Ministry of Health & Family Welfare

Government of India

INTEGRATED DISEASE SURVEILLANCE PROJECT (IDSP)

NON-COMMUNICABLE DISEASE RISK FACTORS SURVEY

2007-08

Tamil Nadu

Madras Diabetes Research Foundation

Chennai

(State Survey Agency)

National Institute of Epidemiology

Chennai

(Regional Resource Centre)

National Institute of Medical Statistics

New Delhi

(National Nodal Agency)

National Institute of Communicable Diseases
New Delhi

(IDSP Central Surveillance Unit)

Indian Council of Medical Research
New Delhi

(National Implementing Agency)

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(स्वास्थ्य अनुसंधान विभाग)
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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-co mmunicable 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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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

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 whose 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
DHO	District Health Officer
ICMR	Indian Council of Medical Research
IDSP	Integrated Disease Surveillance Project
IIHFW	Indian Institute of Health and Family Welfare
LPG	Liquid Petroleum Gas
MET	Metabolic Equivalent
NCD	Non-communicable Diseases
NICD	National Institute of Communicable Diseases
NIE	National Institute of Epidemiology
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
WC	Waist Circumference
WHO	World Health Organization

Tables

Figures

IDSP-NCD Risk Factor Survey
Fact Sheet - Tamil Nadu

Population		*Any form of Tobacco use*	22
Household covered	4799	Male	36
Individual covered	5177	Female	8
Household Characteristics(%)		**Mean age of Initiation (in years)**	
Religion		*Smoking*	20
Hindu	89	Male	20
Muslim	5	Female	*
Access to piped drinking water	86	*Smokeless*	20
Urban	84	Male	20
Rural	87	Female	20
Sanitation		**Alcohol Consumption**	
Flush Toilet	43	*Consumed Alcohol (last 30 days)*	11
Urban	74	Male	21
Rural	19	Female	*
Source of Lighting		*Consumed Alcohol (last 12 Months)*	15
Electricity	93	Male	30
Urban	96	Female	0.1
Rural	90	**Consumed alcohol (in last 7 days)**	
Type of House		*Binge Drinkers*	3
Pucca House	73	Male	6
Urban	86	Female	0.2
Rural	62	**Mean age of Initiation Alcohol (in years)**	
Kachha House	14	Male	21
Urban	5	Female	*
Rural	21	**Fruits and Vegetables consumed**	
Fuel use for Cooking		*Less than five servings per day*	99
LPG/Gas	37	Male	98
Urban	62	Female	99
Rural	19	**Physical Activity**	
Wood	57	*Low Physical Activity*	66
Urban	26	Urban	71
Rural	80	Rural	62
Separate Kitchen		**Hypertension**	
Urban	76	*Pre hypertension*	43
Rural	51	Urban	44
Own Agricultural land		Rural	42
Urban	11	*Stage I and II hypertension*	20
Rural	42	Urban	22
Individual Characteristics(%)		Rural	19
Education -illiterate	33	**Physical Measurement - BMI**	
Urban (Male)	15	*Under weight*	25
Urban (Female)	28	Urban	18
Rural (Male)	30	Rural	30
Rural (Female)	53	*Over weight (grade I,II,III)*	23
Behavioural Information(%)		Urban	32
Current Tobacco users		Rural	15
Smokers	14	*Central Obesity*	25
Male	27	Urban	33
Female	*	Rural	18
Smokeless tobacco users	11		
Male	14		
Female	8		

*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 data 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, Maharashtra, 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 including taking care of certain administrative and logistic difficulties and the National Monitoring Committee for monitoring the overall progress of the project. Indian Council of Medical Research through the division of non-communicable diseases, 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 National Institute of Epidemiology, Chennai as a Regional Resource Centre (RRC) for monitoring the quality of data collection and technical support to State Survey Agency (SSA) for the state of Tamil Nadu.

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 Tamil in case of Tamil Nadu), 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 sex, which are available on the population level.

Two types of questionnaires - one at household level and another at 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 STEPS 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 Tamil Nadu. Among them two hundred

one households refused to participate in the survey. The overall individual response rate for the survey was 98.6 percent. More than four-fifth (89%) of the households were Hindu, about 5 percent were Muslim and about 6% were Christian. Ninety-two percent of the households used drinking water from a piped or hand pump. Almost all households had flush or pit toilet facility. Ninety-three percent of households had electricity. LPG was a major source of cooking fuel in urban area and wood was main source of fuel in rural area. As envisaged, less than 1/3rd of the households possessed agricultural land, which was only 11% in case of urban area.

Twenty two percent respondents were illiterate. It was pronounced in rural area where more than half of females were illiterate. The results emphasize the need of taking female literacy program of the Government further. About three-quarter of the respondents were currently married. Most of the respondents in rural area were engaged in Agricultural work.

BEHAVIOURAL RISK FACTORS FOR NCD

Tobacco Smoking

As per the WHO STEPS guidelines, 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*. The survey finds that about 27 percent of males in Tamil Nadu (25% of urban and 29% of rural male population) were current smokers. Females were not involved in smoking.

The urban and rural prevalence was similar for the current smokers. The mean number of smoking *beedis*, manufactured cigarette and hand rolled cigarette in a
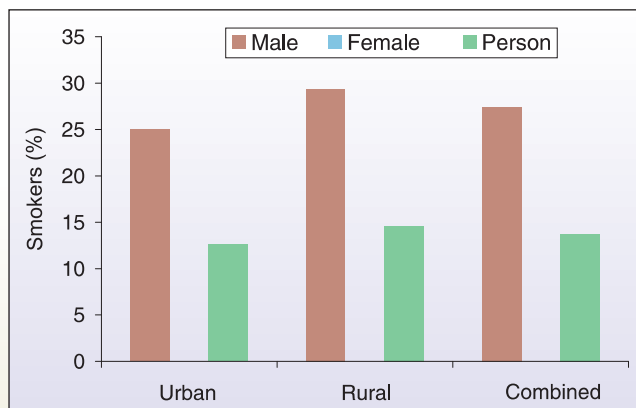
Figure 1. Current smokers (%) by sex and residence

day was 9, 3 and less than one respectively. The average age of onset of smoking was around 19 years among young urban respondents as compared to 20 years among young rural respondents aged 15-34 years. The mean age of cessation of smoking for all those who stopped smoking was 31 years. Among non-smokers about 11% of respondents were exposed to tobacco smoke at home & work place.
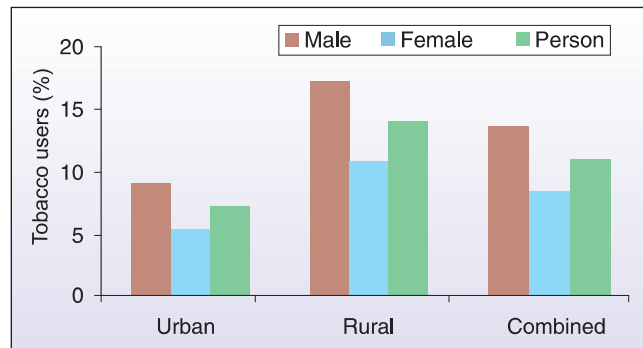
Figure 2. Current daily smokeless tobacco users (%) by sex and residence

Above one-tenth (11%) of respondents were current users of smokeless tobacco. The mean frequency of chewing tobacco in a day was around 2 (3 for men and 1 for women) for tobacco chewer and for chewing pan with tobacco in a day was around 3 (2 for males and 4 for females), where as the mean frequency for snuff by mouth/nose was less than one. The mean age of initiation of smokeless tobacco use was 20 years for the young respondents aged 15-34 years and it was 27 years for the respondents in the age group of 35-64 years. The over all mean age of quitting smokeless tobacco was 31 years. About 22% of the respondents were using tobacco in either form (smoking and smokeless) whereas 1% was using tobacco in both the forms.

Alcohol Consumption

In the survey, about 15% of the respondents report to have consumed alcohol in past 12 months and 11% consumed in last 30 days preceding the survey. Six percent of the male respondents were past drinkers. The habit was higher among men with 30% consuming alcohol in past 12 months as compared to only 0.1% among women. The average number of drinks consumed on a drinking day was 2 drinks. Less than five percent of current drinkers were binge drinkers (high drinking). The mean age of initiation of alcohol consumption regularly was 21 years for the respondents in the age

group 15-34 years and 25 years for the respondents in the age group of 35-64 years. Twenty one percent of male and no females were reported to have consumed alcohol in past 30 days. The percentage of current drinkers was higher for respondents whose main occupation was agriculture.
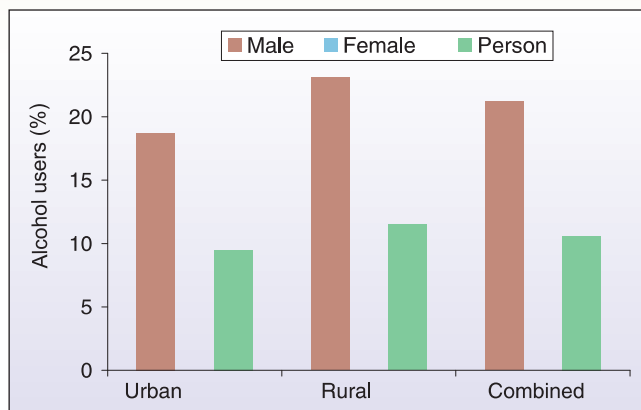
Figure 3. Alcohol consumplion (%) by sex and residence

Fruits and Vegetables Consumption

In a week, people consumed both fruits and vegetables only 12 day. The mean number of days when fruits were consumed was marginally higher in urban population (3 days) as compared to that in rural (2 days). Only one percent of population consumed five or more servings of fruits and vegetables per day.
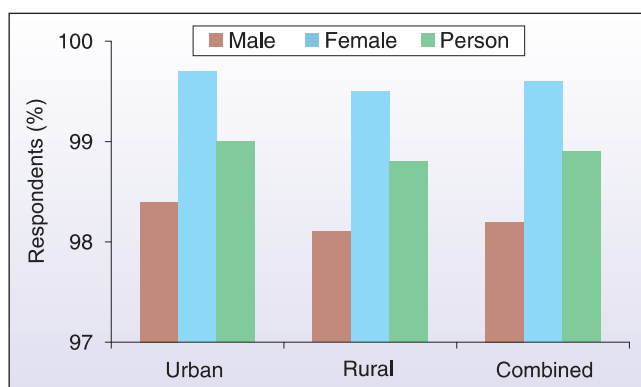
Figure 4. Less than five servings of fruits & vegetables consumption (%) by sex and residence

In respect of consumption of specific food habits, 28% population consumed eggs, 22% consumed fish, and 18% consumed red meat and fried local food at least once a week. Cheese/butter was consumed daily by 5% of the population. Cake pastries or other bakery items including chips/namkeen were consumed daily by 3% of population.

