Democratic Socialist Republic of Sri Lanka

Ministry of Health

PROJECT ON HEALTH PROMOTION AND PREVENTIVE CARE MEASURES OF CHRONIC NCDS

FINAL REPORT

MARCH 2013

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

GLOBAL LINK MANAGEMENT, INC.

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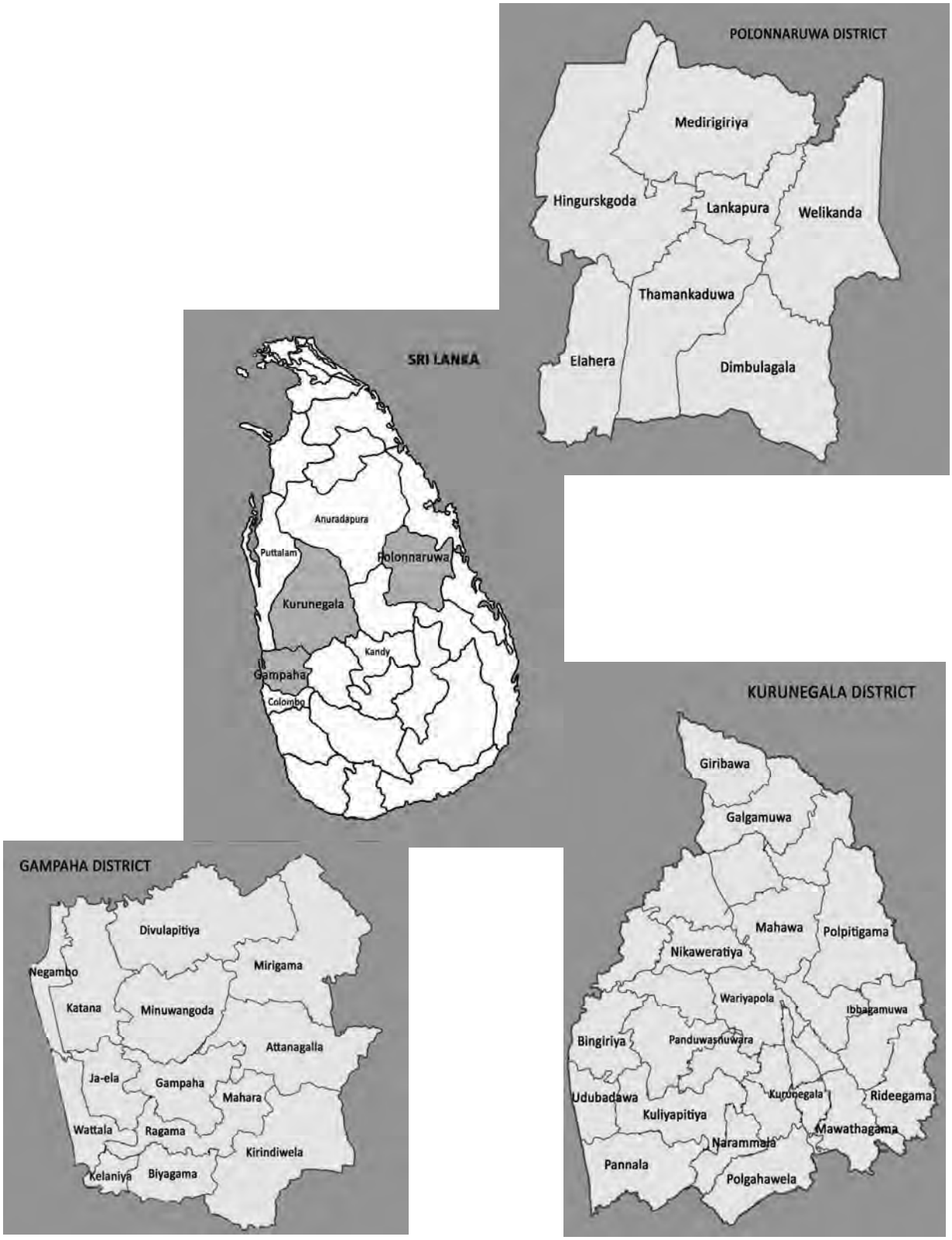
13-002

The following foreign exchange rates are applied in the study (as of February 2013)

- USD 1 = 91.04 JPY
- LKR 1 = 0.72 JPY

Location Map



Abbreviations

AMO	Assistant Medical Officer
BH	Base Hospital
BHA, BHB	Base Hospital type A, Base Hospital type B
BMI	Body Mass Index
CD	Central Dispensary
CI	Confidence Interval
CVD	Cardio-vascular diseases
DDG/DS	Deputy Director General, Dental Services
DDG/ET&R	Deputy Director General, Education, Training & Research
DDG/F	Deputy Director General, Finance
DDG/LS	Deputy Director General, Laboratory Services
DDG/MS	Deputy Director General, Medical Services
DDG/P	Deputy Director General, Planning
DDG/PHS	Deputy Director General, Public Health Services
DG	Director General
DGH	District General Hospital
DH	District Hospital
DM	Diabetes Mellitus
ECG	Electrocardiograph
ECU	Emergency Care Unit
ET&R	Education, Training and Research
FBG	Fasting Blood Glucose
FY	Fiscal Year
GH	General Hospital
GoSL	Government of Sri Lanka
GPT(ALT)	Glutamic Pyruvic Transaminase
HC	Health Check-up (subgroup)
HDL	High Density Lipoproteins
HEB	Health Education Bureau
HEO	Health Education Officer
HI	Health Information (subgroup)
HLC	Healthy Lifestyle Centre(s)
HMP	Health Master Plan
HR	Hazard Ratio
HT	Hypertension
HP	Health Promotion (subgroup)
HRH	Human Resources for Health
HSDP	Health Sector Development Programme
ICB	International Competitive Bidding
ICU	Intensive Care Unit
IEC	Information, Education and Communication
IDA	International Development Association
IFG	Impaired Fasting Glycaemia
IHD	Ischaemic Heart Disease

