondents. Men, on an average, spent

1257 MET minutes a day while women spent 824 MET minutes a day on physical activity. The mean time spent in work related physical activity was 161 minutes per day which was 144 minutes per day for urban and 167 minutes per day for rural. The time spent in work related physical activity was more among women (170 minutes per day) than men (152 minutes per day).

The mean time spent in travel related activity (cycling/walking) was found to be 32 minutes per day, both for urban and rural. It was more among men (45 minutes per day) as compared to women (19 minutes per day). The survey also reported that the mean time spent in recreational activities was 15 minutes per day (4 minute per day for urban and 16 minutes per day for rural). Men spent more time (25 minutes per day) than women (7 minutes per day) in recreational activities.

According to the WHO Global Physical Activity Questionnaire Analysis Guidelines[7], the respondents were classified under three categories low, medium and high on the basis of duration for which they perform physical activities of varying intensity. The percentage of respondents according to three categories of physical activity by sex and place residence is presented in Table 3.4.2.

Majority of the respondents (76% of overall, 79% of urban and 75% of rural) reported low physical activity,

Table 3.4.1 Mean time spent (in minutes) on physical activity per day by sex and residence, Kerala, 2007- 08

Phisical Activity	Residence						Combined		
	Urban			Rural					
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Total Physical Activity(MET)									
Mean	1056.7	765.9	906.5	1329.7	845.1	1078.3	1257.0	824.2	1032.8
95% CI Lower	914.9	660.2	812.9	1159.1	735.7	961.4	1127.9	740.1	943.4
Upper	1198.4	871.6	1000.1	1500.3	954.5	1195.2	1386.2	908.3	1122.1
Work Related Activity									
Mean	128.1	158.2	143.7	160.1	173.9	167.3	151.6	169.8	161.0
95% CI Lower	105.3	133.2	124.6	139.7	149.4	150.1	135.7	150.8	147.4
Upper	150.9	183.2	162.7	180.4	198.4	184.5	167.4	188.8	174.6
Travel Related Activity									
Mean	41.7	20.4	30.7	46.6	18.2	31.9	45.3	18.7	31.5
95% CI Lower	36.3	16.2	26.5	39.9	14.9	27.2	40.2	16.1	28.0
Upper	47.2	24.5	34.9	53.3	21.4	36.5	50.4	21.4	35.1
Recreational Activity									
Mean	21.0	7.1	13.8	26.0	6.6	15.9	24.7	6.7	15.4
95% CI Lower	15.7	-0.5	8.0	18.1	-1.0	8.5	18.8	0.8	9.7
Upper	26.4	14.7	19.6	33.8	14.1	23.3	30.5	12.6	21.0
Number	924	1565	2489	798	1572	2370	1722	3137	4859

Table 3.4.2 Percentage of respondents classified in three categories of total physical activity per day (P & 95% CI) by sex and place of residence, Kerala, 2007-08

Physical Activity		Residence						Combined		
		Urban			Rural			Combined		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
Low		70.5	87.8	79.4	62.6	85.6	74.5	64.7	86.2	75.8
95% CI	Lower	64.6	83.3	75.2	57.4	81.5	70.7	60.6	83.0	72.8
	Upper	75.8	91.2	83.1	67.4	88.9	78.0	68.5	88.8	78.5
Medium		21.1	11.3	16.0	22.5	12.9	17.5	22.1	12.5	17.1
95% CI	Lower	16.8	8.0	12.7	18.6	9.8	14.8	19.1	10.0	14.9
	Upper	26.1	15.8	20.1	27.0	16.7	20.6	25.6	15.0	19.6
High		8.4	0.9	4.5	14.9	1.5	8.0	13.2	1.4	7.1
95% CI	Lower	5.7	0.5	3.1	10.8	0.8	5.7	10.0	0.8	5.4
	Upper	12.2	1.6	6.5	20.3	2.9	11.0	17.2	2.3	9.3

17% of respondents (16% of urban and 18% of rural) recorded medium physical activity and only about 7% of respondents (5% of urban and 8% of rural respondents) reported a high level of physical activity.

Table 3.4.3 presents the percentage of respondents according to their category of time spent in physical activity by age and sex. High physical activity was recorded 11% among age 45-54 years respondents and 10% among age 35-44 years. The total time spent daily in sedentary activities was also recorded and provided in Table 3.4.4. Majority of the respondents (41%) spent more than 4 hours in sedentary activities followed by 23% of the respondents spent 2-3 hours.

Table 3.4.3 Percentage of respondents (with 95% confidence interval) according to three categories of total physical activity by age group and sex, Kerala, 2007-08

Age group	Sex								
	Men			Women			Both Sex		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
15-24	78.4	15.5	6.1	95.9	4.0	0.1	87.3	9.6	3.1
	(72.2,83.6)	(11.0,21.3)	(3.3,11.1)	(93.2,97.6)	(2.3,6.7)	(0.0,0.8)	(83.6,90.3)	(7.2,12.8)	(1.6,5.6)
25-34	60.4	23.7	15.9	85.5	13.4	1.1	73.7	18.2	8.0
	(54.4,66.0)	(18.5,29.8)	(11.3,22.0)	(80.9,89.1)	(9.9,18.0)	(0.4,2.9)	(69.6,77.5)	(14.9,22.1)	(5.6,11.5)
35-44	50.5	31.5	18.0	76.4	21.2	2.4	64.0	26.1	9.9
	(42.6,58.5)	(24.1,40.0)	(12.7,24.8)	(71.0,81.1)	(16.5,26.7)	(1.0,5.7)	(58.3,69.3)	(21.3,31.7)	(7.1,13.5)
45-54	59.3	21.6	19.1	82.5	14.6	2.9	70.9	18.1	11.0
	(51.1,67.0)	(16.0,28.6)	(14.1,25.2)	(76.6,87.1)	(11.1,19.0)	(1.2,6.9)	(65.7,75.7)	(14.4,22.5)	(8.3,14.3)
55-64	73.8	18.9	7.2	87.0	12.0	1.0	80.8	15.3	3.9
	(67.9,79.1)	(14.7,24.0)	(4.5,11.3)	(81.7,90.9)	(8.2,17.2)	(0.4,2.5)	(76.5,84.4)	(11.9,19.4)	(2.5,6.3)

Note: WHO Steps guideline used to calculate the cut off value of low, medium and high for total physical activity.

Table 3.4.4 Sex wise percentage of respondents classified according to total time spent in sedentary activity per day by type of residence, Kerala, 2007-08

Time spent sitting/ reclining	Residence						Combined		
	Urban			Rural			Combined		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Less than 1 hours	7.9	5.2	6.5	3.8	3.1	3.4	4.9	3.7	4.3
1-2 hours	15.5	12.9	14.1	14.5	9.0	11.6	14.7	10.0	12.3
2-3 hours	27.0	22.0	24.4	25.5	20.2	22.8	25.9	20.7	23.2
3-4 hours	18.7	20.8	19.8	19.2	20.1	19.7	19.0	20.3	19.7
More than 4 hours	30.9	39.1	35.2	37.1	47.6	42.5	35.5	45.4	40.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

3.5 SOCIO-DEMOGRAPHIC PATTERN

The socio-demographic patterns of behavioural risk factors of NCD (tobacco, alcohol, fruits and vegetable consumption, and physical activity) by residence are presented in Table 3.5.1, Table 3.5.2, and Table 3.5.3.

Tobacco

Tobacco is mainly used either in the form of smoking or smokeless tobacco use among urban and rural residents of Kerala. The prevalence and pattern of smoking among urban male respondents was increasing with age (7% in 15-24 to 38% in 45-54) . But, it was decreasing with increasing level of education (58% among illiterates to 10% in higher secondary). Prevalence of smoking among female respondents was very low compare with males across all the categories. Occupation is an important socioeconomic indicator and differences in pattern of smoking tobacco were observed form one category of occupation to another. Prevalence of smoking among the occupational categories manual worker (35%) and agriculture (23%) was high compare with other categories of occupation. A similar pattern of increasing in prevalence with age and decreasing with level of education was also observed with smokeless tobacco users. The prevalence of smokeless tobacco users among urban respondents was also increasing with age (2% in 15-24 to 8% in 55-64 aged respondents). Prevalence of smokeless tobacco users among females was recorded low (2%), but the pattern was increasing with age. However, the prevalence with education was showing a declining pattern with increasing level of education (16% among illiterates to 2% in higher Secondary). In the occupational categories, prevalence of smokeless tobacco users among agriculture (5%) and manual worker (9%) was high compare with other categories of occupation. Among urban male respondents, smokers were higher (24%) than smokeless tobacco users (5%), but the pattern was similar in both.

Rural-urban differences in the prevalence of smoking and smokeless tobacco users were observed across all the socio-demographic categories. Prevalence of smoking among rural male respondents was high (29%) compare with urban males (24%). Overall, pattern of smoking and smokeless tobacco use in urban and rural subgroups of population remain similar across age, education and occupation. The prevalence of smoking among rural male respondents shows the increasing pattern with age (6% in 15-24 to 50% in 55-64). Prevalence of smoking among occupational categories of agriculture (35%) and manual worker (41%) of male

rural respondents was high compare with other. Similar pattern of smoking and smokeless tobacco users was observed in the combined population (Table 3.5.3).

Alcohol

The prevalence of current alcohol drinkers among urban male respondents was high among the adults (48% in 25-34, 56% in 35-44, 46% in 45-54 and 42% in 55-64 age groups). It was comparatively low among younger age (18% in 15-24). An increasing pattern of prevalence with age was observed up to age group of 35-44 among urban males, than the pattern declined with increasing age (older age groups). Prevalence of drinking alcohol among male respondents was recorded high in lower level of education such as illiterate (53%), Primary (49%) and Middle (53%), than started declining with higher level (30% among collage). Prevalence of drinking alcohol in occupational categories of male urban respondents was high among service (56%), manual worker (55%) and agriculture (46%). Prevalence of drinking alcohol was very low among the female urban respondents (Table 3.5.1). Among the rural male respondents, current alcohol users were high in the adult age groups (40% in 25-34, 49% in 35-44, 37% in 45-54 and 42% in 55-64). A similar pattern of prevalence of alcohol use was observed in the rural and combined (rural and urban) population across age, education and occupation (Table 3.5.2 & 3.5.3).