Most common edible oil used for cooking among households in Tamil Nadu was groundnut oil (41%), followed by sunflower oil (30%), palm oil (12%) and others (14%).
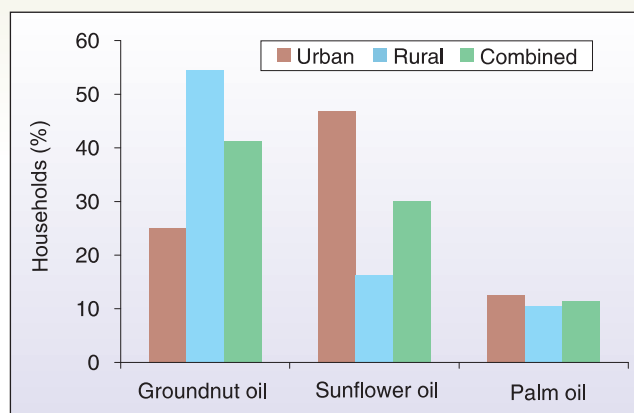
Figure 5. Major oil consumption among households (%) by residence

Physical Activity

The lack of physical activity leads to obesity, hyperlipidemia, diabetes mellitus, hypertension, and coronary heart disease. In this respect survey finds that in Tamil Nadu, the mean time spent in different sub groups on work related physical activity range between 209 to 247 minutes per day. The mean duration of total physical activity was 1309 MET minutes per day. Around 53 minutes per day were spent on travel and 5 minutes per day on recreational activities.
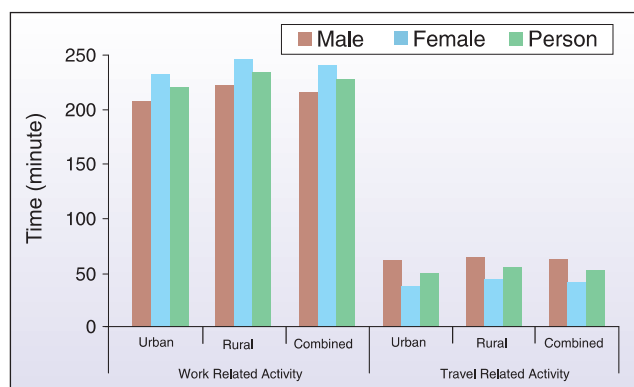
Figure 6. Mean time spent on physical activity per day (minutes) by sex and residence

As per the WHO guidelines, the total physical activity of the individual had been categorized as low, medium and high. About 66% of respondents reported low level of physical activity, while 30% and 4% of respondents reported medium and high level of activity, respectively. Majority of respondents spent more than 4 hours in sedentary activities (79%).
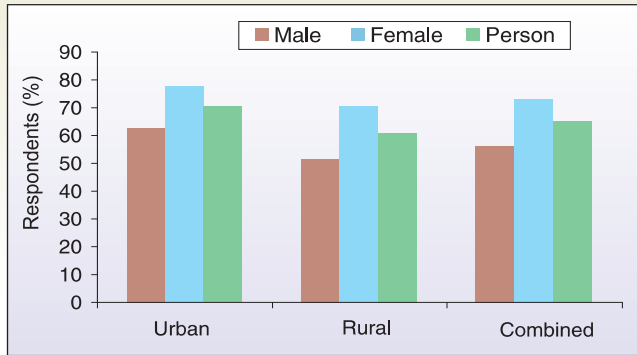
Figure 7. Low physical activity of respondents (%) by sex and residence

HYPERTENSION AND DIABETES

Hypertension

The blood pressure is an important determinant of risk of cardiovascular and ischemic heart diseases, congestive cardiac failure and renal failure. In the survey, 5% respondents report to have been diagnosed as hypertensive by health professionals (4% for males and 5% for females; 6% for urban and 3% for rural population). Among those who were diagnosed for hypertension, 77% were on prescribed drugs, more than half were advised dietary modification, and only 3% consulted AYUSH practitioner of which more than half were taking treatment from the same. The survey also carried out measurement of blood pressure as a part of step-2 of individual questionnaire. The mean systolic blood pressure in the population was around 124 mm Hg and mean diastolic blood pressure was 78 mm Hg. In the hypertension categories, 38% were found to be normal, 44% pre hypertension, 14% stage I hypertension and four percent stage II hypertension. Stage I & II hypertension was more pronounced in men (21%) as compared to women (15%).
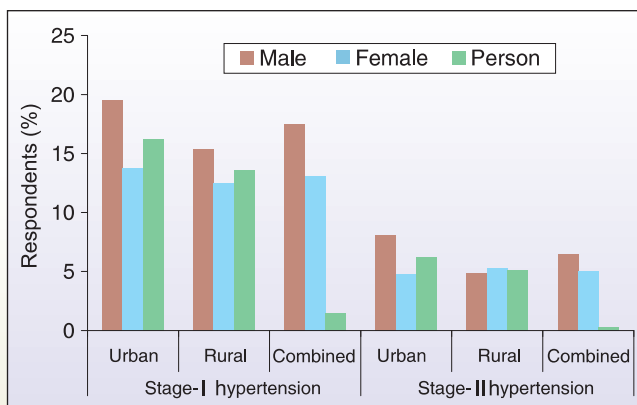
Figure 8. Stage I & II hypertension (%) by sex & residence

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. The survey also included information on history of diabetes. Three percent of the respondents report to have history of raised blood sugar of which 12% were taking insulin and 87% were on oral drugs. A large proportion of them were advised life style modification such as diet modification, reducing weight and increasing physical activity. About 3% (of the diagnosed) have consulted AYUSH practitioners for the elevated blood sugar levels and more than half of them were taking the treatment from the system.
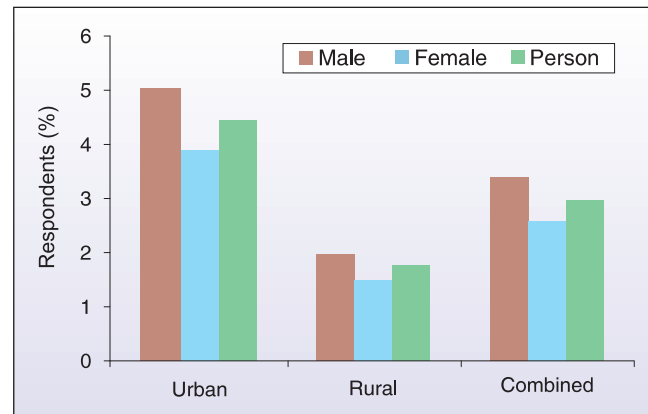
Figure 9. History of raised blood sugar (%) by sex and residence

PHYSICAL MEASUREMENTS

Body Mass Index (BMI)

Worldwide researches have shown that there is a strong association between BMI and health risk. On the
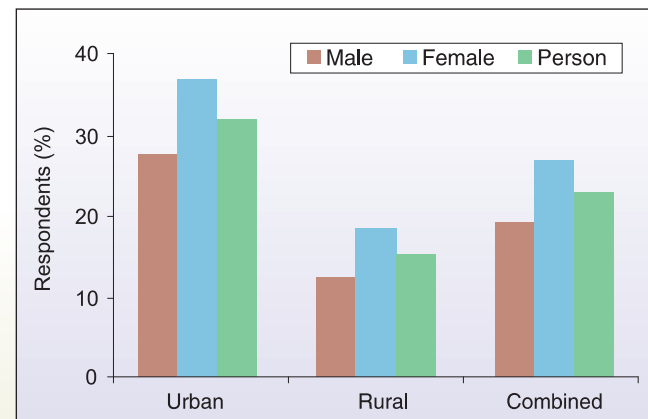
Figure 10. Overweight respondents (%) by sex and residence in Tamil Nadu

other hand, low BMI is an indicator of risk to health, often being associated with tobacco, alcohol use and drug addiction. The survey recorded height, weight and waist circumference. The mean BMI was around 22 kg/m^2 with mean height 158 cm (164 cm for men, 152 cm for women) and mean weight 55 kg (57 kg for men and 51 kg for women). According to the survey, 25% of the respondents were under weight and about 23% were overweight which was 31% in urban and 15% in rural population. Overall 53% of the respondents were in the normal category of BMI.

SOCIO-DEMOGRAPHIC DIFFRENTIALS

Tobacco is mainly used as smoking and other forms of smokeless tobacco in Tamil Nadu. 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 service and agriculture was high compare with other categories . 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 (25-34) which was declining in the older age groups (35-64). 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, more than half 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 groups (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 work were doing more physical work compare with other occupational categories. Low physical activity was high among executive and business occupation.

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 illiterate. Prevalence was recorded low among the people whose occupation was agriculture or manual work 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 Tamil Nadu.

The results generated through this IDSP-NCD survey would certainly focus on major issues in bringing about changes or initiate various programs 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 Regional Resource Centres (RRCs). The State Survey Agencies (SSAs) were identified based on their experience and knowledge about the local conditions. The division of non communicable disease 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 Tamil Nadu. Madras diabetes research foundation, Chennai was the SSA in the state while National Institute of Epidemiology, Chennai was the RRC.

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[1] 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

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

RISK FACTORS COMMON TO MAJOR NCD'S

Risk factor	Non-communicable Disease			
	CVD	Diabetes	Cancer	Respiratory
Smoking/tobacco	+	+	+	+
Alcohol	+		+	
Nutrition	+	+	+	+
Physical Inactivity	+	+	+	+
Raised BP	+	+	+	
Raised blood Sugar	+	+		
Obesity	+	+	+	+
Blood lipids*	+	+	+	

+ Corresponds to Risk Factor;

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

the greatest impact on non-communicable disease mortality and morbidity, and modification is possible through effective prevention.

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 vegetables are associated with several health

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.

1.4 HEALTH PROFILE OF THE STATE

The state of Tamil Nadu is situated on the southeastern side of the Indian peninsula. It is bounded on the east by Bay of Bengal, in the south by the Indian ocean, in the west by the states of Kerala and Karnataka and in the North by the Karnataka and Andhra Pradesh. Almost every district has a hill-station or a sea-side resort. It has an area of 130,058 sq. km. and a population of 65629 people (in thousand)[2]. There are 30 districts, 385 blocks and 16317 villages in the state. The State has population density of 479 per sq. km. (as against the national average of 325). The decadal growth rate of the State is 11.72% (against 21.52% for the country) and the population of the state continues to grow at a slower rate than the national rate. The key health indicators for Tamil Nadu are presented in Table 1.1 - 1.2.

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

S. No	Indicator	Namil Nadu	India
1	Total Population (in thousand)*	65629	1128521
2	Population Ratio (Urban/1000 Rural)*	787	385
3	Decadal Growth Rate*	11.72	21.52
4	Crude Birth Rate (Per 1000 Population) **	16.2	23.5
5	Crude Death Rate (Per 1000 Population) **	6.4	7.5
6	Life Expectancy at Birth**	64.8(M)	62.3(M)
		67.1(F)	63.9(F)
7	Total Fertility Rate***	1.8	2.9
8	Infant Mortality Rate (Per 1000 Live Births)**	37	57
9	Maternal Mortality Ratio (Per 100000 Live Births) [†]	134	301
10	Sex Ratio (Females/1000 Males)*	987	933
11	Mean Age at Marriage (Female) [††]	21.8	20.2
12	Population Below Poverty Line [†††]	22.5	27.5%
13	Literacy Rate*	73.5	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	Tamil Nadu	India
1	Number of Allopathic doctors with recognized medical qualifications and registered with State Medical Council*	77780	696747
2	Dental Surgeons Registered**	9876	72497
3	Number of Government Allopathic Doctors***	7107	76542
4	Average Population served/Doctor***	9234	-
5	Number of Registered AYUSH Doctors [†]	27223	725338
6	Total Number of Registered Nurses [††]	228027	1509196
7	Number of Doctors at the PHCs [†††]	2537	22273
8	Total CHCs Specialists at CHCs [†††]	-	3979
9	Health Assistant (Male & Female) [†††]	2037	35330
10	Health Worker (Male & Female) [†††]	11053	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-year 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 the same was

followed in Tamil Nadu. 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. Independent teams carried out the household listing operation.

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 4799 households covering 2415 households from rural and 2384 from urban areas. From

these households, a total of 5177 individuals were contacted out of which 5176 completed the Step-1, and 5105 completed the Step-2 survey. The overall individual non-response rate for the survey was around 1.5% (Table 1.3)

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 above information

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

Response	Residence		
	Urban	Rural	Combined
Households interview			
Households contacted	2500	2500	5000
Households interviewed	2384	2415	4799
Households response rate (%)	95.6	96.6	96.0
Eligible Participants Step-1			
Individual contacted	2562	2615	5177
Individual interviewed	2561	2615	5177
Response rate (%)	99.6	100.0	99.9
Eligible Participants Step-2			
Step-2 completed	2517	2588	5105
Overall individual response rate (%)	98.2	98.9	98.6

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 Tamil in the present case. It first listed all usual residents age 12 years and above, in

was 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, i.e., 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 drink 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 serving 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 listing 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

As mentioned, the field staff recruited for the survey in Tamil Nadu was trained by MDRF, Chennai and the officials of NIE, Chennai, supervised the training process. The training was conducted from 20-29 August, 2007 at Madras Diabetes Research Foundation (MDRF),

Chennai. The training consisted of lectures, classroom training, demonstration, practice interviews and field based training. A total of 25 participants were trained, 20 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 in Tamil, 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 Senji, Thiruvallur district was also arranged as part 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 conduction of the survey.