IMMR	Indoor Mortality and Morbidity Return
JCC	Joint Coordinating Committee
JICA	Japan International Cooperation Agency
JPY	Japanese Yen
LDL	Lipid Density Lipoproteins
MCH	Maternal and Child Health
MET	Metabolic equivalent for Task
MI	Myocardial Infarction
MLT	Medical Laboratory Technologist
MO	Medical Officer
MoH	Ministry of Health
MOH	Medical Officer of Health, or Medical Office of Health
NABNCD	National Advisory Body for NCDs
N/A	Not Available
NAFLD	Non Alcoholic Fatty Liver Disease
NC	North Central Province
NCD	Non-Communicable Diseases
NHSL	National Hospital of Sri Lanka
NO	Nursing Officer
NPP	NCD Prevention Project
NW	North Western Province
OPD	Outpatient Department
OR	Odds Ratio
p	Probability value
PEN	Package of Essential NCD interventions for primary health care in low-resource settings
PDHS	Provincial Director of Health Services
PDM	Project Design Matrix
PGH	Provincial General Hospital
PGIM	Post Graduate Institute for Medicine
PH	Provincial Hospital
PHI	Public Health Inspector
PHM	Public Health Midwife
PMCU	Primary Medical Care Units
PPA	Programme Planning Assistant
PU	Peripheral Unit
PY	Person Years
RDHS	Regional Director of Health Services
RH	Rural Hospital
RHS	Ragama Health Study
RMO	Registered Medical Officer
Rs	Sri Lankan Rupees
SD	Standard Deviation
SLDCS	Sri Lanka Diabetes and Cardiovascular Study
STEPS	STEPwise approach to surveillance
TAG	Triacylglycerol
TH	Teaching Hospital
TOT	Training of Trainers

ToR	Terms of Reference
TWG	Technical Working Group
USD	United States Dollars
VP	Visiting Physician
WB	World Bank
WHO	World Health Organization

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CHAPTER 1 INTRODUCTION

1.1 NCD Situation in Sri Lanka

In terms of health status, Sri Lanka has come a long way since independence. Until recently, the main focuses have been the control of communicable diseases and reducing maternal and child morbidities and mortalities through improved sanitary conditions, high coverage of an expanded immunization programme, and comprehensive maternal and child health services. The epidemiological, demographic and social transition is shifting the disease pattern from one related to maternal and child health and communicable diseases to chronic non-communicable diseases (NCDs), such as cardiovascular disease (CVD), cancer, respiratory disease, diabetes and mental disorders. NCDs are now the leading cause of mortality, morbidity, and disability in the country.

Over the last few decades, the proportion of deaths due to cardiovascular diseases such as heart diseases and strokes increased from less than 5 per cent to 30 per cent. During the same period, deaths due to communicable diseases decreased from 24 per cent to 12 per cent. Mortality rates from NCDs are currently 20–50 per cent higher in Sri Lanka than in developed countries, with high disparities for cardiovascular diseases and asthma. In Sri Lanka two-thirds of all deaths in the country can be attributed to NCDs. Out of total deaths, 29.6 per cent have been attributed to CVDs, 9.4 per cent to cancers, 8.5 per cent to respiratory diseases and 3.9 per cent to diabetes. Incidence of hospitalization due to diabetes mellitus, hypertensive disease and ischemic heart disease increased between 2005 and 2010 by 36 per cent, 40 per cent and 29 per cent, respectively[1].

Patients with NCDs are largely managed by specialist clinics as long-term outpatients and as inpatients in higher-level (secondary or tertiary) facilities in the country. Primary health care facilities are not expected to initiate management of chronic NCDs but only to provide follow-up care in some lower-level hospitals. A formal referral system is not in place and government policy allows self-referral on demand to secondary and tertiary facilities. Thus, patients often use these higher-level facilities, bypassing primary facilities, as these often lack the facilities to perform necessary clinical investigations and provide medications.

Bed-occupancy rates in 2008 were nearly 85 per cent in higher-level facilities and below 50 per cent in lower-level facilities. Specialist clinics in secondary and tertiary facilities are overcrowded, managing 65 per cent of chronic NCD cases. Primary care facilities manage follow-up for approximately 33 per cent of the acute NCD cases. The staff to provide essential clinical investigations and medical equipment to diagnose and manage NCDs are frequently unavailable at primary and secondary care

[1] Ministry of Health (2011). *Country Report, Regional Meeting on Health and Development Challenges of Noncommunicable Diseases, 1-4 March 2011*, Jakarta.

levels. In addition, at lower-level (primary care) facilities such as divisional hospitals and primary medical care units, essential medications for treating NCDs are often unavailable[2].

Four common shared risk factors for four major chronic NCDs are well-known, namely smoking, unhealthy diet, physical inactivity and harmful use of alcohol. Prevalence of these risk factors at the population level has a major influence on morbidity and mortality due to NCDs. The prevalence of (current) smokers nationwide among adult males is 22.8%, while less than 1 % of females smoke[3]. Although a declining trend for smoking has been observed over the past few years, this is not reflected in a drop of overall sales for tobacco-related products.

Despite a modest consumption of fat (15%-18%) by Sri Lankans, this includes a higher percentage of saturated fats in the diet compared to unsaturated fats. A higher saturated to unsaturated fat ratio is considered an important risk factor for the development of cardiovascular diseases.

The daily intake of salt (10g/day) and added sugar (60g/day, based on food consumption data; and 35 g/day, based on individual dietary records) is also high in the Sri Lankan diet when compared to WHO recommendations. Although the traditional Sri Lankan diet is vegetable-based, a large proportion of adults (82%) do not consume an adequate amount of vegetables. Despite the availability of an abundance and variety of fruit in Sri Lanka, average consumption has been found to be inadequate.

A majority of Sri Lankans (78%) are engaged in moderate or higher level physical activities (>600 MET-minutes/week). However, only a small proportion engages regularly in recreational activities. Females are significantly sedentary (30%) compared to males (19%) and this is also reflected in the higher mean BMI among females (BMI>=25 among females 30.4%).

The percentage of current drinkers is significantly higher in males (26.0%) compared to females (1.2%). However, less than five per cent of the male population consumes alcohol more than 4 days per week.

1.2 Challenges of the Ministry of Health (MoH)

1.2.1 Formulation of the NCD policy

The government of Sri Lanka has acknowledged that the prevention and control of chronic NCDs is a priority issue in the national health agenda. Priority has been given in the National Health Master Plan 2007-2016 as these diseases lower the quality of life, impair the economic growth of the country and place a heavy and rising demand on families and national budgets. It is recognized that a significant proportion of the NCD burden is preventable if evidence-based policies are in place and relevant

[2] Engelgau, M., Okamoto, K., Navaratne, K.V., & Gopalan, S. (2010). *Prevention and control of selected chronic NCDs in Sri Lanka: Policy options and action,* Working Paper No: 57563. The World Bank.

[3] MoH, (2008). *Risk Factor Surveillance.*

programmes are implemented.

Considering these facts, MoH formulated the National Policy for Prevention and Control of Chronic Non-communicable Diseases in 2010. The emphasis of the National NCD Policy is on promoting the health and well-being of the population by preventing chronic NCDs through four major prevention models: primordial, primary, secondary and tertiary prevention. It emphasises prevention of shared modifiable risk factors (primordial and primary prevention), providing acute and integrated long-term care for people with NCDs (secondary and tertiary prevention), and maximizing their quality of life.