Fruits and Vegetables

Though fruits and vegetable consumption reduces the risk of non-communicable diseases, but the survey showed larger proportion of population consumed inadequate amount of fruits and vegetables (i.e. less than five servings of fruits and vegetables per day). Prevalence of low (inadequate) consumption was recorded high (87%) among urban population which varies with age groups (88% in 15-24 to 86% in 55-64). Inadequate consumption of fruits and vegetables by education was high among illiterate (95%) and it was found declining with increasing level of education (78% among College). Differences in occupation categories were also observed. It was varying between 76% among executive class to 98% among domestic worker in urban population (Table 3.5.1). A similar pattern of inadequate consumption of fruits and vegetables was observed among rural population. Prevalence of inadequate consumption was varying with age groups (84% in 15-24 to 89% in 55-64). A declining pattern with increasing level of education was reflected (94% among illiterate

Table 3.5.1 Percentage of respondents in the category of some high risk factors of NCD (current daily smokers, daily smokeless tobacco user, current drinkers, low fruits and vegetables intake and low physical activity) across age, education, occupation and sex, urban, Kerala, 2007- 08

Characteristic	Smoker			Smokeless tobacco user			Current drinkers			Less than five servings of fruits & vegetables consumed per day			Low physical activity		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Age group															
15-24	6.8	0.0	3.3	3.3	0.5	1.9	18.3	0.5	9.2	83.6	92.1	87.9	79.0	96.7	88.0
25-34	21.1	0.0	10.0	5.0	0.3	2.5	48.0	0.0	22.6	80.1	92.7	86.8	61.5	84.5	73.7
35-44	33.2	0.0	16.0	5.4	1.2	3.2	55.5	0.0	26.7	87.3	90.2	88.8	65.9	82.1	74.3
45-54	37.5	0.0	18.8	4.6	5.6	5.1	45.6	0.3	23.0	78.8	94.9	86.8	68.7	84.8	76.8
55-64	33.3	0.5	16.0	11.3	5.8	8.4	41.7	0.0	19.8	77.6	93.6	86.0	82.0	89.0	85.7
Total	23.8	0.1	11.5	5.2	2.0	3.5	40.4	0.2	19.6	82.1	92.5	87.4	70.5	87.8	79.4
Education															
Illiterate	57.5	0.7	16.8	10.0	18.6	16.2	52.8	0.0	15.0	87.8	97.1	94.5	51.3	78.6	70.9
Primary	55.1	0.0	26.7	12.5	5.5	8.9	48.7	0.0	23.6	95.5	98.2	96.9	47.4	83.5	66.0
Middle	34.4	0.0	18.6	5.9	1.3	3.8	52.5	0.0	28.5	91.5	96.4	93.8	49.6	88.9	67.6
Secondary	24.1	0.0	12.1	5.7	0.5	3.1	44.6	0.0	22.4	84.9	92.3	88.6	66.4	85.0	75.7
Higher Secondary	10.2	0.0	4.7	4.7	0.0	2.2	29.9	0.8	14.3	80.6	92.9	87.2	79.0	92.3	86.2
College & above	13.1	0.0	6.3	1.6	0.0	0.8	29.9	0.2	14.5	68.1	87.3	78.0	93.1	91.7	92.4
Total	23.8	0.1	11.5	5.2	2.0	3.5	40.4	0.2	19.6	82.1	92.5	87.4	70.5	87.8	79.4
Occupation															
Executive/Business	21.2	0.0	17.5	5.7	0.0	4.7	39.6	0.0	32.7	74.4	82.3	75.8	84.3	93.8	85.9
Agriculture	23.4	0.0	17.9	6.2	1.5	5.1	45.5	0.0	34.8	90.0	96.4	91.5	66.0	79.7	69.2
Domestic Work	**	0.1	0.2	**	1.6	1.7	**	0.0	0.0	**	97.9	98.0	**	87.6	87.6
Services/Sales	23.8	0.0	15.1	0.0	1.7	0.6	55.7	0.0	35.3	87.7	89.0	88.2	92.6	77.5	87.1
Manual Worker	35.3	0.0	32.1	7.8	19.5	8.9	54.5	0.0	49.6	86.4	91.2	86.8	40.5	48.2	41.2
Other	10.2	0.0	3.6	2.0	1.3	1.6	18.2	0.4	6.6	79.7	89.3	86.0	93.6	91.0	91.9
Total	23.5	0.1	11.4	5.2	2.0	3.5	40.3	0.2	19.6	82.0	92.4	87.4	70.5	87.8	79.4
Number (n)	921	1563	2484	920	1563	2483	921	1563	2484	921	1563	2484	921	1563	2484

** Figure not shown; based on fewer than 15 unweighted cases

and 78% among higher education). In the occupational categories, inadequate consumption of fruits and vegetables was high among domestic (97%) and agriculture (92%). It was comparatively low (80%) among executive category (Table 3.5.2). Overall, prevalence and pattern of consumption of fruits and vegetables by age, education and occupation was similar as recoded in rural and urban population of Kerala (Table 3.5.3).

Physical Activity

The differences in the prevalence of low physical activity were recorded across age, sex, education and occupation in urban population (Table3.5.1). Large proportion of urban respondents were recorded in the category of low physical activity (79%) and it was varying with age groups (88% in 15-24, 74% in 25-34, 74% in 35-44, 77% in 45-54 and 86% in 55-64). Prevalence of low physical activity was high among old and young age people. Low physical activity by sex was recorded high (88%) among female respondents compare with males (71%), and such differences remain across all the age groups (Table 3.5.1). The pattern of low physical activity was increasing with level of education (71% of illiterates to 92% of higher level). Accordingly, low physical activity

was recorded high among the domestic (88%), executive and business (86%) categories of occupation. Those working in agriculture and manual worker were doing more physical activity (Table 3.5.1).

Urban-rural comparison of low physical activity demonstrated that rural population(75%) was doing more physical work than urban (79%) and such differences observed across all age groups and sex (Table 3.5.2). Low physical activity by education was observed more among higher level of education (88%) compare with lower level (62% among illiterates) in rural population. Similarly, occupational differences in low physical activity were also observed across all the categories. The occupation of people working as agriculture and manual worker were doing more physical work compare with others. Overall, low physical activity was high among the domestic worker (86%) in the rural and urban population (Table 3.5.3).

Physical inactivity is one of the important risk factors of NCD. Most important point to be noted that seven out of ten individual adult population was categorized into low level of physical activity. This invites special attention to health planner.

Table 3.5.2 Percentage of respondents in the category of some high risk factors of NCD (current daily smokers, daily smokeless tobacco user, current drinkers, low fruits and vegetables intake and low physical activity) across age, education, occupation and sex, rural, Kerala, 2007- 08

Characteristic	Smoker			Smokeless tobacco user			Current drinkers			Less than five servings of fruits & vegetables consumed per day			Low physical activity		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Age group															
15-24	6.4	0.6	3.4	6.3	0.6	3.4	15.2	0.0	7.5	76.9	91.6	84.3	78.2	95.6	87.1
25-34	30.3	0.0	14.2	10.8	1.2	5.7	39.9	0.0	18.6	83.3	91.9	87.9	59.9	85.8	73.7
35-44	40.6	0.2	19.5	6.0	3.0	4.4	48.7	0.3	23.4	88.5	91.7	90.2	44.8	74.3	60.2
45-54	36.7	0.0	18.2	7.5	7.8	7.6	37.0	0.3	18.6	83.6	91.3	87.5	55.7	81.6	68.7
55-64	49.5	0.3	23.5	12.9	15.7	14.4	42.2	0.0	19.9	84.6	92.4	88.7	70.9	86.2	79.0
Total	28.4	0.2	13.8	8.2	3.9	6.0	34.3	0.1	16.6	82.7	91.7	87.4	62.6	85.6	74.5
Education															
Illiterate	67.0	0.3	18.0	10.0	18.6	16.2	54.2	0.0	14.4	81.2	98.7	94.0	31.1	73.3	62.1
Primary	57.4	0.7	31.2	12.5	5.5	8.9	38.4	0.7	21.0	94.2	94.1	94.2	32.3	86.7	57.5
Middle	47.2	0.0	23.4	5.9	1.3	3.8	43.7	0.0	21.7	90.9	92.5	91.7	44.8	79.7	62.4
Secondary	27.2	0.0	13.4	5.7	0.5	3.1	38.0	0.0	18.8	85.4	92.2	88.8	61.5	86.3	74.1
Higher Secondary	10.0	0.0	4.9	4.7	0.0	2.2	20.6	0.0	10.1	77.4	89.5	83.6	76.0	92.5	84.4
College & above	12.0	1.0	6.6	1.6	0.0	0.8	26.3	0.4	13.5	70.1	86.5	78.2	87.8	89.1	88.4
Total	28.4	0.2	13.8	8.2	3.9	6.0	34.3	0.1	16.6	82.7	91.7	87.4	62.6	85.6	74.5
Occupation															
Executive/Business	24.0	0.0	21.1	6.6	2.1	6.0	33.7	0.0	29.6	79.0	91.4	80.5	84.4	96.3	85.8
Agriculture	34.8	0.0	26.5	3.1	12.9	5.5	22.9	0.0	17.4	89.8	97.4	91.6	42.3	60.9	46.8
Domestic Work	**	0.6	0.6	**	3.8	3.8	**	0.0	0.0	**	97.3	97.2	**	84.9	84.9
Services/Sales	16.4	0.0	11.0	7.4	3.0	6.0	41.5	0.0	27.8	72.2	84.7	76.3	75.1	78.0	76.1
Manual Worker	40.9	0.0	36.0	13.1	16.1	13.5	48.3	0.0	42.5	85.7	92.2	86.5	36.8	50.6	38.4
Other	13.6	0.0	4.8	4.0	2.4	3.0	18.2	0.2	6.6	80.0	87.2	84.7	89.5	90.8	90.4
Total	28.4	0.2	13.8	8.2	3.9	6.0	34.3	0.1	16.6	82.7	91.7	87.4	62.6	85.6	74.5
Number (n)	798	1572	2370	798	1572	2370	798	1572	2370	798	1572	2370	798	1572	2370

** Figure not shown; based on fewer than 15 unweighted cases

Table 3.5.3 Percentage of respondents in the category of some high risk factors of NCD (current daily smokers, daily smokeless tobacco user, current drinkers, low fruits and vegetables intake and low physical activity) across age, education, occupation and sex, combined, Kerala, 2007- 08