Data Entry Training

Data entry software in Epi-Info with its manual was developed by the NIMS, ICMR. A two-days 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 (*bidis, 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 month, 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 Tamil Nadu. It was executed by the Madras Diabetes Research Foundation, Chennai (SSA) and was monitored by the National Institute of Epidemiology, Chennai (RRC). The Division of Non-Communicable Diseases, Indian Council of Medical Research with its National Institute of Medical Statistics coordinated and supervised the survey in the state along with other states. In addition, an independent check by collecting data in randomly drawn sample of 10% of PSUs was carried out by RRC. 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 with an overlapping of 95% confidence intervals. Various activities hitherto were to maintain the highest level of the quality of data.

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 Tamil Nadu. 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 (89%) were Hindu followed by Christian (6%) and Muslim (5%). Hindu constituted

84% of urban households and 93% of rural households. Eighty six percent of sample households had piped drinking water supply followed by 6% from hand pump, 4% from well and a small fraction (0.5%) from surface. It was found that 84% of urban households and 87% of rural households had piped drinking water supply. Regarding the sanitation facility, 57% of the households had pit toilets and 43% had flush toilets. Seventy four percent of urban households had access to the flush toilets as compared to 19% of the rural households in Tamil Nadu.

Over ninety percent (93%) households had electricity

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

Characteristics	Residence		Combined
	Urban	Rural	
Religion of household head			
Hindu	84	92.8	89
Muslim	7.1	2.9	4.6
Christian	8.9	4.3	6.4
Total	100.0	100.0	100.0
Source of drinking water			
Piped	84.2	86.7	85.6
Hand pump	5.5	7.1	6.4
Well water	10.2	5.3	7.5
Surface water	0.1	0.9	0.5
Total	100.0	100.0	100.0
Sanitation facility			
Flush toilet	74.4	18.9	43.1
Pit toilet	25.6	81.1	56.9
Total	100.0	100.0	100.0
Main source of lighting			
Electricity	96.4	90.4	93.0
Kerosene	3.5	9.5	6.9
Gas	0.1	0.1	0.1
Total	100.0	100.0	100.0
Type of House			
Pucca	86.2	61.9	72.5
Semi-Pucca	8.8	16.9	13.4
Kachha	5.0	21.2	14.1
Total	100.0	100.0	100.0

Cooking fuel			
LPG	61.8	18.6	37.4
Wood	26.0	80.0	56.5
Kerosene	12.0	1.3	6.0
Others	0.2	0.1	0.1
Total	100.0	100.0	100.0
Separate kitchen room			
Yes	75.6	51.4	61.9
No	24.4	48.6	38.1
Total	100.0	100.0	100.0
Agriculture land			
Own agriculture land (%)	10.5	42.3	28.4
Number	2384	2415	4799

as main source of lighting, which was slightly higher in urban area (96%) than that in the rural area (90%). In the state, 73% households had *pucca* house, 13% households had *semi-pucca* house and 14% households had *kaccha* house. High percentage of households in the urban area (86%) had *pucca* houses compared to the rural area (62%)s. Several types of fuel were used for cooking in Tamil Nadu, with wood as the most common type (80%) in the rural areas and L.P.G. was most common (62%) in urban area. In the state as a whole, 57% households used wood followed by L.P.G (37%) and kerosene (6%).

Seven in every ten households in Tamil Nadu had no own agricultural land. About 60% households in rural area had no own agricultural land compared to 90% in urban area. The proportion of households having separate kitchen was 62%. This percentage was 76 in urban area against 51 in rural.

2.2 AGE AND SEX COMPOSITIONS

A total of 5105 individuals with 2077 males and 3028 females from urban and rural areas were contacted and interviewed 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 sex 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. 873, in the age group 15-24 and maximum, i.e., 1281 in age group 25-34 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. Thirty three percent of the total respondents were illiterate whereas 30% were with primary or middle, similar pattern was observed for secondary or higher secondary, while 8% were educated up to college and above. In the sample, 41% females and 22% males were illiterate. The proportion of illiterate respondents among rural females was more than half than that among urban females. A higher percentage of males than of females had completed almost each level of schooling. Education levels were much higher for urban respondents than rural respondents.

Table 2.2 Age and sex-wise distribution of respondents by type of residence (unweighted), Tamil Nadu 2007- 08

	Residence								
	Urban			Rural			Combined		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total
15 – 24	189	238	427	180	266	446	369	504	873
25 – 34	240	423	663	205	414	619	445	837	1282
35 – 44	243	322	565	197	311	508	440	633	1073
45 – 54	177	270	447	193	333	526	370	603	973
55 – 64	219	196	415	234	255	489	453	451	904
15 - 64	1068	1449	2517	1009	1579	2588	2077	3028	5105

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 married, 15% were never married and 9% were widowed divorced or separated. The proportion of respondents who were currently married did not vary, much by urban and rural residents.

2.5 OCCUPATION

Table 2.3 provides information on the current occupation of the respondents. In the sample, about two-third females (61%) were currently engaged in domestic works. Individuals involved in agricultural work, which were about 42% in case of males and 26% in case of females, closely followed it. About 16% individuals were engaged in manual work and only 2% of the total respondents were engaged in services/sales work.

Table 2.3 Percentage of respondents according to background characteristics, sex and place of residence, Tamil Nadu, 2007- 08

| Characteristic | Residence | | | | | | Combined | | |
| | Urban | | | Rural | | | | | |
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Education									
Illiterate	14.5	28.2	22.4	29.5	53.0	43.6	21.8	40.9	33.2
Primary	12.1	11.5	11.7	14.7	10.0	11.8	13.4	10.7	11.8
Middle	19.6	18.1	18.7	20.0	16.0	17.0	19.3	16.9	17.9
Secondary	26.4	20.9	23.3	21.1	13.8	17.6	24.3	17.6	20.3
Higher Secondary	12.6	12.6	12.6	8.5	4.8	6.2	10.2	8.5	9.3
College & above	14.8	8.7	11.3	6.2	2.4	3.8	11.0	5.4	7.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Marital status									
Never married	22.4	10.3	15.4	21.3	9.0	13.8	21.9	9.6	14.6
Married	75.6	77.2	76.6	76.5	75.5	75.9	76.0	76.3	76.2
Widowed/Divorced/ Separated	2.0	12.5	8.0	2.2	15.5	10.3	2.1	14.1	9.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Occupation									
Executive/Business	21.6	5.1	12.1	6.1	2.0	3.6	14.1	3.5	7.8
Agriculture	25.8	10.9	17.2	59.2	40.4	47.7	42.0	26.3	32.7
Domestic work	15.0	72.1	47.8	11.9	50.0	35.0	13.5	60.5	41.4
Services/Sales	2.3	0.7	1.4	2.4	1.0	1.5	2.4	0.8	1.5
Manual worker	34.4	11.0	20.8	20.2	6.5	12.0	27.5	8.7	16.4
Other	0.9	0.2	0.7	0.2	0.1	0.2	0.5	0.2	0.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number	1068	1449	2517	1009	1579	2588	2077	3028	5105

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.

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 current smokers, current daily smokers, past daily smokers and those who have never smoked in lifetime are classified as non-smokers.

Table 3.1.1 presents the percentage of respondents, both male and female as well as combined in various categories of smokers and non-smokers according to the place of residence (rural or urban). One in every ten respondents in the survey was current smoker. They were mostly current daily smokers. The prevalence of smoking among men was 27%, whereas none of the females were

smoking tobacco. By place of residence, 13% of rural respondents and 12% of urban respondents were current daily smokers. The past daily smokers were only 6% among males.

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

Among those who were current daily smokers of different products of tobacco, the mean number of smoking per day was 9 in case of *bidis*, 3 for manufactured cigarettes and less than one for hand-rolled cigarettes. Only few female respondents were smoking. The mean frequency of smoking bidi was higher among rural respondents (10 per day) as compared to urban respondents (7 per day). In case of manufactured cigarettes however, the mean number of smoking was higher among urban respondents (4 per day) as compared to rural respondents (2 per day).

Table 3.1.3 presents the mean age of initiation,

Table 3.1.1 Percentage of respondents classified by smoking status across sex and place of residence, Tamil Nadu, 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	25.0	(21.8,28.5)	23.3	(20.3,26.6)	6.5	(5.0,8.4)	68.5	(64.4,72.4)
Female	*		*		*		100.0	
Total	12.6	(10.9,14.5)	11.8	(10.2,13.6)	3.3	(2.5,4.2)	84.1	(81.9,86.2)
Rural								
Male	29.4	(25.6,33.5)	26.5	(22.7,30.8)	5.0	(3.8,6.5)	65.6	(60.9,70.0)
Female	*		*		*		100.0	
Total	14.6	(12.4,17.0)	13.1	(11.0,15.6)	2.5	(1.9,3.3)	83.0	(80.2,85.4)
Combined								
Male	27.4	(24.8,30.1)	25.1	(22.5,27.8)	5.7	(4.7,6.8)	67.0	(63.8,69.9)
Female	*		*		*		100.0	
Total	13.7	(12.3,15.2)	12.5	(11.1,14.1)	2.8	(2.3,3.4)	83.5	(81.7,85.1)

*Percentage not shown based on fewer than 10 unweighted cases

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

Residence/ Sex	Type of smoking					
	Bidi		Manufactured Cigarettes		Hand-rolled Cigarettes	
	Mean	95% CI	Mean	95% CI	Mean	95% CI
Urban						
Male	7.1	(5.7,8.5)	3.7	(3.0,4.4)	0.1	(0.0,0.3)
Female	*		*		*	
Total	7.1	(5.7,8.5)	3.7	(3.0,4.4)	0.1	(0.0,0.3)
Rural						
Male	10.0	(8.4,11.5)	2.4	(1.6,3.2)	0.1	(0.0,0.2)
Female	*		*		*	
Total	10.0	(8.4,11.5)	2.4	(1.6,3.2)	0.1	(0.0,0.2)
Combined						
Male	8.7	(7.6,9,9)	2.9	(2.4,3.5)	0.1	(0.0,0.2)
Female	*		*		*	
Total	8.7	(7.6,9,9)	2.9	(2.4,3.5)	0.1	(0.0,0.2)

*no observation

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. The mean age of cessation of smoking for all those who stopped smoking was 31 years. On an average, the young age (15-34 year) rural resident in Tamil Nadu initiated smoking at the age of 20 years as compared to urban counterpart who initiated it at the age of 19 years. The mean age of initiating smoking for an urban male in the age group 35-64 years was same as that of rural

male (20 years). The mean age of cessation of smoking for rural male was 32 years and for urban male it was 30 years.

About 11% respondents of those who never smoked were exposed to tobacco smoke at home or work place. It was 17% in case of men against about 6% in case of women. Over 10% of the urban respondents and 11% 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.