A series of international policy guidelines on NCDs developed by the World Health Organisation (WHO) have also been taken into consideration in formulating this policy document. It includes World Health Assembly Resolution (WHA 57.17): WHO Global Strategy on Diet & Physical Activity, Health and Preventing Chronic Diseases - A Vital Investment (WHO 2005), and the WHO Strategic Framework for NCD Control and Prevention 2008-2013.

Four priority actions for prevention and control of NCDs were established by the WHO as the guiding principles for development of the policy document. These are: addressing risk factors through multi-stakeholder partnerships, health system strengthening, providing essential medicines and technology, and ensuring accountability by monitoring and evaluation.

The objective of the NCD policy is to reduce premature mortality (less than 65 years) due to chronic NCDs by 2% annually over the next 10 years through the expansion of evidence-based curative services, and individual and community-wide health promotion measures for the reduction of risk factors. The strategic framework includes nine key strategies to achieve the above objective.

1.2.2 Implementation of NCD policy and programmes

In order to implement the proposed strategic approaches and actions plans, MoH has established coordination mechanisms at national, provincial and district levels with a system to monitor and evaluate policy implementation. The NCD Prevention and Control Unit serves as the operational and overall coordination body in implementing the National NCD Policy under the National Health Council, National Steering Committee for NCDs and National Advisory Body for NCDs (NABNCD).

The planning and coordination unit of the Provincial Directorate of Health Services (PDHS) and the NCD Cell of the Regional Directorate of Health Services (RDHS) function as the coordinating bodies in the planning and implementation of NCD programmes. To promote and implement NCD prevention activities at the district level, MoH created a Medical Officer NCDs (MO/NCD) position in 2010 that is attached to RDHS. MO/NCDs implement the NCD district plans with the support of other technical experts and relevant stakeholders at district level under the supervision of RDHS. MO/NCDs are responsible for preparation of the medium-term plan and annual development plans of the district related to NCDs as well as being responsible for the implementation and monitoring of NCD activities in the district.

1.2.3 Risk factor surveillance

The WHO STEPwise approach to surveillance (STEPS) is the recommended tool of the WHO for surveillance of chronic diseases and their risk factors. STEPS is a sequential process. It starts with gathering key information on risk factors with a questionnaire, then moves to simple physical measurements and then to more complex collection of blood samples for biochemical analysis. Usually, this survey is carried out to gather demographic and behavioural information by questionnaire in a household setting. Physical measurements are carried out either in a household setting or in a clinic. Taking blood samples is done in a clinic to measure prevalence of diabetes or raised blood glucose and abnormal blood lipids.

In Sri Lanka, STEPS risk factor surveillance has been carried out every 5 years from 2003 to describe the prevalence of non-communicable disease risk factors. The last STEPS surveillance was carried out in 2007. STEPS surveillance 2007 was a population-based national survey to study selected risk factors for non-communicable diseases. It consisted of two steps: a questionnaire-based assessment and physical measurements. The survey was carried out in five randomly selected districts. The sample size of 12,500 consisted of people aged between 15-64 years.

"STEPS surveillance 2012" has been already initiated and data collection will be carried out in mid-2013. This time, all three steps will be implemented: a questionnaire, followed by anthropometric and biochemical measurements to determine behaviour-related non-communicable disease risk factors. The survey covers a sample population of 6,300 of ages 15-64 years from each province of the country.

1.2.4 Mapping NCD-related research

In order to uncover the prevalence of NCDs and their risk factors in Sri Lanka, and to assess the socioeconomic burden they impart on the population, the NCD Unit conducted a research mapping survey[4] on NCDs, based on the hypotheses of studies conducted by other researchers and organizations.

This survey was carried out from September to December 2012 in seven libraries/institutions[5] by referring to printed and digital publications. NCD-related local studies, surveys and activities published between January 1st 1990 and November 30th 2012 were documented in this research mapping. Altogether 356 publications relating to the topic of NCDs were gathered during a four-month period, with 241 of them directly related to the prevalence and risk factors of NCDs. The 75 studies showed the prevalence of NCDs and their risk factors in the general population.

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[4] Ministry of Health (2012). *Abstracts of non communicable diseases and prevalence of risk factors in Sri Lanka, published from 1990 – 2012*.

[5] Postgraduate Institute of Medicine (PGIM), Alcohol and Drug Information Centre (ADIC), Sri Lanka Medical Association (SLMA), National Science Foundation (NSF), World Health Organisation (WHO), University of Colombo and Ministry of Health.

Among the 75 studies, 57.6% examined only a single risk factor relating to NCDs and 42.4% examined multiple risk factors. Table 1-1 shows the number of studies carried out to determine the prevalence of each of NCD risk factor in the general population. The report detailing the results of the research, 'Abstracts of Non-Communicable Diseases and Prevalence of Risk Factors in Sri Lanka, published from 1990 – 2012', will be published by the Ministry of Health.

Table 1-1: Number of studies carried out to determine the prevalence of major NCD risk factors in the general population published from 1 January 1990 – 30 November 2012

NCD related risk factor	Number of studies found
Smoking	25
Alcohol	14
Physical inactivity/activity	13
Hyperglycaemia	19
Hypertension	17
Hypercholesterolemia	4
Overweight, obesity, wasting	20
Asthma	4

1.2.5 Multi-sectorial coordination

Multi-sectoral actions and multi-sectoral partnerships are important in enabling a suitable environment for carrying out the identified activities in the country. Therefore, strengthening and facilitating multi-sectoral actions through partnerships is vital for prevention and control of NCDs. Considering this need, a multi stakeholder meeting was held in September 2011 with political leaders and representatives from all the relevant governmental and non-governmental organisations for the implementation of multi-sectoral approaches. With a view to convincing the stakeholders of the importance and responsibility of each organization in prevention and control of NCDs, special emphasis was made to introduce best-buy interventions for dealing with the main modifiable risk factors.

Following the multi-stakeholder meetings, several activities have started. Many activities have been conducted in collaboration with the Ministry of Youth and Skills Development and National Youth Council to mobilise youth for the prevention and control of NCDs. Youth leaders were trained and provincial activity plans were prepared in order to carry out activities to reduce the risk factors and to change the lifestyle of the people. Provincial and district level training programmes have been planned for youth in the future.