Characteristic	Smoker			Smokeless tobacco user			Current drinkers			Less than five servings of fruits & vegetables consumed per day			Low physical activity		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Age group															
15-24	6.5	0.4	3.4	5.5	0.6	3.0	16.0	0.1	7.9	78.6	91.7	85.3	78.4	95.9	87.3
25-34	27.8	0.0	13.0	9.2	1.0	4.8	42.1	0.0	19.7	82.5	92.1	87.6	60.4	85.5	73.7
35-44	38.6	0.2	18.6	5.9	2.5	4.1	50.6	0.2	24.3	88.2	91.3	89.8	50.5	76.4	64.0
45-54	36.9	0.0	18.4	6.7	7.2	6.9	39.4	0.3	19.8	82.3	92.3	87.3	59.3	82.5	70.9
55-64	45.1	0.3	21.5	12.5	13.1	12.8	42.1	0.0	19.9	82.7	92.7	88.0	73.8	87.0	80.8
Total	27.2	0.2	13.2	7.4	3.4	5.3	35.9	0.1	17.4	82.5	91.9	87.4	64.7	86.2	75.8
Education															
Illiterate	65.1	0.3	17.7	12.7	23.5	20.6	53.9	0.0	14.5	82.5	98.4	94.1	35.1	74.3	63.8
Primary	56.9	0.5	30.1	12.0	8.2	10.2	40.8	0.5	21.6	94.5	95.2	94.9	35.8	85.8	59.6
Middle	43.7	0.0	22.2	12.8	1.4	7.2	46.1	0.0	23.4	91.1	93.4	92.2	46.1	81.8	63.7
Secondary	26.4	0.0	13.1	7.7	0.9	4.3	39.5	0.0	19.7	85.3	92.2	88.8	62.8	86.0	74.5
Higher Secondary	10.0	0.0	4.8	3.2	0.3	1.7	22.9	0.2	11.2	78.2	90.4	84.5	76.7	92.5	84.9
College & above	12.4	0.7	6.5	3.5	0.0	1.7	27.5	0.4	13.8	69.4	86.8	78.2	89.5	90.0	89.8
Total	27.2	0.2	13.2	7.4	3.4	5.3	35.9	0.1	17.4	82.5	91.9	87.4	64.7	86.2	75.8
Occupation															
Executive/Business	23.1	0.0	19.9	6.3	1.2	5.6	35.6	0.0	30.7	77.5	87.6	78.9	84.4	95.2	85.9
Agriculture	32.3	0.0	24.6	3.8	10.5	5.4	27.8	0.0	21.2	89.8	97.1	91.6	47.5	64.8	51.6
Domestic Work	**	0.5	0.5	**	3.2	3.2	**	0.0	0.0	**	97.5	97.4	**	85.6	85.6
Services/Sales	19.0	0.0	12.5	4.8	2.5	4.0	46.5	0.0	30.5	77.7	86.4	80.7	81.3	77.8	80.1
Manual Worker	39.5	0.0	35.0	11.8	16.8	12.4	49.8	0.0	44.2	85.9	92.0	86.6	37.7	50.1	39.1
Other	12.8	0.0	4.5	3.5	2.1	2.6	18.2	0.3	6.6	79.9	87.8	85.0	90.6	90.9	90.8
Total	27.2	0.2	13.2	7.4	3.4	5.3	35.9	0.1	17.4	82.5	91.9	87.4	64.7	86.2	75.8
Number (n)	1719	3135	4854	1718	3135	4853	1719	3135	4854	1719	3135	4854	1719	3135	4854

** Figure not shown; based on fewer than 15 unweighted cases

Hypertension and Diabetes

This chapter focuses on the prevalence of hypertension and diabetes in the study population along with the information regarding history of hypertension and diabetes and the nature of treatment advised by the treating physician.

4.1 HYPERTENSION

The blood pressure is an important determinant of the risk of cardiovascular diseases, ischemic heart disease, congestive cardiac failure and renal failure. In the survey the blood pressure of the respondents was measured using automated blood pressure measuring instrument (OMRON®). Table 4.1.1 provides percentage of respondents with history of raised blood pressure, treatment and life style modification advised, seeking consultation and treatment from AYUSH by sex and place of residence. Over all 9% respondents (8% men and 10% women) were found to have been diagnosed hypertension by the health professional. In the urban area, the prevalence of hypertension was 10% with 9% among men and 11% among women. In rural area, **8**% of males and 10% of females were hypertensive.

Of those who were diagnosed hypertension, majority of them (62%) were taking the prescribed medicine. A higher percentage of women (64%) than men (59%) were taking medicines. It appears to be more common in rural area where 59% men against 65% women took medicines after they were diagnosed with hypertension. Over half (61%) of those who were diagnosed hypertension, were advised dietary modification including low salt intake; 30% were advised to lose weight and 32% were advised to increase physical activity. If the respondent was a smoker, 13% were advised to quit smoking. The percentage of those who received dietary advice including low salt intake was higher for women (62%) than for men (59%), more for urban (62%) than rural (61%) respondents.

Over one-tenth (13%) of those who were diagnosed hypertensive, had consulted AYUSH (12% of urban and 13% of rural). Among those respondents who had consulted AYUSH, 42% of respondent were taking treatment from the AYUSH practitioner which was 41% for rural and 43% for urban.

Table 4.1.1 Percentage of respondents with history of raised blood pressure, treatment and lifestyle modification advised, seeking consultation and treatment from an AYUSH practitioner by sex and place of residence, Kerala, 2007- 08.

| | Residence | | | | | | Combined | | |
| | Urban | | | Rural | | | | | |
Hypertension	Male	Female	Total	Male	Female	Total	Male	Female	Total
Hypertension diagnosed by health professional (all respondents)	8.8	11.4	10.1	7.6	10.0	8.9	7.9	10.4	9.2
Diagnosed Hypertensives									
Currently taking drugs	56.9	60.7	59.1	59.2	65.0	62.6	58.5	63.8	61.6
Advised dietary modifications	61.5	61.2	61.4	57.6	62.5	60.5	58.8	62.1	60.7
Advised to lose weight	22.7	32.1	28.2	26.1	32.8	30.0	25.1	32.6	29.5
Advised to quit smoking	28.0	0.0	11.9	28.9	1.6	13.0	28.6	1.2	12.7
Advised to increase physical activity	33.7	29.9	31.5	35.0	30.9	32.6	34.6	30.6	32.3
Consulted AYUSH practitioner	11.4	12.5	12.0	14.1	12.3	13.0	13.3	12.3	12.7
Taking treatment from AYUSH practitioner	25.0	55.0	43.1	37.7	44.0	41.2	34.5	47.3	41.7

Table 4.1.2 presents the mean systolic and diastolic blood pressure by sex and place of residence. The survey finds that the mean systolic blood pressure was 125 mm Hg whereas mean diastolic blood pressure was 77 mm Hg in the survey population. These averages were almost same for rural and urban, but little higher for males than females.

According to WHO STEPS guideline, the population is categorized into four categories namely, normal, pre-hypertensive, Stage-I hypertensive and Stage-II hypertensive on the basis of their blood pressure level[8]. In the present survey, this categorization was done after recording the resting blood pressure for each study subject. The upper and the lower limit of the systolic and diastolic blood pressure for each category have been given in Table 4.1.3.

Table 4.1.4 presents the percentage of respondents according to categories of hypertension by sex and place

Table 4.1.2 Mean Systolic and Diastolic blood pressure by sex and place of residence, Kerala, 2007- 08

| Blood Pressure | Residence | | | | | | Combined | | |
| | Urban | | | Rural | | | | | |
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Systolic blood pressure	128.1	122.9	125.4	127.1	122.6	124.8	127.4	122.7	125.0
95% CI Lower	126.7	121.7	124.5	126.0	121.3	123.8	126.5	121.7	124.2
Upper	129.6	124.0	126.4	128.3	123.9	125.9	128.3	123.7	125.8
Diastolic blood pressure	79.4	76.9	78.1	77.9	76.3	77.0	78.3	76.4	77.3
95% CI Lower	78.2	76.1	77.3	76.8	75.4	76.2	77.5	75.7	76.7
Upper	80.5	77.6	78.9	78.9	77.2	77.9	79.1	77.1	78.0

Table 4.1.3 Categories of Hypertension

Category	Systolic Blood Pressure (mm Hg)		Diastolic Blood Pressure (mm Hg)
Normal	<120	and	<80
Pre-hypertension	120-139	or	80-89
Stage-I hypertension	140-159	or	90-99
Stage-II hypertension	≥ 160	or	≥ 100

Table 4.1.4 Percentage of respondents according to category of hypertension by sex and place of residence (P & 95% CI), Kerala, 2007- 08

| Category of hypertension | Residence | | | | | | Combined | | |
| | Urban | | | Rural | | | | | |
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Normal	24.2	40.5	32.5	24.2	44.0	34.3	24.2	43.1	33.8
95% CI									
Lower	19.8	36.8	29.1	20.4	39.6	30.9	21.2	39.7	31.2
Upper	29.2	44.4	36.2	28.4	48.5	37.9	27.4	46.5	36.6
Pre – hypertension	52.9	43.8	48.3	56.1	40.5	48.1	55.3	41.3	48.1
95% CI									
Lower	47.4	40.2	44.2	51.1	36.7	44.7	51.4	38.5	45.4
Upper	58.4	47.6	52.4	61.0	44.3	51.5	59.1	44.3	50.9
Stage-1 hypertension	16.7	11.6	14.1	16.4	11.7	14.0	16.5	11.7	14.0
95% CI									
Lower	13.8	9.5	12.3	13.6	10.0	12.3	14.3	10.3	12.7
Upper	20.1	14.1	16.2	19.8	13.6	15.9	19.0	13.1	15.5
Stage-2 hypertension	6.2	4.0	5.1	3.3	3.9	3.6	4.1	3.9	4.0
95% CI									
Lower	4.5	3.2	4.1	2.2	3.0	2.8	3.1	3.2	3.3
Upper	8.5	5.1	6.4	4.8	5.0	4.6	5.2	4.8	4.8

of residence. Over all, 34% respondents were normal, 48% were in the category of pre-hypertension, 14% in stage I hypertension and only 4% were in stage-II hypertension. Among males, 24% were normal, 55% were in the category of pre-hypertension, 17% were in stage I hypertension and only 4% were in stage-II hypertension against females having 43% normal, 41% pre-hypertension, 12% stage I hypertension and 4% stage-II hypertension. The composition appears to be same in urban and rural areas.

4.2 SOCIO-DEMOGRAPHIC PATTERN OF HYPERTENSION

Hypertension is a major NCD risk factors especially related to cardiovascular disease. The socio-demographic patterns of respondents in the category of hypertension (stage I & II) are presented in

Table 4.2. Among the urban population, the prevalence of hypertension was 19% and it was recorded as increasing with age (6% in 15-24, 14% in 25-34, 24% in 35-44, 33% in 45-54 and 46% in 55-64). The prevalence among male respondents was high (23%) compare with females (16%), but the increasing pattern with age was observed in both sexes (Table 4.2). Prevalence of hypertension by education was 36% among illiterate and 15% among higher level. However, the prevalence was high among occupational categories manual worker (26%), service (23%) and agriculture (23%). Low prevalence of hypertension was recorded among the domestic workers (19%). Overall, prevalence among rural population was 18% and the pattern was increasing with age (6% in 15-24 to 47% in 55-64). Similarly, high prevalence was observed among illiterate (26%) and primary (34%), which was showing a declining pattern with increasing level of education (13% in higher level).