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, Tamil Nadu, 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	19	(18.5,20.5)	20	(20,20.5)	30	(27.8,32.6)	16.5	(13.3,20.4)
Female	*		*		*		5.6	(4.0,7.8)
Total	19	(18.5,20.5)	20	(20,20.5)	30	(27.8,32.6)	10.4	(8.4,12.7)
Rural								
Male	20	(19.5,20.5)	20	(20,20.5)	32	(28.1,35.2)	17.6	(13.3,22.9)
Female	*		*		*		6.2	(4.8,8.1)
Total	20	(19.5,20.5)	20	(20,20.5)	32	(28.1,35.2)	11.0	(8.8,13.7)
Combined								
Male	20	(19.5,20.5)	20	(20,20.5)	31	(28.8,33.0)	17.1	(14.3,20.3)
Female	*		*		*		6.0	(4.8,7.3)
Total	20	(19.5,20.5)	20	(20,20.5)	31	(28.8,33.0)	10.7	(9.2,12.4)

*no observation

Table 3.1.4 Percentage of smokeless tobacco users by sex and place of residence, Tamil Nadu, 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	9.3	(7.1,12.1)	8.3	(6.2,10.9)	2.5	(1.4,3.7)	88.2	(85.1,91.2)
Female	5.5	(3.4,8.9)	5.3	(3.2,8.6)	0.4	(0.0,0.7)	94.1	(91.4,96.8)
Total	7.4	(5.4,10.0)	6.8	(4.9,9.4)	1.5	(0.8,2.1)	91.1	(88.6,93.6)
Rural								
Male	17.2	(13.9,21.2)	15.9	(12.8,19.5)	1.5	(0.9,2.1)	81.3	(77.7,84.8)
Female	10.8	(8.5,13.7)	10.4	(8.1,13.2)	0.8	(0.3,1.3)	88.4	(85.6,91.2)
Total	14.0	(11.6,16.8)	13.1	(10.8,15.7)	1.1	(0.8,1.5)	84.9	(82.2,87.4)
Combined								
Male	13.6	(11.6,16.0)	12.4	(10.5,14.6)	2.0	(1.3,2.6)	84.4	(82.0,86.7)
Female	8.4	(6.8,10.5)	8.1	(6.5,10.1)	0.6	(0.3,0.9)	91.0	(89.0,92.9)
Total	11.0	(9.4,12.9)	10.2	(8.7,12.0)	1.3	(0.9,1.6)	87.7	(85.9,89.4)

One in every ten respondents in the survey was a current user of smokeless tobacco with 14% among men and 8% among women. A small percentage of men and women (less than 2%) were found to be past daily users. The prevalence of smokeless tobacco user was higher in rural (14%) as compared to that of the urban area (7%). More men (16% in rural and 8% in urban) than women (10% in rural and 5% in urban) were current daily users of smokeless tobacco.

The mean number of times per day various smokeless tobacco products used such as tobacco chewing, pan with tobacco, snuff by mouth, snuff by nose and others are provided in Table 3.1.5.

The mean number of times chewing tobacco per day in Tamil Nadu was about 2 (3 for men and 1 for women). The mean number of times chewing tobacco per day was slightly higher in rural (2.2) as compared to that of the urban (1.8). For those who chew pan with tobacco, the mean frequency was 2 for men and 4 for women. A similar pattern was observed in rural and urban respondents, whereas for snuff by mouth, snuff by nose or others of such kind, the average daily frequency of such consumption was quite less.

The mean age of initiation and age at stopped using 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 aged 15-34 years, was 20 years for both

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, Tamil Nadu, 2007- 08

Residence/ Sex	Type of smokless tobacco									
	Chewing tobacco		Pan with tobacco		Snuff by mouth*		Snuff by nose*		Others	
	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI
Urban										
Male	2.5	(1.6,3.4)	1.7	(1.0,2.5)	0.3	(0.0,0.6)	0.2	(0.0,0.3)	0.5	(0.1,1.0)
Female	0.5	(0.0,1.1)	4.1	(2.6,5.7)	0.5	(0.0,1.3)	0.7	(0.0,1.3)	1.0	(0.0,3.2)
Total	1.8	(1.0,2.5)	2.6	(1.6,3.7)	0.4	(0.0,0.7)	0.4	(0.1,0.6)	0.3	(0.0,0.6)
Rural										
Male	3.2	(2.6,3.7)	2.1	(1.3,2.9)	0.2	(0.0,0.5)	0.4	(0.0,0.8)	0.1	(0.0,0.1)
Female	0.8	(0.5,1.1)	3.9	(3.3,4.4)	0.4	(0.0,0.9)	0.3	(0.0,0.6)	0.0	(0.0,0.1)
Total	2.2	(1.8,2.7)	2.8	(2.2,3.5)	0.3	(0.0,0.5)	0.4	(0.1,0.6)	0.0	(0.0,0.1)
Combined										
Male	3.0	(2.5,3.4)	2.0	(1.4,2.6)	0.2	(0.1,0.3)	0.3	(0.1,0.6)	0.2	(0.1,0.3)
Female	0.7	(0.4,1.0)	3.9	(3.3,4.5)	0.4	(0.0,0.8)	0.4	(0.1,0.7)	0.0	(0.0,0.1)
Total	2.1	(1.7,2.5)	2.7	(2.2,3.3)	0.3	(0.1,0.5)	0.4	(0.2,0.6)	0.1	(0.0,0.2)

*Tooth powder or tooth paste prepared using tobacco

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, Tamil Nadu, 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	22	(19.5,24.5)	25	(20.5,30.5)	25	(20.6,29.6)
Female	17	(16.5,20.0)	30	(23.5,35.5)	44	(42.4,46.0)
Total	20	(19.5,23.5)	26	(23.5,31.5)	28	(23.4,32.3)
Rural						
Male	20	(19.5,24.5)	25	(22.5,27.5)	31	(26.5,36.5)
Female	20	(15.5,26.5)	30	(27.5,32.5)	41	(34.4,48.3)
Total	20	(19.5,22.5)	28	(25.5,30.5)	35	(30.3,39.0)
Combined						
Male	20	(19.5,23.5)	25	(23.5,27.5)	28	(24.8,31.5)
Female	20	(16.5,26.5)	30	(27.5,32.5)	42	(37.2,47.2)
Total	20	(19.5,22.5)	27	(25.5,30.5)	31	(28.2,34.7)

males and females where as there was no sex differential in mean age of initiation of smokeless tobacco use in rural. Urban female appears to initiate smokeless tobacco slightly earlier (17 years) than urban males (22 years). For respondents aged 35-64 years, the mean age of initiation of smokeless tobacco use was 26 years (25 years for males and 30 years for females) in urban residence. The mean age of quitting smokeless tobacco use was 31 years; it was 28 years in case of men and 42 years in case of women. The mean age of quitting smokeless tobacco use for urban respondents was 28 years against 35 years for rural respondents.

Table 3.1.7 Presents the percentage of smokers and smokeless tobacco users by sex and the place of residence. It shows that 22% of respondents were either smoking or using smokeless tobacco, whereas only 1% of the respondents were using both forms of tobacco, i.e. smoking and also smokeless tobacco. There was urban rural differences in prevalence of use of either smoking or smokeless tobacco. The percentage of respondents either smoking or using smokeless tobacco among men (36%) was much higher than that among women (8%).

Overall, one-fourth of male population in Tamil Nadu smoked tobacco daily whereas smoking among females was very low. Overall 11% of the population used

Table 3.1.7 Percentage of tobacco users by sex and place of residence, Tamil Nadu, 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	6.5	(4.7,9.0)	21.6	(18.6,24.8)	1.8	(1.0,3.2,)	29.8	(26.2,33.7)
Female	5.3	(3.2,8.6)	*		*		5.3	(3.2,8.6)
Total	5.9	(4.1,8.3)	10.9	(9.3,12.6)	0.9	(0.5,1.6)	17.6	(14.8,20.9)
Rural								
Male	13.6	(10.7,17.1)	24.3	(20.3,28.8)	2.2	(1.4,3.6)	40.2	(36.7,43.8)
Female	10.4	(8.1,13.2)	*		*		10.4	(8.1,13.2)
Total	12.0	(9.8,14.5)	12.0	(9.9,14.6)	1.1	(0.7,1.8)	25.1	(22.6,27.9)
Combined								
Male	10.4	(8.6,12.5)	23.1	(20.5,25.8)	2.0	(1.4,2.9)	35.5	(32.9,38.1)
Female	8.1	(6.5,10.1)	*		*		8.1	(6.5,10.1)
Total	9.2	(7.8,10.9)	11.5	(10.1,13.1)	1.0	(0.7,1.5)	21.8	(19.9,23.8)

*no observation

smokeless tobacco with 14% of men and 8% of women. Use of smokeless tobacco was high among rural population compare to urban. Twenty two percent of population in Tamil Nadu used tobacco in any form (i.e. smoking or smokeless). This prevalence was 36% among males and 8% among females. The mean age of initiation of tobacco use among young age people was 20 years for smokers and smokeless tobacco users of both sex. These findings emphasize the need of implementing the tobacco control programme for prevention of NCD.

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% of the respondents consumed alcohol in past 30 days and 15% consumed in past 12 months. Only 3% respondents were past drinker. Twenty one percent men consumed alcohol in past 30 days and about a quarter (30%) men did so in past 12 months as compared to very less among women (less than 1%). Percentage of lifetime abstainer to alcohol was high in urban (85%) as compared to that in rural respondents (81%). Rural men were more likely to consume alcohol (23% in past 30 days and 33% in past 12 months) than urban men (19% in past 30 days and 26% 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 avarege standard drinks per day.

Of the current drinkers, 55% of urban, 59% of rural respondents and 58% in the combined sample consumed alcohol on less than one occasion in a month. Further,

Table 3.2.1 Percentage of Alcohol consumption by sex and place of residence, Tamil Nadu, 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	18.8	(15.8,22.3)	25.6	(22.0,29.6)	6.1	(4.4,8.3)	68.3	(65.9,73.6)
Female	*		0.1	(0.0,0.4)		*	99.9	(99.5,100.0)
Total	9.5	(7.9,11.3)	12.9	(11.0,15.1)	2.6	(1.9,3.6)	84.5	(82.5,86.8)
Rural								
Male	23.1	(20.1,26.4)	32.7	(29.7,35.8)	7.0	(4.6,10.5)	60.3	(58.6,66.5)
Female	*		*		*		100.0	(99.7,100.0)
Total	11.5	(9.8,13.4)	16.2	(14.4,18.2)	2.8	(1.8,4.2)	81.0	(78.9,83.7)
Combined								
Male	21.2	(19.0,23.5)	29.5	(27.1,31.9)	6.6	(5.0,8.5)	63.9	(63.1,68.6)
Female	*		0.1	(0.0,0.2)	*		99.9	(99.7,100.0)
Total	10.6	(9.4,11.9)	14.7	(13.4,16.2)	2.7	(2.1,3.5)	82.6	(81.2,84.5)

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 sex and place of residence, Tamil Nadu, 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	13.9	*	13.9	12.8	*	12.8	13.2	*	13.2
1-4 days per week	7.1	*	7.1	7.2	*	7.2	7.1	*	7.1
1-3 days per month	23.8	*	23.8	20.9	*	20.9	22.1	*	22.0
Less than once per month	55.2	*	55.2	59.1	*	59.1	57.6	*	57.6

Mean number of drinks on a drinking day	4.7	*	4.7	4.7	*	4.7	4.7	*	4.7
Drinks during last 7 days Alcohol consumed on 4+days (%)	12.6	*	12.6	16.1	*	16.1	14.7	*	14.7
**Binge drinking on any day (%)	47.1	*	47.1	46.4	*	46.4	46.7	*	46.7
20+ drinks in 7days (%)	10.7	*	10.7	14.0	*	14.0	12.6	*	12.6
Average standard drinks per day	1.6	*	1.6	1.7	*	1.7	1.7	*	1.7

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

24% of the urban respondents and 21% of the rural respondents consumed alcohol, 1-3 days per month in past one year. Seven percent of the urban and rural respondents consumed alcohol 1-4 days every week and 14% of the urban respondents and 13% of the rural respondents consumed alcohol 5-7 days every week in the past one year. The average numbers of drinks consumed on a drinking day was 5 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 13% of urban respondents, 16% of the rural respondents and overall 15% respondents consumed alcohol at least 4 days a week. About 47% of current drinkers were in high risk drinking (binge drinking) and there was no urban-rural differential, but it was 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 two drinks.

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 years and 35-64 years. The mean age of initiation of alcohol consumption regularly in the age group of 15-34 years was 21 years with 22 years for urban and 20 years for rural respondents. The mean age of initiation in the age group 35-64 years was 25 years.

Table 3.2.4 presents the percentage of current daily smokers, 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 (29%), among illiterates (32%) and agriculturist (50%). Similarly, percentage of smokeless tobacco users was high in the age group 35-44 years (27%), among illiterates and agriculturists (59%). The percentage of current drinkers was high (31%) in the age group 25-34, among illiterates (29%) and those who reported their occupation as agriculture (47%).