Discussions were held with relevant officials to improve the availability of fruits and vegetables in the community. In addition, suggestions were made to increase intake of healthy food among school children. Furthermore, the stakeholders collaborated to introduce measures to convince people of the importance of physical activity and to improve the levels of physical activity in the community.

Activities carried out are being monitored and evaluated frequently through the meetings held such as steering committee meetings, NABNCD and Working group for NCDs. The challenge of multi-stakeholder partnerships is to maintain the commitment and the interest shown by the other stakeholders over time, despite the other priorities of their ministries and organisations.

1.3 International Trends and NCD Prevention Partners in Sri Lanka

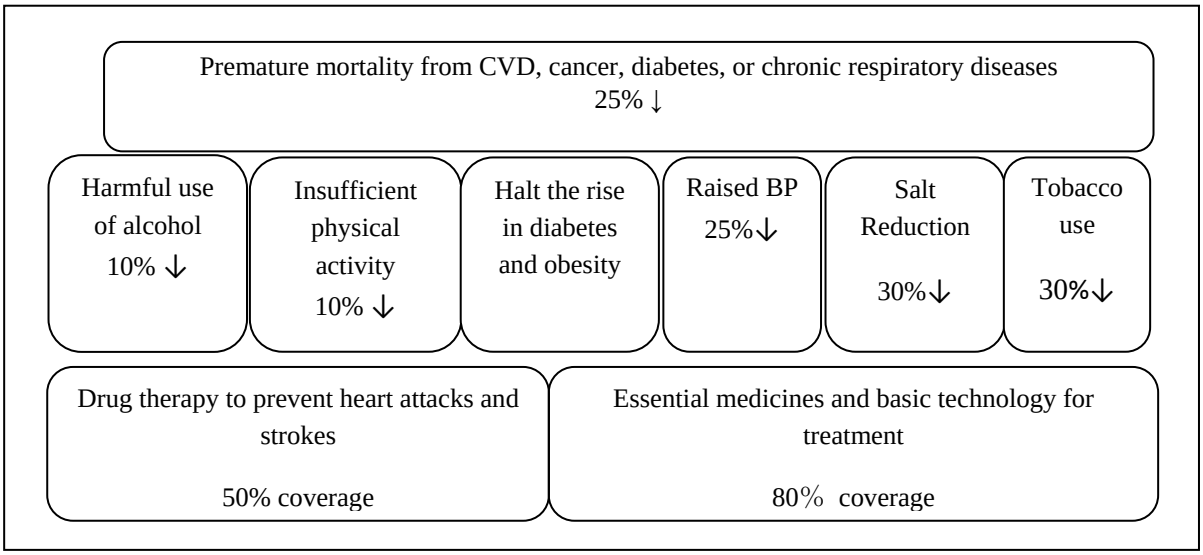
1.3.1 International trends on NCD prevention

The Global Strategy for the Prevention and Control of NCDs (the Global Strategy) was formulated in 2000 for the four main NCDs: cardiovascular diseases (CVD), diabetes, cancer, and chronic respiratory diseases. The global strategy consists of three objectives: 1) to map the emerging epidemics of NCDs, 2) to reduce the level of exposure of individuals and the population to the four major risk factors and their determinants, and 3) to strengthen health care systems. The action plan for the global strategy was also formulated in 2008, establishing six objectives for the period of 2008-2013.

The High-Level Meeting of the UN General Assembly on the Prevention and Control of Non-communicable Diseases was held in September 2011. The members of this meeting recognised NCDs as one of the major challenges in development and expressed their high commitment to six countermeasures: 1) The importance of a “whole-of-society” effort, 2) create health-promoting environments, 3) strengthen national policies and health systems, 4) promote international cooperation, 5) facilitate research and development, 6) promote monitoring and evaluation.

The outcomes of this meeting led the WHO to develop a comprehensive global monitoring framework, including indicators and a set of voluntary global targets to assess progress in the implementation of national strategies and plans for NCD prevention and control. This framework will be integrated into a draft WHO Global Action Plan for the Prevention and Control of NCDs covering the period 2013-2020. Work is underway in preparation for submission of the framework to the 66th World Health Assembly in May 2013. As of January 2013, nine voluntary indicators, such as a 25% relative reduction in overall premature mortality from CVD, cancer, diabetes, or chronic respiratory diseases by 2025, as well as 25 indicators covering the three components: mortality and morbidity, risk factors and national system response were agreed in the formal meeting of member states.

Figure 1-1: Voluntary global targets for the prevention and control of NCDs to be achieved by 2025 (Draft as of January 2013)



(Source: WHO, Report of the Formal Meeting of Member States to conclude the work on the Comprehensive Global Monitoring Framework, including indicators, and a set of voluntary global targets for the prevention and control of noncommunicable diseases, November 21, 2012)

1.3.2 NCD prevention partners in Sri Lanka

The World Health Organisation (WHO), the World Bank (WB) and the World Diabetic Foundation are the major donors in prevention and management of NCDs in Sri Lanka.

(1) World Health Organization

NCDs are one of the six strategic priorities in the WHO Country Cooperation Strategy: Sri Lanka 2012 - 2017 (CCS). The main focus area for NCD prevention and control is to prevent and reduce disease, disability and premature death from chronic NCDs including injuries. The five strategic approaches are: (a) advocating for higher prioritisation for the prevention and control of NCDs including injuries, and integrating this into policies across all government ministries and private sector organizations, (b) supporting the prevention of chronic NCDs, injuries and disability by strengthening policy and regulatory and service delivery measures aimed at the reduction of the level of risk factors in the population, (c) empowering the community to adopt healthy lifestyles for the prevention and control of NCDs, (d) ensuring sustainable financing mechanisms that support cost-effective health interventions, both preventive and curative, and (e) strengthening the national health information system, including disease and risk factor surveillance.

The main focus areas among NCDs are chronic kidney disease, the package of essential NCD interventions for primary health care in low-resource settings (PEN), the tobacco free initiative and healthy ageing. PEN was implemented in Badulla district from 2009 to 2011 with the support of the WHO and covered a total number of 18 facilities within three medical office of health (MOH) areas.

The package includes six core activities as well as plans to introduce comprehensive NCD care within the primary care settings and includes assessing human resource availability. The six core activities are: providing NCD care knowledge updates for staff, assessing availability of essential equipment needs for NCD care, making necessary changes to the essential drugs list to include first line drugs for NCDs, developing and applying 10-year CVD risk charts to clinic populations, and developing and introducing protocols for follow-up care and management of NCDs.

(2) World Bank

The Health Sector Development Project (HSDP) was implemented by the MoH and the PDHS from 2004 to 2010, and funded by the International Development Administration (IDA)/World Bank with a grant of US $60 million and additional credit of $24 million[6]. The development objective was to contribute to improvements in efficiency, utilization, equity of access, and quality of public health sector health services in Sri Lanka, with a particular focus on the district and provincial level.