Table 4.2 Percentage of respondents in the category of stage I & stage II hypertension across age, education, occupation and by sex and residence, Kerala, 2007- 08

Characteristic	Stage I & II hypertensive								
	Urban			Rural			Combined		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Age group									
15-24	8.9	4.0	6.4	7.0	4.1	5.5	7.5	4.0	5.7
25-34	22.5	5.6	13.6	20.5	5.4	12.4	21.1	5.5	12.7
35-44	28.6	19.4	23.9	19.7	20.2	19.9	22.1	19.9	21.0
45-54	30.6	35.7	33.1	27.0	37.2	32.0	28.0	36.8	32.3
55-64	43.5	45.5	44.5	49.3	44.9	47.2	47.8	45.1	46.5
Total	22.9	15.6	19.2	19.7	15.6	17.6	20.6	15.6	18.0
Education									
Illiterate	42.1	33.1	35.9	19.5	28.9	26.1	23.9	29.7	28.0
Primary	22.2	30.5	26.4	29.7	40.4	34.3	28.0	37.7	32.4
Middle	30.2	24.0	27.4	20.8	21.0	20.9	23.3	21.8	22.6
Secondary	23.4	16.0	19.8	19.0	13.1	16.0	20.1	13.8	17.0
Higher Secondary	16.9	5.6	10.8	14.5	11.2	12.8	15.1	9.7	12.3
College & above	19.9	11.0	15.2	21.7	5.0	13.4	21.1	7.1	14.0
Total	22.9	15.6	19.2	19.7	15.6	17.6	20.6	15.6	18.0
Occupation									
Executive/Business	23.1	11.6	21.1	30.9	8.1	28.0	28.4	9.5	25.7
Agriculture	22.3	23.1	22.5	18.6	15.7	17.9	19.4	17.3	18.9
Domestic Work	48.7	18.8	18.8	100	16.0	16.1	83.5	16.7	16.8
Services/Sales	29.7	12.7	23.4	22.5	14.2	19.6	25.1	13.6	21.0
Manual Worker	27.6	13.7	26.3	19.7	21.2	19.9	21.6	19.7	21.4
Other	15.5	13.7	14.3	12.9	15.1	14.3	13.6	14.7	14.3
Total	23.0	15.6	19.2	19.7	15.6	17.6	20.6	15.6	18.0
Number (n)	835	1390	2225	740	1404	2144	1575	2794	4369

** Figure not shown; based on fewer than 15 unweighted cases

In the occupational category, the prevalence was high among executive and business class (28%), manual worker (20%) and it was low among domestic worker (16%). Overall, prevalence of hypertension was 18% in Kerala and pattern of prevalence was increasing with age (Table 4.2).

Most striking observations of blood pressure measurements was that only around a third of the adult population surveyed had normal blood pressure. While half of the adult population was categorized into pre-hypertension group, another 14% were found in stage-I hypertension with the remaining 4% in stage-II. On the contrary, only 9% of population reported history of hypertension, which requires urgent attention for intervention.

4.3 DIABETES

Diabetes mellitus is an important marker of risk for the arterial disease of the coronary, cerebral and peripheral arterial trees, and for micro vascular disease leading to blindness and renal failure. In the survey, the history pertaining to diabetes was elicited from the respondents. Table 4.3 deals with the percentage of respondents with history of raised blood sugar, a treatment and life style modification advises by sex and place of residence. Over all, 6% of respondents both of urban and rural had reported having raised blood sugar level in past 12 months. This percentage was 7% for males and 5% for females. Amongst those who were diagnosed diabetes, 14% (12% of urban and 14% of rural) were currently taking insulin; 69% of the respondents (70% of urban and 69% of rural) were taking oral hypoglycemic drugs. A good proportion of respondents reported to have received advice from the treating physicians on their life style modification — 83% for dietary advice, 34% to reduce weight and 49% to increase physical activity. Out of the total diagnosed diabetics, 14% respondents (13% of urban and 14% of rural respondents) consulted AYUSH practitioners in last 12 months. Among those respondents who had consulted AYUSH, 67% of them (59% in urban and 70% in rural) were seeking treatment for diabetes from the system.

Table 4.3. Percentage of respondents with history of raised blood sugar, treatment and lifestyle modification advised, seeking consultation and treatment from an AYUSH practitioner by sex and place of residence, Kerala, 2007- 08

| | Residence | | | | | | Combined | | |
| | Urban | | | Rural | | | | | |
Blood sugar	Male	Female	Total	Male	Female	Total	Male	Female	Total
Raised blood sugar diagnosed (All respondents)	7.1	5.8	6.4	6.4	5.7	5.9	6.5	5.3	5.9
Diagnosed diabetics									
Currently taking insulin	10.6	14.4	12.3	14.2	14.3	14.2	13.1	14.3	13.7
Currently taking oral drugs	61.4	79.4	69.8	58.2	80.9	68.7	59.1	80.1	69.0
Advised dietary modifications	71.0	82.7	76.5	87.6	84.0	85.9	82.8	83.6	83.2
Advised to lose weight	21.2	34.2	27.2	37.5	34.3	36.1	32.8	34.2	33.5
Advised to increase physical activity	46.6	45.6	46.1	56.9	41.0	49.5	54.0	42.3	48.6
Consulted AYUSH practitioner	17.7	7.9	13.1	13.3	15.8	14.4	14.6	13.5	14.1
Taking treatment from AYUSH practitioner	50.8	79.1	58.7	82.0	57.3	69.5	71.0	61.0	66.6

CHAPTER 5

Physical Measurements

This chapter describes various physical measurements such as height, weight, waist circumference and body mass index (BMI), which are key indicators for surveillance of non-communicable diseases. Weight of an individual is directly related to the Body Mass Index (BMI), waist circumference, blood pressure and probability of developing diabetes mellitus-2.

5.1 WEIGHT

Having weight more than the ideal weight for age and height is a risk factor for development of colorectal cancer, uterine cancer, coronary artery disease and it would also exacerbate the symptoms of osteoarthritis. The weight is a continuous variable, reflecting the body mass of an individual in light clothing; it is used for calculating BMI.

5.2 HEIGHT

Height is another key variable required for calculation of body mass index (BMI). Height is a continuous variable measured with the individual standing on a firm leveled surface, without wearing any foot wear, and stand with feet together, with heels, calves, buttocks, dorsal spine and head in same plane.

5.3 BODY MASS INDEX (BMI)

BMI (Body mass index) is a valid indicator for finding out whether the body weight of an individual is appropriate for the height of the individual. It is calculated from height and weight measurements as body weight per meter[2]. Worldwide researches have shown that there is a strong association between BMI and health risk. The excess of adipose tissue in the adults is associated with excess morbidity and mortality from a large number of health conditions like diabetes, hypertension, hypercholesterolemia, carcinomas of colon and breast, gall bladder stones and osteoarthritis. On the other hand low BMI is an indicator of risk to health, often being associated with tobacco, alcohol use and drug addiction (Table 5.1).

5.4 WAIST CIRCUMFERENCE (WC)

The waist circumference is one of the sensitive indicators for abdominal obesity. Abdominal obesity has got a stronger association with coronary heart diseases as compared to BMI. The waist measurement is taken at the level of mid point between the inferior margin of the rib and crest of ileum in the mid auxiliary plane, using a non-stretchable measuring tape, without clothing. A cut-off level of 102 cm in males and 88 cm in females have been recommended for developed countries (ATP3 Guidelines), however lower cut-off levels are appropriate for Indians- 90 cm in males and 80 cm in females (The Asia Pacific Guidelines)[9].

Table 5.2 presents the mean value of BMI, height, weight and waist circumference by sex and the place of residence. The mean BMI in Kerala was 22.7 kg/m^2 (23.1 for urban, 22.7 for rural respondents, 22.2 for males and 23.3 for females). The mean height in the survey population was 159 centimeter (160 centimeter for urban, 159 centimeter for rural respondents, 166 centimeter for males and 153 centimeter for females). The mean weight was 57.8 kg. with 59.1 kg for urban, 57.3 kg for rural respondents. By sex, the mean weight

Table: 5.1 Categories of BMI

Body Mass Index (BMI)	Category of Relative Weight
<18.5	Under Weight
18.5- 24.9	Normal Weight
25.0- 29.9	Grade-1 Over Weight
30-39.9	Grade-2 Over Weight
$\geq$ 40	Grade-3 Over Weight

Source: WHO Step-wise approach to NCD surveillance

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Table 5.2   Mean value for body mass index (BMI), height, weight and waist circumference by sex and place of residence, Kerala, 2007- 08

Physical measurment	Residence						Combined		
	Urban			Rural					
	Male	Female	Total	Male	Female	Total	Male	Female	Total
BMI (kg/m²)	22.6	23.6	23.1	22.1	23.2	22.7	22.2	23.3	22.7
95% CI									
Lower	22.2	23.3	22.8	21.5	22.9	22.3	21.8	23.1	22.5
Upper	23.1	24.0	23.5	22.7	23.5	23.0	22.7	23.6	23.1
Height	166.7	153.2	159.7	166.3	152.7	159.3	166.4	152.8	159.4
95% CI									
Lower	166.0	152.7	159.1	165.5	152.1	158.7	165.8	152.4	158.9
Upper	167.4	153.7	160.4	167.1	153.2	159.9	167.0	153.2	159.9
Weight	62.9	55.5	59.1	60.8	54.1	57.3	61.4	54.5	57.8
95% CI									
Lower	61.4	54.5	58.0	59.7	53.3	56.5	60.5	53.8	57.1
Upper	64.5	56.5	60.2	61.9	55.0	58.2	62.2	55.2	58.5
Waist circum.	82.5	81.3	81.9	81.6	81.0	81.3	81.9	81.1	81.5
95% CI									
Lower	81.2	79.7	80.6	80.5	79.5	80.2	81.0	79.9	80.6
Upper	83.9	83.0	83.2	82.8	82.5	82.4	82.8	82.3	82.3

was 61.4 kg. forg males and 54.5 kg. for females. The average waist circumference was 81.5 centimeters with 81.9 centimeter for urban and 81.3 centimeters for rural respondents. The waist circumference for male and female was 82 centimeters and 81 centimeters respectively.

Table 5.3 presents the percentage of respondents according to their BMI category and central obesity by sex and the place of residence. In the survey, we found that 15% respondents were under-weight, which was 14% for urban and 16% for rural respondents. Eighteen percent of males and 13% of females were underweight.