Interesting observations of alcohol consumption

Table 3.2.3 Mean age of initiation of alcohol use by sex and place of residence, Tamil Nadu, 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, 24)	27	(25,30)
Female	*		*	
Total	22	(21, 24)	25	(25,30)
Rural				
Male	20	(20, 21)	25	(25,27)
Female	*		*	
Total	20	(20, 21)	25	(25,27)
Combined				
Male	21	(21, 22)	25	(25,27)
Female	*		*	
Total	21	(21, 22)	25	(25,27)

*no observation

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

Characteristic	Daily Smoking	Daily Smokeless tobacco	Daily Alcohol
Age group			
15-24	10.4	8.9	13.1
25-34	26.9	17.0	30.5
35-44	28.7	26.8	28.5
45-54	23.3	25.3	19.9
55-64	10.7	22.0	8.0
Total	100.0	100.0	100.0
Education			
Illiterate	31.8	59.2	28.5
Primary	15.5	12.3	15.0
Middle	24.0	15.1	24.6
Secondary	18.7	10.7	20.2
Higher Secondary	6.0	1.4	4.9
College & above	4.0	1.3	6.8
Total	100.0	100.0	100.0
Occupation			
Executive/Business	8.1	2.8	9.8
Agriculture	49.8	58.7	46.5
Domestic Work	0.1	1.2	0.1
Services/Sales	3.5	1.1	3.5
Manual Worker	32.9	20.0	36.9
Other	5.6	16.2	3.2
Total	100.0	100.0	100.0
Number	602	617	622

was that three in every ten men consumed alcohol at least once in last one year whereas two in every ten men in last one month. The alcohol consumption among females was very low. Those who consumed alcohol in last seven days, half of them were binge drinkers. The mean age of initiation of alcohol consumption by young age (15-34 years) men was 21 years.

3.3 FRUITS AND VEGETABLES CONSUMPTION

Survey asked questions about the number of days in a typical 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. In a week, mean number of days people in Tamil Nadu consumed vegetables was 5 days and fruits 2 days. The mean number of days when fruits were consumed was higher in case of urban (3 days per week) as compared to that of rural population (2 days per week).

Ninety nine percent of the respondents report that they had less than five servings of fruits and vegetables per day on those days when they

Table 3.3.1 Mean number of days in a week fruit and vegetable consumed by the respondents according to sex and place of residence, Tamil Nadu, 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	2.6	2.4	2.5	1.9	1.1	1.5	2.2	1.7	2.0
Mean Number of days vegetables consumed	4.9	5.1	5.0	4.6	4.6	4.6	4.7	4.8	4.7
Less than five servings of fruits & vegetables consumed per day (%)	98.4	99.7	99.0	98.1	99.5	98.8	98.2	99.6	98.9

consumed it. It was almost same among urban and rural respondents.

Table 3.3.2 presents the mean number of servings of fruits and vegetables consumed on a typical day by sex and place of residence. The mean number of servings of fruits and vegetables each in one particular day was less than one across the sex and place of residence.

Nutritional inadequacy is the major risk factor of many non-communicable diseases. Overall, 99% of population in Tamil Nadu consumed less than five servings of fruits and vegetables per day, which was inadequate as per WHO recommended standards. On an average only two days in a week people consumed fruits against vegetables consumed on 5 days. 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 is provided in Table 3.3.3. The specific food items include cheese/butter, fried local foods, red meat, eggs, chicken, aerated soda, sweetened drinks, pizza/burger/French fries, cakes/ pastries or other bakery items, chips/*namkeen* etc. Over 45% population consumed eggs, 23% consumed fish and chicken, about 25% each consumed red meat and fried local foods and 10% consumed cakes/pastries or other bakery items at least once a week. Fried local food was consumed daily that too only by 8% population. Chease butter, eggs and cakes/pastries or other bakery items were also consumed daily by less than 4% of the population.

Table 3.3.4 presents the type of edible oil used for cooking by the sample households in rural and urban residence. It shows that the use of groundnut oil for cooking was higher (41% households with 25% of urban and 55% of rural households) followed by sunflower oil (30% households with 47% of urban and 16% of rural households) and palm oil (12% households with 13% of urban and 11% of rural households).

Table 3.3.2 Mean number of servings of fruits, vegetables consumed in on a typical day by sex and place of residence, Tamil Nadu, 2007- 08

Number of servings of fruits/vegetables/both per day	Residence								
	Urban			Rural			Combined		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Servings of fruit	0.6	0.6	0.6	0.5	0.4	0.4	0.6	0.6	0.5
Servings of vegetable	0.9	0.9	0.8	0.9	0.8	0.8	0.9	0.8	0.9
Servings of fruit and vegetable	1.5	1.4	1.5	1.4	1.3	1.4	1.5	1.4	1.4

Table 3.3.3 Percentage of respondents according to the intake of specific food items by sex and place of residence, Tamil Nadu, 2007- 08

	Residence					
	Urban		Rural		Combined	
Specific Food Items	Daily	At least once in a week	Daily	At least once in a week	Daily	At least once in a week
Cheese/Butter	3.4	6.3	1.6	2.6	2.4	4.3
Fried local foods	9.3	28.2	8.0	21.6	8.6	24.6
Red Meat	0.3	32.7	0.2	18.1	0.2	24.7
Eggs	4.3	52.9	3.5	39.5	3.9	45.6
Chicken	0.4	31.0	0.4	16.0	0.4	22.8
Fish	2.4	26.6	0.9	20.5	1.6	23.2
Aerated Soda	0.9	6.8	0.8	6.4	0.9	6.6
Sweetened drinks	0.4	5.0	0.3	3.2	0.4	4.0
Pizza/ burgers/ French fries etc.	0.1	1.1	0.3	0.5	0.0	0.6
Cakes, Pastries or other bakery items	1.7	13.4	0.6	7.1	1.1	10.0
Chips, Namkeen etc.	2.0	20.6	0.9	14.9	1.4	17.5

Table 3.3.4 Percentage of households according to type of oil consumed, Tamil Nadu, 2007- 08

Type of oil	Residence		Combined
	Urban	Rural	
Coconut oil	2.3	3.8	3.1
Groundnut oil	25.0	54.6	41.3
Sunflower oil	46.8	16.3	30.1
Palm oil	12.6	10.6	11.5
Vanaspati oil	0.1	0.0	0.0
Others	13.2	14.7	14.0
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 Tamil Nadu were doing some physical activity for duration of 1309 MET minutes per day (1213 MET minutes per day in urban and 1387 MET minutes per day in rural). Men, on an average, spent 1425 MET minutes a day while women spent 1192 MET minutes a day on physical activity. The mean time spent in work related physical activity was 229 minutes per day, which was 221 minutes per day in urban and 235 minutes per

day in rural. The time spent in work related physical activity was more among women (241 minutes per day) than men (217 minutes per day).

The mean time spent in travel related activity (cycling/walking) was found to be about 53 minutes per day (50 minutes for urban and 55 minutes per day for rural respondents). It was more among men (63 minutes per day) as compared to women (42 minutes per day). The survey also reports that the mean time spent in recreational activities was low (5 minutes per day). Men spent more time (9 minutes per day) than women (One minutes per day) in recreational activities.

According to WHO Global Physical Activity Questionnaire, Analysis Guidelines[7], the total physical activity of the respondents was classified under three categories low, medium and high on the basis of duration for which they performed 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 (66% overall, 71% of urban and 62% of rural respondents) recorded low physical activity, 30% of respondents (26% of urban and 33% of rural respondents) recorded medium physical activity and only 4% of respondents (3% of urban and 5% of rural respondents) recorded in high level physical activity. Table 3.4.3 presents the percentage of respondents according to, category of time spent in physical activity

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

Physical Activity	Residence						Combined		
	Urban			Rural					
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Total Physical Activity(MET)									
Mean	1304.1	1119.9	1212.7	1526.0	1250.4	1387.0	1425.1	1192.1	1308.5
95% CI Lower	1187.5	1050.3	1130.5	1421.7	1175.8	1306.4	1347.9	1141.3	1250.8
Upper	1420.8	1189.5	1294.9	1630.2	1325.0	1467.7	1502.4	1242.9	1366.1
Work Related Activity									
Mean	209.1	233.4	221.9	222.7	247.0	234.9	216.5	240.9	228.7
95% CI Lower	193.1	219.1	208.6	207.0	233.3	221.9	205.3	231.1	219.6
Upper	225.2	247.6	233.7	238.4	260.8	248.0	227.6	250.7	237.8
Travel Related Activity									
Mean	61.6	38.6	50.2	65.0	45.4	55.1	63.4	42.4	52.9
95% CI Lower	54.5	34.5	45.2	59.1	41.2	50.7	59.0	39.4	49.6
Upper	68.6	42.8	55.2	70.9	49.6	59.5	67.9	45.3	56.2
Recreational Activity									
Mean	8.1	1.1	4.6	8.9	0.8	4.8	8.5	0.9	4.7
95% CI Lower	6.2	0.6	3.6	6.1	0.3	3.3	6.8	0.6	3.8
Upper	10.1	1.6	5.7	11.7	1.3	6.3	10.3	1.3	5.7
Number	1068	1449	2517	1009	1579	2588	2077	3028	5105

by age and sex. The percentage of population in high level physical activity was more among age group 35-44 years compare to other age group of people. The total time spent daily in sedentary activities was also recorded and provided in Table 3.4.4. Majority of the respondents (79%) spent more than 4 hours in sedentary activities.

Table 3.4.2 Percentage of respondents classified in three categories of total physical activity per day (P & 95% CI), Tamil Nadu, 2007-08

| Physical Activity | Residence | | | | | | Combined | | |
| | Urban | | | Rural | | | | | |
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Low	63.4	78.3	70.8	52.2	70.9	61.6	57.3	74.2	65.8
95% CI									
Lower	57.7	72.9	65.9	46.7	66.1	56.9	53.4	70.7	62.4
Upper	68.7	82.9	75.2	57.7	75.3	66.2	61.1	77.4	68.9
Medium	30.8	20.8	25.8	40.0	27.0	33.4	35.8	24.2	30.0
95% CI									
Lower	26.8	16.3	22.1	35.2	22.8	29.3	32.6	21.1	27.2
Upper	35.0	26.1	29.9	44.9	31.6	37.7	39.1	27.6	32.9
High	5.9	0.9	3.4	7.8	2.1	4.9	6.9	1.6	4.3
95% CI									
Lower	3.7	0.4	2.2	5.7	0.9	3.4	5.3	0.8	3.2
Upper	9.3	1.9	5.3	10.6	4.8	7.1	9.0	3.0	5.6

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

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

| Age group | Sex | | | | | | | | |
| | Men | | | Women | | | Both Sex | | |
	Low	Medium	High	Low	Medium	High	Low	Medium	High
15-24	66.6 (61.2,71.7)	27.3 (22.7,32.5)	6.0 (3.8,9.4)	81.2 (77.0,84.7)	18.2 (14.6,22.4)	0.7 (0.2,1.2)	73.9 (70.1,77.4)	22.8 (19.5,26.4)	3.3 (2.2,5.0)
25-34	49.4 (43.8,55.0)	43.2 (38.0,48.6)	7.4 (5.1,10.7)	70.9 (66.1,75.3)	27.7 (23.3,32.5)	1.4 (0.6,3.3)	60.4 (55.8,64.9)	35.2 (31.1,39.6)	4.3 (3.1,6.1)
35-44	50.3 (44.1,56.5)	39.6 (34.3,45.2)	10.0 (7.0,14.3)	66.9 (61.2,72.2)	29.8 (25.0,35.1)	3.3 (1.6,6.5)	58.6 (53.6,63.4)	34.8 (30.8,38.9)	6.7 (4.5,9.7)
45-54	54.9 (47.6,61.9)	38.7 (32.8,45.0)	6.4 (3.7,10.9)	69.7 (64.8,74.2)	28.6 (24.2,33.4)	1.6 (0.7,4.0)	62.1 (56.9,67.0)	33.8 (29.6,38.3)	4.1 (2.4,6.8)
55-64	67.8 (62.1,73.1)	29.5 (24.6,34.9)	2.7 (1.5,4.7)	84.2 (78.7,88.5)	14.6 (10.4,20.1)	1.2 (0.4,3.3)	76.1 (72.4,79.4)	22.0 (18.7,25.7)	1.9 (1.2,3.1)