The World Bank issued a report entitled "Prevention and Control of Selected Chronic NCDs in Sri Lanka" in October 2010 aiming to stimulate policy dialogue for NCDs and to provide an evidence base to facilitate decisions.

The second HSDP will start from 2013 with a total cost of US $5,170 million, of which the International Development Association (IDA) contribution is expected to be US$200 million[7]. Area 3 of the of the Country Partnership Strategy for the Democratic Socialist Republic of Sri Lanka (FY 2013 - FY 2016) calls for improving living standards and social inclusion as part of its emerging middle-income country agenda. The second HSDP is expected to make an important contribution to addressing all three sub-areas of Area 3. The project development objective is to improve the public sector health system so as to respond to the challenges facing it, especially with regard to nutrition and NCDs. Improving prevention and control of NCDs is one of the Bank's focus thematic areas for technical engagement and monitoring. The resources will be utilised mainly in the following NCD-related areas: implementation of the WHO Framework Convention for Tobacco Control (FCTC); introduction of legislation for the control of indoor air pollution, pesticides and excessive alcohol, salt, sugar and trans fat usage; establishment of fully functional 24-hour emergency treatment units at all levels of hospitals; establishment of at least one healthy lifestyle centre in each of the 325 MOH areas; utilization of a mobile health screening system for screening at workplaces; improvement of NCD care management at hospitals; strengthening laboratory and other investigation services, ICU services, clinic facilities, and other ancillary services; and improvement of drug quality assurance, drug logistics and the distribution system.

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6 World Bank, 2011, Sri Lanka Health Sector Development Project – Report No. ICR1842

7 World Bank, 2013, Project Information Document (Appraisal Stage) – Sri Lanka – Second Health Sector Development Project-Report No. PIDA55

(3) World Diabetes Foundation

The Nirogi Lanka project, started in 2009 with a grant from the World Diabetes Foundation, aimed to establish diabetes educator nursing officers in Sri Lanka, improve the quality of diabetes care through development of a health care model of tertiary-primary care partnerships in Colombo, and prevent type 2 diabetes by empowering the public and identifying at-risk populations. The phase two project is expected to start in 2013.

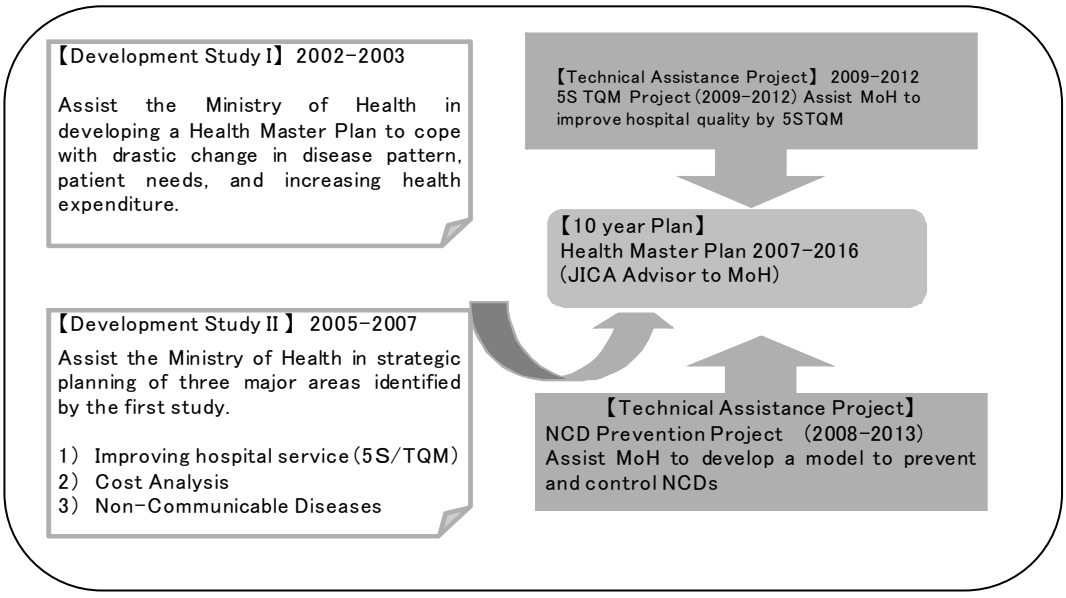
1.4 NCD Prevention Project (NPP)

1.4.1 Background

Japanese cooperation with the Sri Lankan health sector dates back several decades. The well-known contribution includes the formulation of the Health Master Plan, the National Blood Transfusion Centre, rehabilitation of major hospitals such as Jaffna Teaching Hospital, and introduction of 5S-TQM in hospital management.

Under the increased socio-economic burdens of NCDs, MoH initiated the project on "Health Promotion and Preventive Care Measures of Chronic NCDs (NPP)" in 2007 to develop an implementation model to prevent and control chronic NCDs. The background to this technical cooperation project is shown in Figure 1-2. After thorough discussions between MoH and the Japan International Cooperation Agency (JICA), the record of discussion was signed in February 2008 to implement a five-year project (May 2008 to March 2013) with a focus on ischemic heart diseases through screening, health guidance and health promotion activities.

Figure 1-2: Background and areas of JICA assistance



Source: JICA NPP

1.4.2 Project components

The NPP is designed to "develop effective and efficient implementation models to prevent and control NCDs". The following three indicators were set to measure the achievements of the project:

1) Twenty (20) % of target population is screened annually;
2) Seventy (70) % of people identified as high risk receive regular follow-up guidance; and
3) Ninety (90) % of newly identified patients have received necessary treatment.

To achieve the above goal, NPP selected four approaches (outputs):

Output 1: Risk factors of cardiovascular diseases are identified by the Ragama Health Study based on the evidence;

Output 2: Intervention guidelines and manuals are formulated based on available evidence and related literature;

Output 3: Institutional and technical feasibilities of the consolidated intervention guidelines are assessed for development of the NCD prevention models in pilot areas; and

Output 4: Expansion plan for health check-up/guidance and health promotion for prevention of cardiovascular diseases is finalised.

The project is implemented based on the Project Design Matrix that was modified and finalised as shown in the table below during the mid-term review in September 2010 (Annex 1).