Table 5.3   Percentage of respondents according to BMI categories by sex and place of residence, Kerala, 2007- 08

Category of BMI	Residence						Combined		
	Urban			Rural					
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Under weight(<18.5)	15.3	13.5	14.4	18.3	13.4	15.8	17.5	13.4	15.4
95% CI									
Lower	12.4	11.2	12.3	15.6	11.3	14.0	15.4	11.8	14.0
Upper	18.9	16.1	16.7	21.3	15.9	17.8	19.8	15.3	17.0
Normal weight (18.5-24.9)	58.5	50.6	54.5	61.8	55.5	58.5	60.9	54.2	57.5
95% CI									
Lower	53.6	47.1	51.4	57.3	52.3	55.8	57.5	51.7	55.3
Upper	63.3	54.1	57.5	66.0	58.6	61.2	64.2	56.7	59.5
Grade-1 over weight (25.0-29.9)	23.6	27.8	25.8	17.8	24.3	21.2	19.4	25.2	22.4
95% CI									
Lower	19.4	25.2	23.0	14.9	22.0	19.2	17.0	23.4	20.8
Upper	28.3	30.6	28.7	21.2	26.8	23.2	22.0	27.2	24.0
Grade-2 over weight	2.5	7.9	5.3	1.9	6.6	4.3	2.1	7.0	4.6
95% CI									
Lower	1.5	6.6	4.3	1.0	5.2	3.4	1.3	5.8	3.8
Upper	4.0	9.6	6.5	3.5	8.4	5.5	3.2	8.3	5.4

Grade-3 over weight (≥ 40.0)	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2
95% CI									
Lower	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1
Upper	0.3	0.4	0.2	1.1	0.5	0.5	0.7	0.4	0.4
Central Obesity WC ≥ K*	27.7	60.2	44.5	22.9	59.7	42.0	24.2	59.9	42.7
95% CI									
Lower	23.0	55.0	40.1	19.4	55.0	38.7	21.3	56.1	39.9
Upper	33.0	65.2	49.0	26.8	64.3	45.4	27.3	63.5	45.5

*K=90 cm for male and K=80 cm for female

5.5 SOCIO-DEMOGRAPHIC PATTERN OF OVERWIGHT

Overweight (obesity) is a major risk factor of NCD. The socio-demographic pattern of respondents in the category of overweight (grade I, II & III) across age, education, occupation and sex are presented in Table 5.4. The prevalence of overweight among the urban population was 31% and its pattern was found increasing with age (11 in 15-24, 35% in 25-34, 40% in 35-44, 42% in 45-54 and 39% in 55-64). The prevalence among female respondents was high (36%) compare with males (26%), but the increasing pattern with age was observed in both sexes (Table 5.4). In educational categories, the prevalence was varying with 29% among illiterate to

Table 5.4 Percentage of respondents in the category of overweight (Grade I, II & III) across age, education, occupation and by sex and residence, Kerala, 2007- 08

Characteristic	Overweight (Grade I, II & III)								
	Urban			Rural			Combined		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Age group									
15-24	11.5	9.5	10.5	10.1	14.7	12.4	10.5	13.3	11.9
25-34	31.7	38.0	35.0	26.1	31.3	28.9	27.6	33.1	30.5
35-44	32.1	47.1	39.9	23.6	39.0	31.7	25.9	41.2	33.9
45-54	31.0	53.8	42.4	22.7	44.0	33.4	25.0	46.6	35.8
55-64	31.2	45.0	38.5	22.7	37.9	30.5	24.6	39.8	32.6
Total	26.1	35.9	31.1	20.0	31.1	25.7	21.6	32.4	27.1
Education									
Illiterate	21.9	32.5	29.4	8.9	29.4	24.2	11.6	30.0	25.2
Primary	21.6	34.1	28.1	15.2	40.8	27.0	16.7	39.0	27.3
Middle	15.5	41.9	27.5	17.3	31.1	24.3	16.8	33.6	25.1
Secondary	22.2	35.1	28.5	21.6	34.3	27.9	21.7	34.5	28.1
Higher Secondary	29.3	32.5	31.0	18.8	25.1	21.9	21.4	27.1	24.3
College & above	38.5	38.4	38.4	24.9	27.7	26.3	29.4	31.5	30.4
Total	26.1	35.9	31.1	20.0	31.1	25.7	21.6	32.4	27.1
Occupation									
Executive/Business	42.6	45.1	43.1	42.6	45.1	43.1	39.9	36.6	39.4
Agriculture	31.7	19.2	28.8	31.7	19.2	28.8	13.0	29.5	16.9
Domestic Work	38.1	38.7	38.7	38.1	38.7	38.8	73.1	35.5	35.5
Services/Sales	22.3	43.7	30.0	22.3	43.7	30.0	20.6	39.3	27.0
Manual Worker	19.8	27.3	20.5	19.8	27.3	20.5	18.8	23.6	19.3
Other	19.8	33.5	28.7	19.8	33.5	28.7	16.0	30.4	25.3
Total	26.2	35.8	31.1	26.2	35.8	31.1	21.6	32.3	27.1
Number (n)	921	1539	2460	921	1539	2460	1718	3088	4806

** Figure not shown; based on fewer than 15 unweighted cases

38% among higher level. Occupational categories, the prevalence was high among executive and business class (43%) followed by domestic (39%) and service class (30%). Low prevalence of overweight was recorded among manual worker (21%). Overall, prevalence among rural population was 26% and it was varying with age (12% in 15-24 to 33% in 45-54). Similarly, prevalence in the educational categories was varying from 24% among illiterate to 26% among higher level of education. In the occupational category, the prevalence was high among executive and business class (43%), and domestic

workers (39%) and it was low among the people working as manual worker (21%). Overall, prevalence of overweight was 27% and pattern of prevalence was increasing with age. Except the younger age group, the overweight peoples are prevalent in all age groups across educational levels and occupation.

In the category of BMI and central obesity, one-fourth of adult population surveyed was overweight and 43% was categorized into central obesity, constituting a large high-risk group for NCD.

Chapter 6

Summary and Conclusions

The NCD risk factors survey in Kerala collected information from a random sample of 4430 households covering 2235 households from rural and 2195 from urban areas. From these households, 4859 individuals selected randomly were interviewed to collect behavioural information and also to carry out physical measurements. The analysis of the survey data have been presented and discussed in the present report providing information about the proportion of population or subgroup of population under the risk of non-communicable diseases.

In Kerala, over half of households (56%) are Hindu followed by about one-quarter households (24%) belong to Muslim and rest one-fifth households belong to Christian. One-quarter households had access to piped drinking water with 42% households in urban area and 18% households in rural area. In fact, well water was the major source of drinking water (71%) in Kerala. Majority households in Kerala (90% in rural area and 97% in urban area) had flush toilet facility. About 95% of households in Kerala (94% in rural area and 97% in urban area) used electricity as main source of lighting. Two-third rural households were still using wood as a main source of cooking fuel against 46% of urban households. Only 7% of households resided in *kachha* houses. About 90% population of Kerala was literate.

Tobacco is one of the major risk factors of non-communicable diseases. One-quarter of male population smoked tobacco daily while smoking among females was low. Overall, 5% of the population (7% of men and 3% of women) used smokeless tobacco. Sixteen percent of population in Kerala used tobacco in any form — smoking or smokeless. This prevalence was 29% among males and 3% among females. The mean age of initiation of tobacco use among male adults age 15-34 was 20 years for smokers and 19 years for smokeless tobacco users.

The alcohol consumption is a known risk factors of many non-communicable diseases. About 36% of men consumed alcohol at least once in last one year whereas 24% of men in last one month. The alcohol consumption among females was very low. Those who consumed alcohol in last seven days, 11% of them were binge drinkers. The mean age of initiation of alcohol consumption by young age (15-34 years) men was 22 years.

Nutritional inadequacy is the major risk factors of many non-communicable diseases. In Kerala, 87% of population consumed less than five servings of fruits and vegetables per day, which was inadequate as per WHO recommended standards. On an average only 3 days in a week people consumed fruits against vegetables 6 days a week.

Physical inactivity is the leading cause of diabetes, hypertension and coronary heart disease. In Kerala, 76% of population (79% in urban and 75% in rural population) was in low category of physical activity. About 47% of the population was detected with pre-hypertension stage and one-fourth population was in stage-I and stage-II hypertension. According to BMI, 27% of population was in the category of over weight and 16% of population was recorded as under weight. However, 43% of population with 60% among females and 24% among males in Kerala were in the category of central obesity.

Overall, prevalence of smoking and smokeless tobacco uses among female population was low compare with males. The increasing pattern of prevalence was recorded with increasing age of people. A declining pattern of prevalence was observed with increasing level of education. Prevalence among the people working in agriculture and as manual worker was high compare with others. A similar pattern of increasing prevalence with age and decreasing with level of education was also observed with current alcohol drinkers. The habits of tobacco and alcohol use starts at early young age which contributes to the high risk of NCD at later age. High proportion of population was taking inadequate amount of fruits and vegetables which increases the risk of NCD. Its distribution across all age groups, education and occupation by sex and residence was found high with marginal differences. Besides that, three-fourth of the population was found in the category of doing low physical activity. More female respondents were in the category of low physical activity as compare with males across all the age groups. Rural population was doing

more physical work than urban. The increasing pattern of prevalence of hypertension was recorded with increasing age of people. It was prevalent in all education levels and occupational categories. High prevalence of overweight was recorded in all the age groups except the younger age. It was prevalent in both sexes, but higher in urban population compare with rural. Low prevalence of overweight was recorded among illiterates as well as among the people working in agriculture or manual worker. Overall, NCD risk factors were prevalent across all the socioeconomic and demographic categories of population in Kerala.

These are the major health issues related to non-communicable diseases of people in Kerala.

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Appendix - A

SAMPLE WEIGHTS

First, appropriate sampling weights for households were constructed for each state data set separately for Urban and Rural sectors. The element weight consisted of factors reflecting ward selection probabilities, Census enumeration block (CEB) selection probabilities within wards; and household selection probabilities within CEB; and household non-response adjustments.