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

| Time spent sitting/ reclining | Residence | | | | | | Combined | | |
| | Urban | | | Rural | | | | | |
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Less than 1 hours	2.8	2.3	2.6	4.1	2.1	3.1	3.5	2.2	2.9
1-2 hours	2.6	1.0	1.8	3.0	2.6	2.8	2.8	1.7	2.3
2-3 hours	6.7	2.9	4.8	1.8	6.2	8.5	8.9	4.7	6.8
3-4 hours	12.7	4.9	8.9	12.4	7.6	10.0	12.6	6.4	9.5
More than 4 hours	75.2	88.9	82.0	69.7	81.4	75.0	72.2	84.8	78.5

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 as smoking and other forms of smokeless tobacco use among urban and rural residents of Tamil Nadu. The prevalence and pattern of smoking among urban male respondents was increasing with age (9% in 15-24 to 35% in 45-54) . But, it was decreasing with increasing level of education (44% among illiterate to 15% 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 service (56%) and agriculture (31%) 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 (3% in 15-24 to 12% in 55-64 aged respondents). Prevalence of smokeless tobacco users among females was recorded low (6%), but the pattern was increasing with age. However, the prevalence with education was showing a declining pattern with increasing level of education (20% among illiterate to 1% in higher Secondary). In the occupational categories, prevalence of smokeless tobacco users among the occupation of domestic work (20%) and agriculture (17%) was high compare with others. Among urban male respondents, smokers were higher (25%) than smokeless tobacco users (9%), 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 (25%). 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 (11% in 15-24 to 45% in 45-54). Prevalence of smoking among occupational categories of agriculture (34%) and manual worker (33%) 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 (39% in 25-34, 34% in 35-44, 26% in 45-54 and 19% in 55-64 age groups). It was comparatively low among younger age (9% in 15-24). An increasing pattern of prevalence with age was observed up to age group of 25-34 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 (39%), Primary (42%) and Middle (27%), than started declining with higher level (17% among collage). Prevalence of drinking alcohol in occupational categories of male urban respondents was high among service (43%), manual worker (30%) and agriculture (30%). 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 (34% in 25-34, 43% in 35-44, 46% in 45-54 and 27% in 55-64). A similar pattern of prevalence of alcohol use was observed in the 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 (99%) among urban population with less differences between age groups (99% in 15-24 to 98% in 55-64). Inadequate consumption of fruits and vegetables was also high in all the education level (100% among illiterate to 97% among college). Differences in occupation categories were also marginal (Table 3.5.1). A similar pattern of inadequate consumption of fruits and vegetables was observed among rural population. Prevalence of inadequate consumption was high among all the age groups (98% in 15-24 to 99% in 55-64). A declining pattern with increasing level of education was observed with less differences (99% among illiterate and 97% among higher education). In the occupational categories, inadequate consumption of fruits and vegetables was high among all the occupation, domestic

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, Tamil Nadu, 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	9.3	0.0	4.6	5.0	0.0	2.5	9.2	0.0	4.6	98.5	100.0	99.2	68.0	83.4	75.8
25-34	30.4	0.0	15.0	12.0	3.0	7.4	39.0	0.2	19.4	99.1	99.7	99.4	55.9	77.9	67.0
35-44	32.0	0.0	16.4	8.4	10.0	9.2	34.1	0.0	17.5	97.9	99.5	98.7	59.2	71.0	65.0
45-54	35.1	0.0	18.5	12.0	10.7	11.4	25.6	0.0	13.4	98.4	99.6	99.0	64.7	72.4	68.4
55-64	24.5	0.0	12.3	12.5	11.6	12.1	19.2	0.0	9.6	97.2	98.9	98.1	76.8	88.7	82.8
Total	25.0	0.0	12.6	9.3	5.5	7.4	25.6	0.1	12.9	98.4	99.7	99.0	63.4	78.3	70.8
Education															
Illiterate	43.5	0.0	15.7	21.5	19.1	20.0	38.6	0.0	13.9	100.0	99.8	99.8	44.1	71.8	61.9
Primary	37.3	0.0	18.7	12.4	3.0	7.7	41.9	0.0	21.0	98.3	99.5	98.9	48.8	65.5	57.1
Middle	31.5	0.0	16.6	13.5	1.7	7.9	27.1	0.3	14.4	99.0	100.0	99.5	56.7	74.8	65.3
Secondary	22.8	0.0	12.6	7.3	0.9	4.4	21.8	0.0	12.1	99.3	99.7	99.5	65.9	79.7	72.0
Higher Secondary	15.4	0.0	7.0	2.2	0.0	1.0	16.7	0.0	7.6	98.2	99.6	98.9	71.2	86.2	79.4
College & above	8.0	0.0	5.0	2.0	0.0	1.3	16.5	0.0	10.2	96.0	99.1	97.2	82.4	95.1	87.3
Total	25.0	0.0	12.6	9.3	5.5	7.4	25.6	0.1	12.9	98.4	99.7	99.8	63.4	78.3	70.8
Occupation															
Executive/Business	17.0	0.0	13.7	3.3	0.8	2.8	21.6	0.0	17.4	97.8	98.8	98.0	83.5	80.2	82.9
Agriculture	30.7	0.0	21.5	14.3	22.8	16.8	29.8	0.0	20.9	99.2	99.4	99.3	46.9	52.3	48.5
Domestic Work	**	0.0	0.0	**	16.3	20.0	**	0.0	6.6	**	100.0	94.3	**	36.8	44.5
Services/Sales	55.9	**	44.7	4.2	**	8.1	42.9	**	34.3	100.0	**	100.0	61.5	**	61.2
Manual Worker	29.1	0.0	22.4	11.8	8.6	11.0	30.3	0.0	23.3	99.1	100.0	99.3	48.9	56.2	50.4
Other	12.4	0.0	2.3	3.9	2.4	2.7	9.9	0.1	1.9	96.5	99.7	99.1	97.0	86.6	88.5
Total	25.0	0.0	12.6	9.3	5.5	7.4	25.6	0.1	12.9	98.4	99.7	99.0	63.4	78.3	70.8
Number (n)	1068	1449	2517	1068	1449	2514	1068	1449	2517	1068	1449	2517	1068	1449	2517

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

(100%) and agriculture (99%). It was comparatively low (91%) among executive category (Table 3.5.2). Overall, prevalence and pattern of consumption of fruits and vegetables by age, education and occupation was high with similar pattern as recoded in rural and urban population of Tamil Nadu (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 (71%) and it was varying with age groups (76% in 15-24, 67% in 25-34, 65% in 35-44, 68% in 45-54 and 83% in 55-64). Prevalence of low physical activity was high among old and young age people. Low physical activity by sex was recorded high (78%) among female respondents compare with males (63%), 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 (62% of illiterate to 87% of higher level). Accordingly, low physical activity was recorded high among the executive and business

(83%), and service (61%) 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 people (62%) were doing more physical work than urban (71%) 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 (79% in college) compare with lower level (53% among illiterate) in rural population. Similarly, occupational differences in low physical activity were also observed across all the categories. The occupational categories of agriculture and manual worker people were doing more physical work compare with others. Overall, low physical activity was high among the executive and business people (82%) 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 six 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, Tamil Nadu, 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	11.2	0.0	5.7	9.2	0.4	4.9	19.8	0.0	10.0	97.8	99.2	98.5	65.5	79.3	72.3
25-34	31.1	0.0	15.1	13.3	3.7	8.3	33.9	0.0	16.4	98.1	99.8	98.9	43.5	64.9	54.5
35-44	40.8	0.0	20.2	21.6	14.3	17.9	42.7	0.0	21.1	97.5	99.4	98.4	42.7	63.6	53.3
45-54	44.9	0.0	22.6	23.5	21.8	22.7	45.7	0.3	23.1	99.4	99.7	99.6	46.8	67.7	57.2
55-64	29.8	0.0	14.7	29.9	31.5	30.7	26.8	0.0	13.2	98.3	99.3	98.8	61.4	81.0	71.4
Total	29.4	0.0	14.6	17.2	10.8	14.0	32.7	0.1	16.2	98.1	99.5	98.8	52.2	70.9	61.6
Education															
Illiterate	41.1	0.0	14.5	27.9	20.5	23.2	44.7	0.1	15.9	99.4	99.4	99.4	35.8	62.8	53.3
Primary	37.8	0.0	20.5	24.0	7.7	16.6	35.2	0.0	19.1	100.0	100.0	100.0	48.1	69.7	58.0
Middle	33.7	0.0	17.8	18.4	2.2	10.8	38.7	0.0	20.5	98.0	99.5	98.7	48.5	72.8	59.9
Secondary	24.2	0.0	14.1	14.5	0.4	8.6	29.7	0.0	17.2	96.8	99.2	97.8	59.4	80.5	68.3
Higher Secondary	11.8	0.0	7.5	2.6	0.6	1.9	9.8	0.0	6.2	96.9	100.0	98.0	69.6	87.1	76.0
College & above	11.4	0.0	7.8	1.6	0.0	1.1	19.4	0.0	13.2	96.7	98.7	97.4	72.1	93.6	79.0
Total	29.4	0.0	14.6	17.2	10.8	14.0	32.7	0.1	16.2	98.1	99.5	98.8	52.2	70.9	61.6
Occupation															
Executive/Business	19.4	0.0	14.2	10.5	0.0	7.7	20.4	0.0	15.0	89.1	97.0	91.2	77.3	83.3	78.9
Agriculture	34.4	0.0	19.9	22.6	15.5	19.6	38.0	0.1	22.0	98.8	99.7	99.2	37.1	46.6	41.4
Domestic Work	**	0.0	5.4	0.0	21.5	20.3	**	0.0	5.4	**	100.0	100.0	**	66.0	62.4
Services/Sales	19.3	0.0	15.0	7.4	11.8	8.4	33.3	0.0	25.9	96.5	100.0	97.3	77.4	72.4	76.3
Manual Worker	32.5	0.0	24.8	14.1	10.8	13.3	37.6	0.0	28.7	98.1	99.2	98.3	53.6	65.7	56.5
Other	9.3	0.0	2.0	6.4	7.5	7.3	7.1	0.0	1.5	99.1	99.4	99.3	95.0	89.9	91.0
Total	29.4	0.0	14.6	17.2	10.8	14.0	32.7	0.1	16.2	98.1	99.5	98.8	52.2	70.9	61.6
Number (n)	1009	1579	2588	1009	1579	2588	1009	1579	2588	1009	1579	2588	1009	1579	2588