Table 1-2: PDM modifications

Narrative Summary	PDM version 3 (2009.02.11)	PDM version 4 (2010.09. 24)
Overall Goal	NCD prevention and control strategies are being implemented in other districts.	Effective and efficient implementation models to prevent and control NCDs (DM, hypertension and hypercholesterolemia) are implemented in Sri Lanka.
Project Purpose	Effective and efficient implementation strategies to prevent and control NCDs (DM, hypertension, IHD, stroke and hypercholesterolemia) are developed.	Effective and efficient implementation models to prevent and control NCDs (DM, hypertension, and hypercholesterolemia) are developed.
Outputs	1) Socio-medical grounds for prevention and control of NCDs, especially cardio-vascular diseases, are identified in pilot areas. 2) Intervention strategies are formulated, reviewed and finalised based on socio-medical grounds. 3) Structures and mechanisms are established to implement the strategies in the target areas. 4) Expansion plan is drafted for island-wide implementation of NCD prevention and control strategies.	1) Risk factors of cardiovascular diseases are identified by the Ragama Health Study based on the evidence. 2) Intervention guidelines and manuals are formulated based on available evidence and related literature. 3) Institutional and technical feasibilities of the consolidated intervention guidelines are assessed for development of the NCD prevention models in pilot areas. 4) Expansion plan for health check-up/ guidance and health promotion for prevention of cardiovascular diseases is finalised for island-wide implementation.

1.4.3 Implementation structure

(1) Governing body in MoH

In the Record of Discussion (R/D) signed by both governments, the Secretary, the Ministry of Health is designated as project director and the Deputy Director General (Planning) as project manager of NPP. The highest decision-making body for NPP is the "Joint Coordinating Committee (JCC)" chaired by the Secretary of Health and consists of DDGs, Provincial Directors (PDs) and representatives from medical associations. JCC is responsible for planning major activities, monitoring the progress and endorsing guidelines and tools for distribution.

In the R/D, the establishment of the Technical Working Group (TWG) was also specified. TWG, consisting of directors and representatives from medical associations, was established to discuss technical issues for the project. During the first two years, the sub TWG sub-groups for health check-ups, health guidance/health promotion and cost analysis were often called to discuss technical matters. The TWG meeting was organised from time to time. However, it was absorbed into JCC due to overlapping participants. The member list of JCC and TWG is shown below.

Table 1-3: JCC & TWG member list

		JCC	TWG
1	Secretary-Ministry of Health (MoH)	Chair	
2	Additional Secretary (Medical Services) - MoH	✓	
3	Director General (Health Services) - MoH	✓	Chair
4	Deputy Director General (Planning) - MoH	✓	✓
5	Deputy Director General (Medical Services I) - MoH	✓	✓
6	Deputy Director General (Medical Services II) - MoH	✓	✓
7	Deputy Director General (Public Health Services I) - MoH	✓	✓
8	Deputy Director General (Public Health Services II) - MoH	✓	✓
9	Deputy Director General (Education, Training and Research) - MoH	✓	✓
10	Chief Accountant - MoH	✓	✓
11	Deputy Director General (Finance II) - MoH	✓	✓
12	Director, Non-Communicable Diseases - MoH	✓	✓
13	Representative, Department of External Resources, Ministry of Finance & Planning Planning	✓	
14	Representative, Department of External Resources, Ministry of Finance & Planning Planning	✓	
15	Representative, Ministry of Higher Education	✓	✓
16	Representative, Ministry of Education	✓	✓
17	Representative, Sri Lanka Medical Association	✓	✓
18	Representative, College of Physicians	✓	
19	Representative, College of Community Physicians	✓	
20	Representative, College of General Practitioners	✓	
21	Provincial Director of Health Services, North Central Province	✓	
22	Provincial Director of Health Services, North Western Province	✓	
23	Regional Director of Health Services, Kurunegala	✓	✓
24	Regional Director of Health Services, Polonnaruwa	✓	✓
25	Representative, Ragama Health Study	✓	✓
26	Director, Epidemiology - MoH		✓

		JCC	TWG
27	Director, Family Health Bureau - MoH		✓
28	Director, Health Education Bureau - MoH		✓
29	Director, Information - MoH		✓
30	Director, Mental Health - MoH		✓
31	Director, Nutrition - MoH		✓
32	Director, Planning - MoH		✓
33	Director, Youth, Elderly and People with Disability - MoH		✓
34	Director, Cancer Control Programme - MoH		✓
35	JICA NPP Team	✓	✓
36	Representative, JICA Sri Lanka Office	✓	✓
37	Representative, Embassy of Japan (Observer)	✓	
38	Representative, World Health Organization (Observer)	✓	
39	Representative, World Bank (Observer)	✓	
40	Others to be designated by MoH and JICA, if necessary	✓	✓

(2) Sri Lankan counterparts

During the five years of NPP implementation, a total of 21 officials from MoH and RDHS were assigned as major counterparts: Secretary of Health, Deputy Director General (Planning), Director NCD, Director Health Education Bureau (HEB), Regional Director (RD) Kurunegala, RD Polonnaruwa, MO/NCD Kurunegala and MO/NCD Polonnaruwa. The list of Sri Lankan counterpart personnel is attached as Annex 2.

(3) Japanese experts

JICA dispatched a team of experts on an assignment basis to assist MoH in implementing the project. A total of 11 experts were dispatched for the period of 94.5 months to work in Sri Lanka. A list of Japanese experts is attached as Annex 3.

(4) Other inputs

During the project period, JICA provided financial inputs as shown in Table 1-4 and the list of procured equipment is shown as Annex 4.

Table 1-4: Financial inputs from JICA

	2008	2009	2010	2011	2012	Total
Local cost	9,670,000	11,372,000	13,776,000	18,567,000	14,875,000	68,260,000
Equipment	1,867,000	284,000	700,000	5,735,000	0	8,586,000

Note: In Japanese yen.

For implementation of NPP, the Ministry of Health provided three office spaces in Colombo, Kurunegala and Polonnaruwa with all utilities and security.

As a part of JICA technical cooperation scheme, three counterpart training programmes were conducted in Japan as shown in Annex 5.

(5) Pilot areas and the road map of NPP

The risk factor survey was conducted in the Ragama MOH area by the University of Kelaniya, and three MOHs, namely Alawwa MOH, Narammala MOH and Medirigiriya MOH,[8] were selected as pilot areas to test the technical, institutional and financial feasibility of NPP models. The following Table shows the road map of NPP from May 2008 to March 2013.