For Urban area of a state, the weight HWT_{ijk} for the household k in CEB j of ward i, can be expressed as follows

$$\mathbf{HWT}_{ijk} = \mathbf{w}_{1i} \times \mathbf{w}_{2j|i} \times \mathbf{w}_{3k|i,j} \quad i = 1, \ldots, 50, \ j=1, \ k=1, \ldots, 50$$

where $\mathbf{w}_{1i} = \dfrac{\mathbf{1}}{\boldsymbol{\pi}_i}$: the reciprocal of the inclusion probability π_i of ward i

where $\pi_i = \dfrac{a \ x \ \text{Population of ward i}}{\text{Total Urban Populaltion}}$ and

a (=50) is the total number wards to be selected from the urban sector

$\mathbf{w}_{2j|i} = \dfrac{\mathbf{1}}{\boldsymbol{\pi}_{j|i}}$: the reciprocal of the conditional probability of selection of CEB j in ward i

where $\pi_{j|i} = \dfrac{\text{Population of selected CEB j within ward i}}{\text{Populaltion of selected ward i}}$

$W_{3k|i,j} = \dfrac{1}{\pi_{k|i,j} \times \bar{\theta}_{k|i,j}}$: the reciprocal of the product of conditional inclusion probability $\pi_{k|i,j}$ of household k in the jth selected CEB of the ith ward and estimated conditional response probability $\bar{\theta}_{k|i,j}$ of household k from within the jth selected CEB of ward i.

where $\pi_{k|I,j} = \dfrac{\text{Number of households sampled from selected CEB j of ward i}}{\text{Number of households in selected CEB j of ward i}}$

$HWT_{ijk} = \dfrac{\text{Size of Urban Population}}{50 \ X \ \text{Population of selected CEB from ward i}} \ X$

$\dfrac{\text{Number of households in selected CEB of ward i}}{\text{Number of households sampled from selected CEB of ward i with HH Re sult code completed}}$

In rural sector, from the lists of villages , 50 villages(or cluster of villages) were selected with probability proportional to size and from each village 50 household were selected using systematic sampling.

Proceeding as above it can be shown the weight for the kth selected household of the ith selected village, HWT_{ik},

$HWT_{ijk} = \dfrac{\text{Size of Rural Population}}{50 \ X \ \text{Population of ith selected village}} \ X$

$\dfrac{\text{Number of households in ith selected village}}{\text{Number of households selected from ith village with HH Re sult code complete}}$

INDIVIDUAL WEIGHTS

From each selected household one member aged 15-54 is selected using the Kish Method and all usual members aged 55-64 were selected. Since objective of the study is to obtain estimates for each age group (15-24 through 55-64) and sex groups, post stratification is used for improvement of efficiency of the estimators.

Post stratification weights for individuals were constructed using the state age distributions for both sexes of the urban sector which are available on the population level. We first divide the target population of persons age 15-64 in 10 age – sex post strata with five age group (15-24 through 55-64) and two sex groups (male and female).

In the subsequent lines the symbol l is used to denote the age group [15 + (l – 1)*10, 15 +10*l], l = 1,2, …, 5 and m for sex, m = 1 if sex is male and m=2 if sex is female.

For Urban,

Define :

$$\delta_{ijknlm} = \begin{cases} 1 & \text{if } n^{th} \text{ selected respondent of the } k^{th} \text{ household of the } j^{th} \text{ CEB of the } i^{th} \\ & \text{ward belongs to age group l and of sex m.} \\ 0 & \text{otherwise} \end{cases}$$

$$\widehat{N}_{lm} \begin{cases} \text{estimated number of persons of age group l and sex m if one person from the list of persons age} \\ \text{15-54 is selected from household of the population (l =1,2,3,4, m=1,2)} \\ \\ \text{estimated number of the persons belonging to the age group l and sex group m (l =5, m=1,2)} \end{cases}$$

$\widehat{N}_{lm}$ is obtained as

$$\widehat{N}_{lm} = \frac{1}{\widehat{\theta}_{l,m}} \sum_{\substack{over\ all \\ all\ possible \\ values\ of \\ i,j,k,n}} HWT_{ijk} \times \delta_{ijknlm} \quad \text{where} \quad \widehat{\theta}_{lm} \text{ is the estimated group response rate.}$$

Calibrated Individual weight

$$IWT_{ijklm} = \frac{N_{lm}}{\widehat{N}_{lm}} \times HWT_{ijk}$$

Denoted by

N_{lm} = Number of person of sex m belonging to age group l in the urban sector of the population (l = 1,2 ,3,4,5 and sex m =1,2)

y_{ijkn}, = the observed value of the study variable for the respondent n belonging to household k, CEB j and ward i.

Estimate of the population total of sex group m and age group l is

$$\widehat{Y}_{l,m} = \sum_{\substack{over\ all \\ all\ possible \\ values\ of \\ i,j,k,n}} \delta_{ijknlm} \times IWT_{ijklm}$$

$$\widehat{N}_{l\cdot} = \widehat{N}_{l1} + \widehat{N}_{l2} \quad , \quad \widehat{Y}_{l\cdot} = \widehat{Y}_{l1} + \widehat{Y}_{l2} \quad , \quad l = 1, .., 5$$

$$\widehat{N}_{\cdot m} = \widehat{N}_{1m} + \ldots\ldots + \widehat{N}_{5m}, \quad \widehat{Y}_{\cdot m} = \widehat{Y}_{1m} + \ldots\ldots + \widehat{Y}_{5m} , \quad m = 1,2$$

$$\widehat{N} = \sum_{l=1}^{5}\sum_{m=1}^{2} N_{l,m} \quad , \quad \widehat{Y} = \sum_{l=1}^{5}\sum_{m=1}^{2} \widehat{Y}_{l,m}$$

Estimate of the mean of the study variable for sex group m and age group l, $\widehat{Y}_{lm}$ and for and overall are $\dfrac{\widehat{Y}_{lm}}{\widehat{N}_{lm}}, \dfrac{\widehat{Y}_{m.}}{\widehat{N}_{m.}}, \dfrac{\widehat{Y}_{.l}}{\widehat{N}_{.l}}, \dfrac{\widehat{Y}}{\widehat{N}}$, respectively.

For Rural,

Define :

$$\delta_{iknlm} = \begin{cases} 1 & \text{if n}^{th} \text{ selected respondent of the k}^{th} \text{ household of the i}^{th} \text{ village} \\ & \text{belongs to age group l and of sex m.} \\ 0 & \text{otherwise} \end{cases}$$

$$\widehat{N}_{lm} \begin{cases} \text{estimated number of persons of age group l and sex m if one person from the list of persons age 15-54 is selected from household of the population (l =1,2,3,4, m=1,2)} \\ \\ \text{estimated number of the persons belonging to the age group l and sex group m (l =5, m=1,2)} \end{cases}$$

$\widehat{N}_{lm}$ is obtained as

$$\widehat{N}_{lm} = \frac{1}{\widehat{\theta}_{l,m}} \sum_{\substack{over\ all \\ all\ possible \\ values\ of \\ i,j,k,n}} HWT_{ik} \times \delta_{ijknlm}, \quad \text{where } \widehat{\theta}_{lm} \text{ is the estimated group response rate.}$$

Calibrated Individual weight

$$IWT_{iklm} = \frac{N_{lm}}{\widehat{N}_{lm}} \times HWT_{ik}$$

Denoted by

N_{lm} = Number of person of sex m belonging to age group l in the rural sector of the population (l = 1,2 ,3,4,5 and sex m =1,2)

y_{ikn}, = the observed value of the study variable for the respondent n belonging to household k of village i.

Estimate of the population total of sex group m and age group l is

$$\widehat{Y}_{l,m} = \sum_{\substack{over\ all \\ all\ possible \\ values\ of \\ i,j,k,n}} \delta_{ijknlm} \times y_{ikn} \times IWT_{ijklm}$$

Estimate of the mean of the study variable for age-sex group l and m, sex group m, age group l and overall mean can be obtained.

Appendix - B

INTEGRATED DISEASE SURVEILLANCE PROJECT (IDSP)

NCD RISK FACTORS SURVEY (PHASE -I), INDIA

(Name of State   Year -2007)

HOUSEHOLD QUESTIONNAIRE

IDENTIFICATION	
STATE :	☐☐
DISTRICT :	☐☐
TEHSIL/TALUK	☐☐☐
CITY/TOWN/VILLAGE:	☐☐☐☐☐☐☐
URBAN/RURAL (*URBAN=1, RURAL =2, URBAN SLUM -3*)	☐
PSU NUMBER ……………………………….	☐☐☐
SEGMENT NUMBER:	☐
Household Number	☐☐☐

Name of Household Head: _____

Address oF HOUSEHOLD: _____

_____

INTERVIEWER VISITS					
	1	2	3	FINAL VISIT	
Date	_____	_____	_____	Day	☐☐
				Month	☐☐
Interviewer's	_____	_____	_____	Year	2 0 ☐☐
Name				Interviewer Code	☐☐
Result	_____	_____	_____		
				Result*	☐
Next Visit:				Total Number of Visits	☐
Date	_____	_____			
Time					

*RESULT CODES: 1. COMPLETED

2. NO HOUSEHOLD MEMBER/ NO COMPETENT RESPONDENT
   AT HOME AT THE TIME OF VISIT
3. ENTIRE HOUSEHOLD ABSENT FOR EXTENDED PERIOD
4. POSTPONED
5. REFUSED

6. DWELLING VACANT OR
   ADDRESS NOT A DWELLING
7. DWELLING DESTROYED
8. DWELLING NOT FOUND
9. OTHER _____
                    (SPECIFY)

NAME	SUPERVISOR	EDITED & CHECKED BY	KEYED BY
DATE	……………… ☐☐	……………… ☐☐	……………… ☐☐

HOUSEHOLD STRUCTURE (HS)						
List of all household members who usually live in your household aged 12 years and above						
LINE NO.	NAME	RELATION-SHIP	SEX	AGE IN COMPLETED YEARS	RESIDENTIAL STATUS	RECRUITED FOR SURVEY
	Please give me names of the persons who usually live in your household (may be temporarily away from home)	(With head of household)	Male-1 Female-2		(Present-1; temporarily away from home-2)	Put a tick mark against one member age 15-54 selected below by kish method and all members age 55-64
(1)	(2)	(3)	(4)	(5)	(6)	(7)
01						
02						
03						
04						
05						
06						
07						
08						
09						
10						
11						
12						

Codes for Q.3
Relationship to Head of Household:

01 – HEAD,
02 – WIFE OR HUSBAND,
03 – SON OR DAUGHTER
04 – SON IN LAW OR DAUGHTER IN LAW
05 - GRANDCHILD
06 - PARENT
07 – PARENT IN LAW

08 – BROTHER OR SISTER
09 – BROTHER IN LAW OR SISTER IN LAW
10 – NIECE OR NEPHEW
11 – OTHER RELATIVE
12 – ADOPTED OR FOSTER CHILD
13 – NOT RELATED

LIST ALL USUAL MEMBERS OF THE HOUSEHOLD AGE 15 – 54 IN THE HOUSEHOLD*.