** 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, Tamil Nadu, 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	10.4	0.0	5.2	7.3	0.2	3.8	15.0	0.0	7.5	98.1	99.6	98.8	66.6	81.2	73.9
25-34	30.8	0.0	15.0	12.7	3.3	7.9	36.2	0.1	17.8	98.6	99.8	99.2	49.4	70.9	60.4
35-44	36.7	0.0	18.5	15.5	12.4	14.0	38.7	0.0	19.5	97.7	99.4	98.5	50.3	66.9	58.6
45-54	40.5	0.0	20.8	18.3	17.1	17.7	36.7	0.2	18.9	99.0	99.7	99.3	54.9	69.7	62.1
55-64	27.6	0.0	13.7	22.6	23.4	23.0	23.6	0.0	11.7	97.8	99.1	98.5	67.8	84.2	76.1
Total	27.4	0.0	13.7	13.6	8.4	11.0	29.5	0.1	14.7	98.2	99.6	98.9	57.3	74.2	65.8
Education															
Illiterate	41.9	0.0	14.9	26.0	20.1	22.2	42.9	0.1	15.3	99.6	99.5	99.5	38.3	65.5	55.9
Primary	37.6	0.0	19.7	19.0	5.5	12.6	38.1	0.0	19.9	99.3	99.8	99.5	48.4	67.7	57.6
Middle	32.7	0.0	17.3	16.2	2.0	9.5	33.4	0.1	17.7	98.5	99.8	99.1	52.3	73.8	62.4
Secondary	23.6	0.0	13.4	11.1	0.6	6.6	26.0	0.0	14.8	98.0	99.5	98.6	62.5	80.1	70.1
Higher Secondary	13.5	0.0	7.2	2.4	0.2	1.4	13.0	0.0	7.0	97.5	99.7	98.5	70.3	86.6	77.9
College & above	9.2	0.0	5.9	1.9	0.0	1.2	17.5	0.0	11.2	96.2	99.0	97.2	78.8	94.7	84.5
Total	27.4	0.0	13.7	13.6	8.4	11.0	29.5	0.1	14.7	98.2	99.6	98.9	57.3	74.2	65.8
Occupation															
Executive/Business	17.6	0.0	13.8	5.0	0.5	4.1	21.3	0.0	16.8	95.7	98.2	96.3	82.1	81.2	81.9
Agriculture	33.4	0.0	20.3	20.3	16.8	18.9	35.8	0.1	21.8	98.9	99.7	99.2	39.8	47.6	42.9
Domestic Work	**	0.0	2.1	**	18.3	20.1	**	0.0	6.1	**	100.0	96.5	**	48.5	51.4
Services/Sales	35.0	0.0	27.5	6.0	16.4	8.3	37.4	0.0	29.4	98.0	100.0	98.4	70.5	67.6	69.9
Manual Worker	30.6	0.0	23.5	12.8	9.6	12.1	33.6	0.0	25.7	98.7	99.6	98.9	50.9	60.5	53.1
Other	10.9	0.0	2.1	5.2	4.8	4.9	8.5	0.1	1.7	97.8	99.6	99.2	96.0	88.1	89.7
Total	27.4	0.0	13.7	13.6	8.4	11.0	29.5	0.1	14.7	98.2	99.6	98.9	57.3	74.2	65.8
Number (n)	2077	3028	5105	2077	3028	5105	2077	3028	5105	2077	3028	5105	2077	3028	5105

** 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 5% respondents (4% men and 5% women) were found to have been diagnosed hypertension by the health professional. In the urban, the prevalence of hypertension was 6% each for both men and women. In rural, 3% of males and 4% of females were hypertensive.

Of those who were diagnosed hypertensive, majority of them (77%) were taking the prescribed medicine. A higher percentage of men (80%) than women (74%) were taking medicine. It appears to be more common in urban where 85% men against 76% women take medicine after they were diagnosed with hypertension. More than 65% percent of those who were diagnosed with hypertension, were advised dietary modification including low salt intake; 35% were advised to lose weight, 39% were advised to increase physical activity and 7% were advised to quit smoking. The percentage of those who received dietary advice including low salt intake was slightly higher for women (66%) than for men (65%).

Among those who were diagnosed hypertensive, 3% had consulted AYUSH with 2% of urban and 6% of rural respondents. By sex, 5% such men against 2% women were consulting AYUSH. Among those respondents who had consulted AYUSH, more than half were taking the treatment from the AYUSH practitioner which was 81% in case of urban and 41% in case of rural.

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, Tamil Nadu, 2007- 08.

Hypertension	Residence						Combined		
	Urban			Rural					
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Hypertension diagnosed by health professional (all respondents	5.6	6.0	5.8	2.5	4.2	3.4	3.9	5.0	4.5
Currently taking drugs	85.2	75.5	80.3	71.4	71.5	71.4	80.4	73.7	76.6
Advised dietary modifications	63.9	67.5	65.8	70.1	62.3	65.2	66.1	65.1	65.5
Advised to lose weight	37.8	34.4	36.1	410	28.7	33.3	38.9	31.8	34.9
Advised to quit smoking	17.3	0.0	8.5	13.5	0.0	5.1	16.0	0.0	7.1
Advised to increase physical activity	44.6	34.0	39.1	48.4	34.6	39.7	45.9	34.2	39.4
Consulted AYUSH practitioner	2.3	1.4	1.8	9.9	3.2	5.6	4.9	2.2	3.4
Taking treatment from AYUSH practitioner	68.1	100	80.6	28.6	65.1	41.3	40.5	77.1	53.7

Table 4.1.2 presents the mean systolic and diastolic blood pressure by sex and place of residence. The mean systolic blood pressure was 124 mm Hg, while mean diastolic blood pressure was 78 mm Hg. These averages were almost same for rural and urban both, but little higher for males than females.

According to WHO STEPS guidelines, the population are 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 has been given in Table 4.1.3

Table 4.1.4 presents the percentage of respondents

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

| Blood Pressure | Residence | | | | | | Combined | | |
| | Urban | | | Rural | | | | | |
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Systolic blood pressure	128.0	122.0	125.0	126.0	122.0	124.0	127.0	122.0	124.2
95% CI									
Lower	127.0	120.3	124.0	125.0	120.5	123.0	126.1	121.0	124.0
Upper	129.0	123.0	126.0	127.0	123.0	125.0	128.0	122.5	125.0
Diastolic blood pressure	80.0	77.0	78.1	77.5	76.4	77.0	78.4	76.6	77.5
95% CI									
Lower	79.0	76.0	77.4	77.0	76.0	76.3	78.0	76.0	77.0
Upper	80.4	78.0	79.0	78.5	77.1	78.0	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), Tamil Nadu, 2007- 08

| Category of hypertension | Residence | | | | | | Combined | | |
| | Urban | | | Rural | | | | | |
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Normal	26.1	45.2	35.6	31.4	48.1	39.8	29.0	46.8	37.9
95% CI									
Lower	23.2	41.8	33.0	27.9	44.7	37.1	26.7	44.4	36.1
Upper	29.2	48.7	38.3	35.2	51.5	42.6	31.5	49.2	39.9
Pre –hypertension	49.9	39.5	44.7	50.6	37.3	43.9	50.3	39.3	44.3
95% CI									
Lower	46.5	36.6	42.6	46.4	34.9	41.5	47.6	36.4	42.6
Upper	53.4	42.4	46.9	54.8	39.8	46.4	53.1	40.2	46.0
Stage-I hypertension	18.1	11.6	14.9	14.4	10.5	12.4	16.1	11.0	13.5
95% CI									
Lower	15.0	9.8	12.9	11.5	8.7	10.6	13.9	9.7	12.2
Upper	21.7	13.8	17.2	18.0	12.6	14.5	18.5	12.4	15.0
Stage-II hypertension	5.8	3.7	4.8	3.5	4.1	3.8	4.6	3.9	4.2
95% CI									
Lower	4.6	2.7	4.0	2.4	3.1	3.0	3.7	3.2	3.7
Upper	7.4	5.1	5.7	5.3	5.4	4.9	5.7	4.8	4.9

according to categories of hypertension by sex and place and residence. Over all, 38% respondents were normal, 44% were in the category of pre-hypertension, 14% in stage I hypertension and 4% were in stage-II hypertension. Among males, 29% were normal, 50% were in the category of pre-hypertension, 16% were in stage I hypertension and only 5% were in stage-II hypertension against females having 47% normal, 39% pre-hypertension, 11% 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 20% and pattern of prevalence was recorded as increasing with age (7% in 15-24, 15% in 25-34, 23% in 35-44, 36% in 45-54 and 44% in 55-64). The prevalence among male respondents was high (24%) compare with females (15%), but the increasing pattern with age was observed in both sexes (Table 4.2). Prevalence of hypertension by education was 23% among illiterate and 18% among higher level. However, the prevalence was high among occupational categories of service (37%), executive (28%) and agriculture (22%). Low prevalence of hypertension was recorded among the domestic workers (13%). Overall, prevalence among rural population was 16% and the pattern was increasing with age (5% in 15-24 to 37% in 55-64). Similarly, high prevalence was observed among illiterate (20%) and primary (22%), which was showing a declining pattern with increasing level of education (10% in higher

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

Characteristic	Stage I & II hypertensive								
	Urban			Rural			Combined		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Age group									
15-24	12.4	2.5	7.4	8.6	1.9	5.3	10.3	2.2	6.3
25-34	21.5	9.3	15.3	17.6	6.3	11.7	19.5	7.7	13.4
35-44	25.8	19.8	22.9	19.2	18.9	19.1	22.2	19.3	20.8
45-54	36.5	34.9	35.7	26.9	27.2	27.0	31.0	30.3	30.7
55-64	48.5	40.4	44.3	29.9	43.4	36.7	36.8	42.3	39.6
Total	24.0	15.3	19.6	18.0	14.6	16.3	20.6	14.9	17.8
Education									
Illiterate	25.0	22.5	23.4	18.0	20.6	19.6	20.0	21.1	20.7
Primary	30.8	17.6	24.2	28.9	13.9	22.0	29.7	15.6	22.9
Middle	20.9	16.5	18.8	17.1	10.1	13.8	18.8	13.0	16.1
Secondary	22.8	11.1	17.6	15.8	7.0	12.1	19.1	9.0	14.8
Higher Secondary	24.5	11.7	17.4	12.1	7.1	10.3	17.7	10.1	14.1
College & above	23.8	8.8	17.9	18.9	8.2	15.5	22.0	8.6	17.1
Total	24.0	15.3	19.6	18.0	14.6	16.3	20.6	14.9	17.8
Occupation									
Executive/Business	30.8	15.2	27.6	23.0	5.7	18.6	28.8	12.2	25.2
Agriculture	23.8	18.6	22.2	18.1	14.7	16.7	19.6	15.4	18.0
Domestic Work	**	7.7	12.8	**	19.8	18.6	**	12.4	14.9
Services/Sales	35.9	**	36.9	25.5	12.8	22.6	29.8	23.8	28.5
Manual Worker	21.6	16.9	20.5	20.1	9.6	17.6	20.9	13.6	19.2
Other	19.3	14.5	15.4	10.2	15.5	14.4	14.6	15.0	14.9
Total	24.0	15.3	19.6	18.0	14.6	16.3	20.6	14.9	17.8
Number (n)	980	1359	2339	972	1515	2487	1952	2874	4826

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

secondary). In the occupational category, the prevalence was high among service (23%), executive and business class (19%), manual worker (18%) and it was low among agriculture (17%). Overall, prevalence of hypertension was 18% in Tamil Nadu 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 5% 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 advised by sex and place of residence. Over all, 3% of respondents (5% of urban and 2% of rural respondents) reported having raised blood sugar level in past 12 months. This percentage was same (3%) in males and females. Amongst those who were diagnosed with diabetes, 12% (15% of urban and 8% of rural respondents) were currently taking insulin; 87% (86% of urban and 88% of rural respondents) were taking oral hypoglycemic drugs. A good proportion of respondents reported to had received advice from the treating physicians on their life style modification — 82% for dietary advice, 42% to reduce weight and 61% to increase physical activity.