Table 1-5: Road map of NPP

Outputs	Year 1	Year 2	Year 3	Year 4	Year 5
1. Risk factors identified.	Agree on survey framework and analyse Ragama Health Study as the baseline	First follow-up survey and results analysis	Second follow-up survey and results analysis	Conduct in-depth analysis	Information sharing for evidence-based planning
2. Intervention guidelines formulated and tools developed.	Preparation of NPP Implementation Guidelines	Preparation of NPP Implementation Guidelines	Develop manuals and tools, cost analysis	Develop/modify manuals and tools, information sharing on costs	Finalise guidelines and manuals
3. Implementation feasibilities tested.	Confirm implementation structure	Start pilot testing in 3 MOH areas	Confirm implementation status in 3 MOHs	Assist RDHS to expand in other MOHs	Assist RDHS to expand in other MOHs
4. Expansion plan			Overall review of NCD prevention activities		Assist MoH to expand NPP model to other districts

The major achievements under each output are described in the following chapters.

[8] Alawwa and Narammala MOH areas are in Kurunegala District and Medirigiriya MOH area is in Polonnaruwa District.

CHAPTER 2 NCD Risk Factors

2.1 Introduction

Cardiovascular diseases (CVD) are the main cause of death globally and over 80% of these deaths take place in low- and middle-income countries. It is estimated that CVDs will continue to dominate mortality trends in the future. Over the past decades, many in depth epidemiological studies have been conducted on CVD risk factors, incidence, and mortality in developed countries. However, no cohort studies have as yet been carried out in Sri Lanka.

Considering the importance of obtaining country-specific data on CVD risks and CVD outcomes, this component was designed as one of the project outputs. For this purpose, the Ragama Health Study (RHS) population was selected to identify risk factors of CVD for the following reasons: (1) a risk factor survey had already been implemented once in 2007, and (2) its methodology and operating structure were clear enough to track the same population in order to identify incidence of hypertension, diabetes mellitus, dyslipidaemia and CVD events as well as to track a variety of potential risk factors (exposure) that might be relevant to the development of relevant NCDs.

2.2 Background Information about Ragama Health Study (RHS)

2.2.1 Purpose of the RHS

The RHS was conducted in 2007 by the Faculty of Medicine, University of Kelaniya to determine the prevalence of major metabolic disorders and to establish diagnostic criteria for metabolic syndrome in the Sri Lankan population. This study was part of an international project by the National Centre for Global Health and Medicine, Tokyo, Japan. The study, conducted in Vietnam, China, Tanzania and Sri Lanka, aimed at controlling NCDs.

2.2.2 RHS study setting

The RHS was conducted in the Ragama Medical Office of Health (MOH) area, the field practice area for the Faculty of Medicine, University of Kelaniya. Ragama is situated in Gampaha district, which is the second most populous district of the country (Table 2-1). The Ragama MOH area has characteristics typical of an urban community in Sri Lanka.

Table 2-1: Basic data about Gampaha district

Province	Western
Population	2,298,588
Population density	1,714 /km2
Sector	Urban 14.6%, Rural 85.4%, Estate 0%
Ethnic Group	Sinhalese 90.6%, Sri Lankan Tamil 3.5%, Indian Tamil 0.5%, Sri Lankan Moor 4.2%, Burgher 0.4%, Malay 05%, Other 0.1%
Religions	Buddhist 71.5%, Hindu 2.3%, Muslim 5.0%, Christian 21.2%, Other 0.1%

Source: Census of Population and Housing 2012. Data about the sector is from the Census 2001

2.2.3 RHS population

A total of 3,150 individuals between 35-64 years of age were sampled using age stratified random sampling from the electoral lists. Of the sample, 3,000 were invited to join the study and 2,986 completed all the examinations and were selected for the RHS cohort in the baseline survey (Table 2-2). 44.8% (n=1,338) were males.

Table 2-2: Study population by age group and sex

Birth Year	**Age group at the baseline**	**Total (n=2,987)**	**Male (n=1,338)**	**Female (n=1,649)**
1942-1951	55-64	1,332	601	731
1952-1961	45-54	1,140	497	643
1962-1971	35-44	515	240	275

Source: Baseline Survey 2009

2.2.4 RHS examination items

The participants were screened by structured interview (past history, family history, dietary habits, physical exercise habits, smoking habits, drinking habits etc.), anthropometric measurements (height, weight, waist circumference), blood pressure measurement, blood investigation including fasting blood glucose, lipid profile, serum insulin, HbA1c, GPT (ALT), and blood count, urinary micro albumin, liver ultrasonography and ECG.

Data was collected by trained pre-intern medical graduates. At the end of the interview, all forms were checked for completeness and participants were requested to come on a pre-assigned date to collect their reports. Data on events from non-responders were obtained by the research assistants during visits to the community to invite subjects to participate in the study.

2.2.5 RHS ethical aspect

Ethical clearance was obtained from the Ethics Committees of the Faculty of Medicine, University of Kelaniya. Voluntary informed written consent was obtained from all participants. Blood for biochemistry was drawn by trained nurses using disposable equipment under aseptic conditions. All reports of investigations were given to participants and participants were appropriately counselled. In cases where results indicated possible abnormalities, participants were referred to the follow-up clinic

or to an appropriate consultant at the Colombo North Teaching Hospital, Ragama for necessary investigations and follow-up.

2.3 Methodology of Follow-up Risk Factor Survey

2.3.1 Design

This survey was a prospective cohort study of 2,986 people with a 3-year follow-up period from 2007 to 2010 with the following specifications.

In the first project year, analysis of RHS was conducted in order to utilise it as baseline data for CVD risk factor analysis. During the same time, a follow-up survey was designed by the University of Kelaniya and NPP. The NPP entrusted the University of Kelaniya to conduct two follow-up surveys in the second and third project year. In the fourth project year, a task force group was established by MoH, NPP, and University of Kelaniya to promote in-depth analysis for identifying risk factors and applying the findings to the NCD intervention strategy. Results of the in-depth analysis were presented in the Seminar of Evidence-based Planning to encourage further discussion in the final project year.

Table 2-3: Benchmarks for output 1

Year	Benchmark activity for output 1
2008	Analysis of the RHS as the baseline and submission of the baseline survey report.
2009	Implementation of the first follow-up study and submission of the RHS annual report.
2010	Implementation of the second follow-up study and submission of the RHS annual report.
2011	In-depth analysis by the task force team
2012	Seminar of Evidence-based Planning

2.3.2 Variables for the follow-up studies

All predictors examined in the follow-up surveys are listed in Table 2-4 below.