Line No.	Sex	Age	Adult Number	Select one member (R) by using Kish Table	Enter a specific Kish Table used for selection of one member below. (A or B1 or B2 or C……. as assigned for each randomly selected household 1 to 50)

*Arrange all the members aged 15-54 in the following order - oldest male, next oldest male, and so on for all males followed by oldest female, next oldest female, etc. Then use selection table assigned to the household to choose R individual RESPONDENT.

GENERAL HOUSEHOLD INFORMATION			
Questions		**RESPONSE**	**SKIP**
1.	Number of members who usually live in the household	☐ ☐	
2.	Religion of the head of the household:	Hindu .... 01 Muslim .... 02 Christian .... 03 Sikh .... 04 Buddhist/neo buddhist .... 05 Jain .... 06 Jewish .... 07 Parsi .... 08 No religion .... 09 Other .... 96 (Specify)	

3.	What is the main source of drinking water?	PIPED WATER
		  Piped into
		     Residence 11
		     Public Tap 12
		GROUND WATER:
		     Hand Pump in Residence 21
		     Public Hand Pump 22
		WELL WATER
		  Well in Residence
		     Covered well 31
		     Open well 32
		Public Well
		     Covered well 33
		     Open well 34
		SURFACE WATER:
		     Spring 41
		     River/Stream 42
		     Pond 43
		     Dam 44
		     Rainwater 51
		     Tanker Truck 61
		     Any other 96
		(specify)	

4.	What kind of toilet facilities do you have?	Flush Toilet
		     Own Flush Toilet 11
		     Shared Flush Toilet 12
		     Public Flush Toilet 13
		Pit Toilet/Latrine
		     Own Pit Toilet 21
		     Shared Pit Toilet 22
		     Public Pit Toilet 23
		     No facility/Bush/Field 31
		     Other 96
		(Specify)	

5.	What is the **main** source of lighting for your household?	Electricity .... 1 Kerosene .... 2 Gas .... 3 Oil .... 4 Other .... 6 (Specify)	
6.	What is the type of **house**?	Pucca .... 1 Semi-Pucca .... 2 Kachha 3	
7.	How many **rooms** are there in your household?	Rooms .... ☐☐	
8.	Do you have a separate room, which is used as **kitchen**?	Yes .... 1 No 2	
9.	What type of **fuel** does your household **mainly use** for cooking?	Wood .... 01 Crop Residue .... 02 Dung Cakes .... 03 Coal/Coke/Lignite .... 04 Charcoal .... 05 Kerosene .... 06 Electricity .... 07 Liquid Petroleum Gas (LPG) .... 08 Bio-Gas .... 09 Others .... 96 (Specify)	
10.	Does this household **own this house** or any other house?	Yes .... 1 No 2	
11.	Does this household **own any agriculture land**?	Yes .... 1 No 2	If No, go to 14
12.	How much **agriculture land** does this household own?	Acres None ☐☐ . ☐	
13.	Out of this land, how much is **irrigated**?	Acres None ☐☐ . ☐	
14.	Does the household own any livestock?	Yes .... 1 No 2	
15.	Does the household own any of the following: *(READ ALL THE OPTIONS AND RECORD THE RESPONSE)*	Yes No A mattress? 1 2 A pressure cooker? 1 2 A chair? 1 2 A cot or bed? 1 2 A table? 1 2 A clock or Watch? 1 2 An electric fan? 1 2 A bicycle? 1 2 A radio or transistor? 1 2 A sewing machine? 1 2 A telephone or Mobile? 1 2 A refrigerator? 1 2 A television? 1 2 A moped, scooter, or motorcycle? 1 2 A car? 1 2 A water pump? 1 2 A bullock cart? 1 2 A thresher? 1 2 A tractor? 1 2	

| 16. | What is the type of oil/cooking medium **most commonly** used in the house?

(CHOOSE ONLY ONE IDENTIFIED BY MAXIMUM CONSUMPTION) | Cooking Oil
Mustard oil 01
Coconut oil 02
Groundnut oil 03
Sunflower oil 04
Soyabean oil........................... 05
Palm oil 06
Vanaspati oil 07
Pure Ghee 08
Butter 09
Others 96
(Specify) | |

INTEGRATED DISEASE SURVEILLANCE PROJECT (IDSP)
NCD RISK FACTORS SURVEY (PHASE -I), INDIA

(Name of State   Year -2007)
INDIVIDUAL QUESTIONNAIRE

IDENTIFICATION	
STATE CODE:	☐☐
DISTRICT CODE	☐☐
TEHSIL/TALUK	☐☐☐
CITY/TOWN/VILLAGE	☐☐☐☐☐☐
SEGMENT NUMBER:	☐☐
URBAN/RURAL (URBAN=1, RURAL =2, URBAN SLUM = 3)	☐
PSU NUMBER	☐☐☐
HOUSEHOLD NUMBER	☐☐☐
LINE NUMBER OF PARTICIPANT NAME: _____	☐☐

CONSENT	RESPONSE
CONSENT HAS BEEN READ OUT TO PARTICIPANT	YES........................1 NO ....2 IF NO, READ CONSENT
CONSENT HAS BEEN OBTAINED	YES........................1 NO ....2 IF NO, END

	1	2	3	FINAL VISIT	
Date Interviewer's Name & Code (Step 1 & Step 2) Technician's Name & Code (Step 3)	_____ _____ _____	_____ _____ _____	_____ _____	Day Month Year Interviewer's Code Result* (Step-1) Result* (Step- 2) Result* (Step- 3)	☐☐ ☐☐ 2 0 ☐☐ ☐☐ ☐ ☐ ☐
Next Visit Date/ Time	_____	_____		Total Number of Visits	☐

*RESULT CODES: 1. COMPLETED   2. NOT AT HOME   3. POSTPONED   4. REFUSED   5. PARTLY COMPLETED   6. NOT ELIGIBLE
9. OTHER (SPECIFY) _____

NAME DATE	SUPERVISOR	EDITED & CHECKED BY	KEYED BY
	.... ☐☐	.... ☐☐	.... ☐☐

STEP- I DEMOGRAPHIC INFORMATION		
QUESTIONS AND FILTERS	**Response**	**Skip**
101. Sex	Male .... 1 Female 2	
102. Age	Age in completed Years ☐☐	
103. What is your **current marital** status?	Never married .... 1 Currently .... Married .... 2 Married but gauna not performed.......... 3 Widowed/Divorced/Separated 4	
104. Have you ever attended school?	Yes .... 1 No 2	If no, go to 107
105. **if yes,** what is the **highest grade** of education you completed?	Grade*............ ☐☐	
106. **Check 105** Grade 0-5 ☐ ↓	Grade 6 & above ☐ → Go to 108	
107. Can you read and write?	Yes .... 1 No 2	
108. What is your main work/ occupation?	Professional/Executive/Manager/ Big business .... 1 Clerical/Medium business .... 2 Sales .... 3 Agriculture/Self-employed .... 4 Agriculture employer .... 5 Household and domestic work .... 6 Services .... 7 Skilled manual .... 8 Unskilled manual .... 9 Other (Specify) .... 10 Do not work 11	

*GRADE FOR DIFFERENT LEVEL OF COMPLETED EDUCATION	EDUCATION LEVEL			GRADE
	CLASS I TO XII	:	1 TO 12 YEARS	= 1 TO 12 GRADE
	BACHELOR'S DEGREE	:	15 YEARS (12+3)	= 15 GRADE
	MASTER'S DEGREE	:	**17 YEARS (12+3+2)**	= **17 GRADE**
	ENGINEERING	:	16 YEARS (12+4)	= 16 GRADE
	MBBS	:	17 YEARS (12+5)	= 17 GRADE
	POLYTECHNIC	:	13 YEARS (10+3)	= 13 GRADE
	ITI	:	**11 YEARS (10 +1)**	= **11 GRADE**
	PH. D.	:	20 YEARS (12+3+2+3)	= 20 GRADE

STEP- I BEHAVIOURAL INFORMATION

Now I am going to ask you some questions about various health behaviours. This includes things like smoking, drinking alcohol, eating fruits and vegetables and physical activity. Let's start with tobacco

Smoking Tobacco use

	Questions	Response	Skip
201.	Do you **currently smoke** any tobacco products, such as bidis, cigarettes, cigars or pipes, hookah or any other local tobacco products?	Yes .... 1 No.. 2	If No, go to 205
202.	**If Yes**, do you smoke **daily?**	Yes .... 1 No.. 2	if No, go to 205
203.	On an average, **how many (number of times in case of hookah)** of the following do you smoke each day? *(RECORD FOR EACH TYPE)* *RECORD 88, IF ANY PRODUCT IS NOT USED INSTEAD OF LEAVING BLANK IN THE PRODUCT CATEGORIES).* *(RECORD FOR ANY NEW FORM OF TOBACCO USE REPORTED BY THE RESPONDENT e.g. REVERSE SMOKING etc.)*	Number Bidis ☐☐ Manufactured Cigarettes ☐☐ Hand-rolled Cigarettes ☐☐ Pipes ☐☐ Cigars, Cheroots ☐☐ Hookah ☐☐ Other local smoked tobacco products…....................... ☐☐ (SPECIFY)	
204.	How old were you at that time when you **first started** using the tobacco product(s) **daily?**	Age in completed years ☐☐ Don't remember 7 7	Go to 208
205.	In the past, did you **ever smoke** tobacco products such as bidis, cigarettes, cigars or pipes **daily?**	Yes .... 1 No 2	If No, go to 207
206.	How **old** were you when you **stopped smoking** daily?	Age in completed years ☐☐ Don't remember 7 7	
207.	Are you **currently exposed** to tobacco smoke at your home or workplace **daily?**	Yes .... 1 No 2	

Smokeless Tobacco use

	Questions	Response	Skip
208.	Do you **currently use** any **smokeless tobacco**, such as (chewing tobacco, *tuibu* snuff, betel, gutka, pan masala, etc.)?	Yes ....1 No 2	if No, go to 212
209.	**If yes,** Do you **currently use smokeless tobacco** products **daily?**	Ye ....1 No 2	if No, go to 212
210.	On average, **how man**y times a day do you use... *(RECORD FOR EACH TYPE)* *SPECIFY 77 IF NO PRODUCTS WERE USED IN EACH CATEGORY INSTEAD OF LEAVING CATEGORIES BLANK.*	Chewing tobacco ☐☐ Pan with tobacco ☐☐ *Tuibu*, Tobacco Snuff, by mouth ☐☐ Snuff, by nose ☐☐ Other ☐☐ Other (specify)..........................	
211.	How old were you at that time when you **first started** using smokeless tobacco **daily?**	Age in completed years ☐☐	Go to 214
212.	If you are not using currently, in the past did you **ever use** smokeless tobacco products **daily** such as chewing tobacco, tuibu, snuff, betel, gutka, etc.?	Yes ....1 No 2	if No, go to 214
213.	How **old** were you when you **stopped** using smokeless tobacco products **daily?**	Age in completed years ☐☐	

Alcohol Consumption

The next questions ask about the consumption of alcohol.