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, Tamil Nadu, 2007- 08

	Residence						Combined		
	Urban			Rural					
Blood sugar	Male	Female	Total	Male	Female	Total	Male	Female	Total
Raised blood sugar diagnosed (All respondents)	5.1	3.9	4.5	2.0	1.5	1.8	3.4	2.6	3.0
Diagnosed diabetics									
Currently taking insulin	15.8	13.0	14.6	11.2	3.8	7.9	14.3	9.9	12.4
Currently taking oral drugs	91.3	80.0	86.4	83.7	94.2	88.3	88.8	84.4	87.0
Advised dietary modifications	77.0	83.4	79.7	87.6	87.1	87.4	80.4	84.6	82.2
Advised to lose weight	41.3	38.2	39.9	50.8	38.5	45.4	44.3	38.3	41.7
Advised to increase physical activity	65.8	56.4	61.8	65.6	49.4	58.5	65.8	54.1	60.7
Consulted AYUSH practitioner	0.8	3.2	1.8	8.2	*	4.6	3.2	2.2	2.7
Taking treatment from AYUSH practitioner	100.0	68.0	75.6	43.5	*	43.5	52.6	68.0	57.9

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 (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 axillary 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 values of BMI, height, weight and waist circumference by sex and the place of residence. The mean BMI in Tamil Nadu was 22 kg/m^2 (23 for urban, 21 for rural respondents, 21.4 for males and 22.4 for females). The mean height in the survey population was 158 centimeter (158 centimeter for urban, 157 centimeter for rural respondents, 164 centimeter for males and 152 centimeter for females). The mean weight was 54.5 kg (57.6 kg for urban and 52

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
> 40	Grade-3 Over Weight

Source: WHO Step-wise approach to NCD surveillance

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

Physical Measurement	Residence						Combined		
	Urban			Rural					
	Male	Female	Total	Male	Female	Total	Male	Female	Total
BMI (kg/m^2)	22.4	23.5	23.0	20.5	21.4	21.0	21.4	22.4	22.0
95% CI									
Lower	22.0	23.1	22.6	20.2	21.0	20.6	21.1	22.0	21.6
Upper	22.8	24.1	23.3	21.2	22.0	21.3	21.6	23.0	22.1
Height (cm.)	165.0	152.0	158.3	163.4	151.3	157.0	164.1	151.5	158.0
95% CI									
Lower	164.1	151.3	158.0	163.0	151.0	157.0	164.0	151.1	157.4
Upper	165.6	152.3	159.0	164.0	152.0	158.0	164.5	152.0	158.1
Weight (kg.)	61.0	54.3	57.6	55.0	49.0	52.0	57.7	51.4	54.5
95% CI									
Lower	59.5	53.1	56.5	54.0	48.1	51.2	57.0	50.6	54.0
Upper	62.4	55.4	59.0	56.0	50.0	53.0	58.5	52.1	55.2
Waist circum.(cm.)	81.0	75.5	78.2	76.0	70.5	73.3	78.3	73.0	75.5
95% CI									
Lower	79.6	74.0	77.1	75.1	69.3	72.4	77.5	72.0	75.0
Upper	82.2	77.0	79.2	77.0	72.0	74.1	79.0	73.6	76.1

kg for rural respondents). The mean weight for males was 57.7 kg and for females 51.4 kg. The average waist circumference was 76 centimeters with 78 centimeter for urban and 73 centimeters for rural respondents. The waist circumference for male and female was 78 centimeters and 73 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 25% respondents were under-weight, which was 18.3% for urban and 30.1% for rural respondents. Twenty seven percent males and 22.5% females were underweight. Over 23% population was over weight (31% for urban and 15% for rural). Overall the central obesity was 25% (25.7% among urban males, 41% among urban females; 12.5% among rural males, 23.3% among rural females).

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

Category of BMI	Residence						Combined		
	Urban			Rural					
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Under weight(< 18.5)	19.6	16.8	18.3	33.1	27.1	30.1	27.0	22.5	24.8
95% CI									
Lower	16.5	13.8	15.6	29.9	24.0	27.7	24.8	20.3	23.0
Upper	23.1	20.5	21.3	36.4	30.5	32.7	29.3	24.9	26.7
Normal weight (18.5-24.9)	53.4	46.9	50.2	54.8	54.6	54.7	54.1	51.2	52.7
95% CI									
Lower	49.7	44.2	47.8	51.1	51.7	52.2	51.6	49.2	51.0
Upper	57.0	49.7	52.7	58.3	57.5	57.1	56.7	53.2	54.4
Grade-1 over weight (25.0-29.9)	22.9	26.4	24.6	10.3	13.9	12.1	16.0	19.5	17.8
95% CI									
Lower	19.6	23.9	22.1	8.5	11.7	10.5	14.2	17.9	16.3
Upper	26.5	29.1	27.3	12.5	16.5	13.9	18.0	21.3	19.3

Grade-2 over weight (30.0-39.9)	3.9	9.7	6.7	1.8	4.1	2.9	2.8	6.6	4.7
95% CI									
Lower	2.7	7.9	5.5	1.1	2.9	2.1	2.1	5.5	3.9
Upper	5.6	11.8	8.3	3.0	5.8	4.1	3.7	7.9	5.5
Grade-3 over weight (≥ 40.0)	0.2	0.2	0.2	0.0	0.2	0.1	0.1	0.2	0.1
95% CI									
Lower	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.1
Upper	1.2	0.5	0.5	0.0	0.8	0.4	0.6	0.5	0.3
Central Obesity WC ≥ K*	25.7	41.0	33.3	12.5	23.3	17.9	18.5	31.2	24.8
95% CI									
Lower	21.8	37.4	30.0	10.5	20.2	15.7	16.4	28.9	22.9
Upper	30.0	44.6	36.7	14.8	26.7	20.4	20.8	33.6	26.9

*K=90 cm for male and 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 Percentage of respondents in the category of overweight (Grade I, II & III) across age, education, occupation and by sex and residence, Tamil Nadu, 2007- 08

Characteristic	Overweight (Grade I, II & III)								
	Urban			Rural			Combined		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Age group									
15-24	12.3	14.7	13.5	3.5	6.6	5.0	7.4	10.3	8.8
25-34	28.3	40.7	34.5	11.8	19.3	15.6	19.6	29.3	24.5
35-44	35.6	43.3	39.4	18.0	27.3	22.7	26.1	34.4	30.2
45-54	36.3	50.6	43.1	18.3	22.1	20.2	26.3	34.3	30.2
55-64	32.1	48.8	40.5	16.1	21.9	19.1	22.8	33.0	27.9
Total	27.0	36.2	31.5	12.2	18.3	15.2	18.9	26.3	22.6
Education									
Illiterate	14.9	30.8	25.0	8.9	15.3	13.0	10.7	19.9	16.6
Primary	24.9	36.2	30.6	13.9	21.5	17.3	18.6	28.5	23.3
Middle	22.3	42.7	31.8	15.1	23.2	18.8	18.4	32.2	24.8
Secondary	26.8	41.8	33.4	11.0	19.7	14.6	18.4	30.6	23.6
Higher Secondary	31.3	29.7	30.5	10.5	12.8	11.3	20.2	23.6	21.8
College & above	38.0	37.3	37.8	17.6	29.1	21.2	30.8	34.9	32.2
Total	27.0	36.2	31.5	12.2	18.3	15.2	18.9	26.3	22.6
Occupation									
Executive/Business	42.0	43.8	42.3	14.6	32.1	18.9	35.4	40.3	36.4
Agriculture	23.8	19.4	22.5	11.9	11.9	11.9	15.1	13.3	14.4
Domestic Work	**	29.1	25.5	**	0.0	0.0	**	17.4	15.7
Services/Sales	43.6	**	39.8	16.6	34.6	20.7	28.2	30.6	28.7
Manual Worker	22.3	27.2	23.4	13.5	19.3	14.9	18.4	23.6	19.6
Other	20.9	40.0	36.5	9.0	22.7	19.8	14.7	31.9	28.5
Total	27.0	36.2	31.5	12.2	18.3	15.2	18.9	26.3	22.6
Number (n)	1064	1419	2483	1008	1546	2554	2072	2965	5037

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

Table 5.4. The prevalence of overweight among the urban population was 32% and its pattern was found increasing with age (14% in 15-24, 35% in 25-34, 39% in 35-44, 43% in 45-54 and 41% in 55-64). The prevalence among female respondents was high (36%) compare with males (27%), but the increasing pattern with age was observed in both sexes (Table 5.4). In educational categories, the prevalence was varying with 25% among illiterate to 38% among higher level (College). Occupational categories, the prevalence was high among executive and business class (42%) followed by service (40%) and others (37%). Low prevalence of overweight was recorded among occupation of agriculture (23%). Overall, prevalence among rural population was 15% and it was varying with age (5% in 15-24 to 19% in 55-64). Similarly, prevalence in the educational categories was varying from 13% among illiterate to 21% among higher level of education. In the occupational category, the prevalence was high among service (21%),executive and business class (19%), and manual workers (15%) and it was low among the occupation of agriculture (12%). Overall, prevalence of overweight was 23% 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 (Table 5.4).

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

CHAPTER 6

Summary and Conclusions

The NCD risk factors survey in Tamil Nadu collected information from a random sample of 4799 households covering 2415 households from rural and 2384 from urban areas. From these households, 5177 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 Tamil Nadu, majority households (89%) are Hindu followed by Christian (6%). Large percentage of households (86%) had access to piped drinking water with marginal difference between rural and urban households. In every ten households, 2 households in rural area and 7 households in urban area had flush toilet facility. Over 90% households both in rural and urban areas used electricity as main source of lighting. One in every five households in rural area resided in *kachha* houses and used wood as a main source of cooking fuel. In urban area, however, 62% households used LPG as a main source of cooking fuel. Two-third population of Tamil Nadu was literate, but there existed sex and rural-urban differential in educational attainment.

Tobacco is one of the major risk factors of non-communicable diseases. In Tamil Nadu, one-quarter men and a small percentage of women smoked tobacco daily. Eleven percent of population with 14% of men and 8% of women used smokeless tobacco. Use of smokeless tobacco was high in rural area as compared to urban area. Twenty two percent of population in Tamil Nadu used tobacco in any form, either smoking or smokeless. This prevalence was 36 among males and 8 among females. The mean age of initiation of tobacco use among young adults age 15-34 was 20 years for male smokers and for smokeless tobacco users of both sexes.

The alcohol consumption is a known risk factor of many non-communicable diseases. In Tamil Nadu, 3 in every 10 men consumed alcohol at least once in last one year and 2 in every 10 men in last one month. The alcohol consumption among females was of course very low.

Those who consumed alcohol in last seven days, half of them were binge drinker. The mean age of initiation of alcohol consumption by young adults age 15-34 was 21 years for men.

Nutritional inadequacy is the major risk factors of many non-communicable diseases. Almost every one in Tamil Nadu (99%) consumed less than five servings of fruits and vegetables per day, which was quite inadequate as per WHO recommended standards. On an average only two days in a week people consumed fruits against vegetables on 5 days a week.

Physical inactivity is the leading cause of diabetes, hypertension and coronary heart disease. In Tamil Nadu, 66% population (71% in urban area and 62% in rural area) was in low category of physical activity. Forty-three percent of population was detected with pre-hypertension stage and one-fifth was in stage-I and stage-II hypertension. According to BMI, one-quarter of population each was in the category of over weight, under weight and in the category of central obesity.

Overall, prevalence of smoking and smokeless tobacco users 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 occupation of agriculture and service 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 very high with marginal differences. Besides that, more than half of the population was found in the category of 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 Tamil Nadu.

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

References

1. Risk factor surveillance for noncommunicable diseases (NCDs): the multi-site ICMR-WHO collaborative initiative, presented in Forum 9, Mumbai, 12-16 September 2005.

2. The World Health Report 2002; Reducing Risks, Promoting Healthy Life, WHO.

3. Primary Census Abstract: Census of India, 2001, Office of the Registrar General, India, Ministry of Home Affairs, Govt. of India.

4. National Health Profile, Central Bureau of Health Intelligence, Director General Health Services, Ministry of Health & Family Welfare, Govt. of India.

5. Lisley Kish: A procedure for objective respondent selection within the household. Am Stat Assoc Journal, 1949; 44: 380-387.

6. Lehtonen R. and Pahkinen E. 2004. Practical Methods for Design and Analysis of Complex Surveys. John Wiley & Sons, Ltd.: England.

7. Global Physical Activity Questionnaire (GPAQ), Analysis Guide, www.who.int/chp/steps.

8. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. JAMA 2003;289:2560–71.

9. WHO/IASO/IOTF: The Asia-Pacific perspective: redefining obesity and its treatment [article online]. Available from http://www.idi.org.au/home.htm. Accessed 21August 2003.

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

$$\mathbf{HWT_{ijk} = w_{1i} \times w_{2j|i} \times w_{3k|i,j}} \quad i = 1, \ldots\ldots, 50, \ j=1, \ k=1, \ldots, 50$$

where $\mathbf{w_{1i} = \dfrac{1}{\pi_i}}$: the reciprocal of the inclusion probability π_i of ward i

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

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

$\mathbf{w_{2j|i} = \dfrac{1}{\pi_{j|i}}}$: the reciprocal of the conditional probability of selection of CEB j in ward i

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

$W_{3k|i,j} = \dfrac{1}{\pi_{k|i,j} \times \hat{\theta}_{k|i,j}}$: 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 $\hat{\theta}_{k|i,j}$ of household k from within the jth selected CEB of ward i.

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

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

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

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},

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

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

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 :

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

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

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

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

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

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

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

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

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

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 :

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

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

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

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

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

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

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

		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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