	Questions	Response	Skip
214.	Have you consumed any alcoholic products (such as beer, wine, whisky, locally prepared alcohol, etc.) within the **past 12 months?**	Yes ....1 No 2	if No, go to 219
215	In the past 12 months, **how frequently** have you had at least one drink?	5-7 days per week ....1 1-4 days per week ....2 1-3 days per month ....3 Less than once per month 4	
216.	When you drink alcohol, **on average**, how many **standard drinks** do you have during one day? *(USE SHOWCARD)*	Number ☐☐	
217.	Have you consumed alcohol (such as beer, wine, spirits, or any locally prepared wine, etc.) within the **past 30 days?**	Yes ....1 No 2	If No go to 220
218.	During each of the past 7 days, how many **standard drinks** of any alcoholic drink did you have each day? *(USE SHOWCARD)*	Monday ☐☐ Tuesday ☐☐ Wednesday ☐☐	Go to 220

		Thursday	
		Friday	
		Saturday	
		Sunday	
219.	**If answer to Question 214 is No, then** Have you **ever** (past user) **consumed** alcohol (such as beer, wine, spirits, or any local wine product)?	Yes .... 1 No 2	if No, go to 221
220.	How **old** were you when you **started** consuming alcohol **regularly?**	Age in years Don't Remember 7 7	

Diet

The next questions ask about the fruits and vegetables that you usually eat. I have a nutrition card here that shows you some examples of local fruits and vegetables. Each picture represents the size of a serving. As you answer these questions please think of **a 'typical' or a 'usual' week.**

Questions		Response	Skip
221.	In a typical week, on how many days do you **eat fruit?**	Number of days	If zero days, go to 223
222.	How many **servings** of fruit do you eat on **one of those days?** *(USE SHOWCARD)*	Number of servings	
223.	In a typical week, how many days do you **eat vegetables?** *(USE SHOWCARD)*	Number of days	If zero days, go to 225
224.	How many **servings** of vegetables do you eat on **one** of those days? *(USE SHOWCARD)*	Number of servings	
225.	How often do you consume each of the following ? **(**USE CODE: *DAILY – 1; AT LEAST ONCE IN A WEEK – 2; ONCE IN A MONTH -3; OCCASIONALY OR RARELY - 4; NEVER – 5)*	Butter/Ghee	
		Fried local foods (Samosa, Kachori, etc.)	
		Red meat	
		Eggs	
		Chicken	
		Fish	
		Aerated drinks	
		Sweetened drinks	
		Pizza/burgers/French fries etc	
		Cakes, Pastries or other bakery items	
		Chips, Namkeen etc	

Physical Activity

Next I am going to ask you about the time you spend doing different types of physical activity in a **typical week.** Please answer these questions even if you do not consider yourself to be a physically active person.

Think first about the time you spend doing work. Work includes things that you have to do such as paid or unpaid work, study/training, household chores, harvesting food/crops, fishing or hunting for food, seeking employment.

In answering the following questions **'Vigorous -Intensity activities'** are activities that require hard physical effort and cause large increase in breathing or heart rate, **'Moderate-Intensity activities'** are activities that require effort and cause small increases in breathing or heart rate.

	Questions	Response	Skip
226.	Does your work involve **vigorous-intensity activity** that causes large increases in breathing or heart rate like (carrying or lifting heavy loads, digging or construction work etc.) for **at least 10 minutes continuously?**	Yes .... 1 No 2	If No, go to 229
227.	In a typical week, on how many days do you do **vigorous-intensity activities** as part of your work?	Number of days ☐	
228.	How much time do you spend doing **vigorous-intensity** activity at home/work on a typical day?	Hours : minutes ☐☐ : ☐☐ Hours　　minutes	
229.	Does your work involve **moderate -intensity** activity that causes small increases in breathing or heart rate for **at least 10 minutes** continuously (such as brisk walking or carrying loads, manual washing of clothes, dry sweeping of floor, wet mopping of floor, drawing water from well, carrying water from tap, carrying water from river or well, manual grinding or pounding of cereals, gardening at home, carrying groceries from market, etc.) ?	Yes .... 1 No 2	If No,go to 232
230.	In a typical week, on how many days do you do **moderate-intensity** activities as part of your work?	Number of days ☐	
231.	How much time do you spend doing **moderate-intensity** activity at work on a typical day?	Hours : minutes ☐☐ : ☐☐ Hours　　minutes	

Travel (related to Physical Activity) to and from places

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

232.	Do you **walk** or use **a bicycle** (pedal cycle) for **at least 10 minutes** continuously to get to and from places?	Yes .... 1 No 2	If No, go to 235
233.	In a typical week, on **how many days** do you walk or bicycle for at least 10 minutes continuously to get to and from places?	Number of days ☐	
234.	How **much time** do you spend walking or bicycling for travel on a typical day?	Hours : minutes ☐☐ : ☐☐ Hours　　minutes	

	Recreational Activity		
235.	Do you do any **vigorous**-intensity **sports**, fitness or recreational (leisure) activities that cause large increases in breathing or heart rate like (running or football,…) for **at least 10 minutes continuously?**	Yes .... 1 No..................................... 2	If No, go to 238
236.	In a typical week, on **how many days** do you do vigorous-intensity sports, fitness, or recreational activity?	Number of days ☐	
237.	How **much time** do you spend doing vigorous-intensity sports, fitness or recreational (leisure) activities on **a typical day?**	Hours : minutes ☐☐ : ☐☐ Hours minutes	
238.	Do you do any **moderate**-intensity **sports**, fitness or recreational (leisure) activities that cause small increases in breathing or heart rate such as brisk walking (cycling, swimming, volleyball etc.) for **at least 10 minutes continuously?**	Yes .... 1 No..................................... 2	If No, go to 241
239.	In atypical week, on **how many days** do you do moderate-intensity sports, fitness, or recreational activity?	Number of days ☐	
240.	How **much time** do you spend doing moderate-intensity sports, fitness, or recreational activities on a typical day?	Hours : minutes ☐☐ : ☐☐ Hours minutes	
	Yoga Activity		
241.	Do you regularly practice **Yogic Exercise /Yogasan?**	Yes .... 1 No..................................... 2	If No, go to 244
242.	If **yes**, **how many days** in a week?	Number of days ☐	
243.	How much **time** do you spend doing Yoga in a **typical day?**	Hours : minutes ☐☐ : ☐☐ Hours minutes	
	Sedentary Behaviour		
	The following question is about sitting or reclining at work, at home, getting to and from places, or with friends including time spent [sitting at a desk, sitting with friends, traveling in car, bus, train, reading, playing cards or watching television], but do not include time spent sleeping.		
244.	How **much time** do you usually spend **sitting or reclining** on a **typical da**y?	Hours : minutes ☐☐ : ☐☐ Hours minutes	

History of Raised Blood Pressure			
	Questions	**Response**	**Skip**
245.	When was your blood pressure last **measured** by a **health professional?**	Within past 12 months .... 1 1-5 years ago .... 2 More than 5 years ago .... 3 Never 4	
246.	Have you ever been told by a doctor or other health worker that you have **raised (high) blood pressure** or hypertension?	Yes .... 1 No 2	If No, go to 248
247.	Are you currently receiving any of the following treatments/advice for raised (high) blood pressure prescribed by a doctor or other health worker as well as **any advice?**		
	Drugs (medication) that you have taken in the last 2 weeks	Yes .... 1 No 2	
	Special prescribed **diet**	Yes .... 1 No 2	
	Advice or treatment to lose weight	Yes .... 1 No 2	
	Advice or treatment to stop smoking	Yes .... 1 No .... 2 Not Applicable 8	
	Advice to start or do **more physical activity**	Yes .... 1 No 2	
248.	During the **past 12 months** have you visited to an AYUSH Practitioner for high blood pressure or hypertension?	Yes .... 1 No 2	If No, go to 250
249.	Are you currently taking any treatment/medicine from an **AYUSH Practitioner** for your high blood pressure?	Yes .... 1 No 2	
History of Diabetes			
250.	Has your blood sugar been **measured** in the last **12 months?**	Yes .... 1 No 2	
251.	Have you ever been **told** by a doctor or health worker that you have **diabetes?**	Yes .... 1 No 2	If No, go to 253
252.	Are you currently receiving any of the following treatments/advice for diabetes prescribed by a doctor or other health worker as well as **any advice?**		
	Insulin	Yes .... 1 No 2	
	Oral **drug** (medication that you have taken in the last 2 weeks).	Yes .... 1 No 2	
	Special Prescribed **diet**	Yes .... 1 No 2	
	Advice or treatment to **lose weight**	Yes .... 1 No 2	
	Advise to start or do **more exercise**	Yes .... 1 No 2	
253.	During the past 12 months have you visited/ seen an **AYUSH Practitioner** for diabetes?	Yes .... 1 No 2	If No, go to 301
254.	Are you currently taking **any treatment/medicine** from an AYUSH Practitioner for your diabetes?	Yes .... 1 No 2	

STEP 2. Physical Measurement			
Questions		**Response**	**Skip**
301.	Technician / Interviewer ID		
302.	Device ID for height and weight	Height....... ☐☐ Weight...... ☐☐	
303.	Height	In Centimeter(cm)... ☐☐☐.☐	
304.	Weight	In Kilograms (kg).... ☐☐☐.☐	
305.	(For Women) Are you pregnant?	Yes... 1 No 2	If Yes, go to 309
Waist Measurement			
306.	Device ID for waist	☐☐	
307.	Waist circumference Reading 1	In Centimeter (cm)... ☐☐☐.☐	
308.	Waist circumference Reading 2	In Centimeter (cm)... ☐☐☐.☐	
Blood Pressure and Pulse Rate			
309.	Technician ID	☐☐	
310.	Device ID for Blood Pressure	☐☐	
311.	Cuff Size Used	Small .... 1 Medium .... 2 Large 3	
312.	B.P. Reading 1	Systolic (mmHg) ☐☐☐ Diastolic (mmHg) ☐☐☐	
313.	Pulse Rate Reading 1	☐☐☐	
314.	B.P. Reading 2	Systolic (mmHg) ☐☐☐ Diastolic (mmHg) ☐☐☐	
315.	Pulse Rate Reading 2	☐☐☐	
316.	B. P. Reading 3	Systolic (mmHg) ☐☐☐ Diastolic (mmHg) ☐☐☐	
317.	Pulse Rate Reading 3	☐☐☐	

Appendix - C

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