Table 2-4: Variables examined in the analysis

	Study variables
Socioeconomic factors	Education, occupation, ethnicity, religion, household income
Demographic factors	Age, gender
Behavioural factors	Alcohol consumption, smoking habits, dietary habits, physical exercise, stress, sleeping patterns
Host physical factors	Systolic blood pressure, diastolic blood pressure, weight, height, waist circumference
Host historical factors	Past history of NCDs, family history of NCDs, information on general health, reproductive history (only for females)
Biochemical status	Fasting blood glucose, lipid profile

Source: First Follow-up Survey 2009, Second Follow-up Survey 2010

Analysis was done using the following definitions:

1) Hypertension: past history of hypertension or a blood pressure of >=140/90 mmHg on follow-up.

2) Diabetes mellitus: past history of diabetes or a FBG>125 mg/dl on follow-up.

3) Dyslipidaemia: past history of dyslipidaemia or presence of one or more of the following criteria: an LDL cholesterol $\geq$160 mg/dl or an HDL cholesterol <40 mg/dl or a triglyceride concentration $\geq$200 mg/dl or total cholesterol $\geq$240 mg/dl.

4) CVD events (outcome): occurrence of a fatal or non-fatal stroke, myocardial infarction or other ischaemic heart diseases (IHD). Events were identified by the researchers' direct observations, reports by health services, or information gathered from relatives with death certificate.

A dietary assessment was conducted using a validated food frequency questionnaire developed by University of Wayamba and University of Kelaniya in a sub-sample of the Ragama Health Study cohort in the Second Follow-up Survey in 2010.

2.3.3 Statistical methods

Data were entered and checked in EPIINFO. Discrepancies were manually checked and corrections made accordingly. Frequency and logical checks were done to ensure data quality.

The significance of the baseline differences was tested with χ^2 test. Factors associated with incidence of hypertension, diabetes mellitus, dyslipidaemia, comorbidity related to the preceding diseases, and CVD events were analysed with Cox's proportional hazards model, which included only those predictors that were significant in the bivariate analysis.

2.4 Analysis of the Baseline Data

The prevalence of hypertension, diabetes mellitus, dyslipidaemia, comorbidities, and other risk factors are listed in Table 2-5. The age-adjusted prevalence of dyslipidaemia in females (64.3% (95% CI: 61.2-67.2)) was significantly higher than males (35.8% (95% CI: 27.5-44.1)) ($p<0.001$). The mean value of selected risk factors by sex is given in Table 2-6.

Table 2-5: Age-adjusted prevalence of target NCDs at the baseline, 2007 (95%CI)

	Males	Females
Age-adjusted prevalence		
Hypertension	33.0% (25.6-40.4)	36.6% (34.2-39.1)
Diabetes mellitus	19.4 (17.4-21.4)	19.3 (13.7-24.8)
Dyslipidaemia	35.8 (27.5-44.1)	64.3 (61.2-67.2)
Hypertension and dyslipidaemia	13.5% (11.8-15.3)	24.8 (22.7-27.0)
Hypertension and diabetes mellitus	9.0% (7.7-10.3)	10.6 (9.3-11.9)
Diabetes mellitus and dyslipidaemia	N/A	N/A
Hypertension, diabetes mellitus, and dyslipidaemia	4.1% (3.2-5.1)	7.1% (6.0-8.2)
Crude prevalence		
Physical inactivity	15.7%	21.4%
Overweight	25.4%	34.9%
Obesity	4.3%	11.5%
Smoker	36.0%	0.3%

Note: Adjusted for estimated mid-year population of Sri Lanka for 2007 by Registrar General's Department, Sri Lanka
Source: Baseline Survey 2009, In-Depth Analysis Report 2012

Table 2-6: Mean values of clinical and biochemical parameters at the baseline

	Males (n=1,338) Mean (SD)	Females (n=1,649) Mean (SD)	P (male vs female)
Fasting blood glucose	11.8 (43.5)	117.9 (44.8)	0.78
Systolic blood pressure	133.9 (21.0)	136.1 (22.7)	0.01
Diastolic blood pressure	79.3 (12.6)	79.7 (12.0)	0.34
Total cholesterol	205.3 (41.0)	217.5 (42.4)	<0.01
HDL cholesterol	48.8 (4.7)	50.2 (4.1)	<0.01
LDL cholesterol	129.0 (35.9)	141.9 (38.2)	<0.01
Triglyceride	138.1 (71.8)	126.2 (64.6)	<0.01
Body mass index	23.1 (3.9)	24.9 (4.4)	<0.01
Waist circumference	86.1 (10.6)	87.1 (28.9)	0.17

Source: Baseline Survey 2009

Table 2-7 shows characteristics of the cohort at baseline by health status. At baseline, 2,106 subjects had at least one of the following: hypertension, diabetes mellitus, or dyslipidaemia. In the bivariate analysis, factors associated with prevalence of these diseases were age group, gender, religion, smoking status, BMI >25, and physical activity ($p<0.05$).

Table 2-7: Characteristics of the cohort at the baseline, 2007 (n, % out of the total)

	Total (n=2,987)	Subject with HT, DM and/or dyslipidaemia (n=2,106)	Subject without HT, DM and/or dyslipidaemia (n=881)
Age group ++			
35-44	515	245 (47.6)	270 (52.4)
45-54	1,140	785 (68.9)	355 (31.1)
55-64	1,332	1,076 (80.8)	256 (19.2)
Gender *			

Male (%)	1,338	916 (68.5)	422 (31.5)
Ethnicity			
Sinhalese	2,805	2,004 (71.4)	846 (30.2)
Tamil	48	35 (72.9)	13 (27.1)
Others	73	56 (76.7)	17 (23.3)
Religion +			
Buddhism	1,823	1,237 (67.9)	586 (32.1)
Christianity	1,097	816 (74.4)	281 (25.6)
Hinduism	15	12 (80.0)	3 (20.0)
Islam	34	28 (82.4)	6 (17.6)
Other	1	1 (100.0)	0 (0.0)
Education			
No formal education	33	23 (69.7)	10 (30.3)
Primary education	213	135 (63.4)	78 (36.6)
Secondary education	2,155	1,544 (71.6)	611 (28.4)
More than secondary education	572	395 (69.1)	177 (30.9)
Monthly household income			
<Rs. 10,000	1,314	928 (70.6)	386 (29.4)
>= Rs.10,000	1,607	1,128 (70.2)	479 (29.8)
Smoking status +			
Non smoker	2,128	1,532 (72.0)	596 (28.0)
Smoker	854	571 (66.9)	283 (33.1)
BMI ++			
<25	1,547	917 (59.3)	630 (40.7)
>=25	1,425	1,179 (82.7)	246 (17.3)
Physical Activity ++			
Low	563	434 (77.1)	129 (22.9)
Moderate	741	544 (73.4)	197 (26.6)
High	1,683	1,128 (67.0)	555 (33.0)
Consumption of vegetables			
Daily	834	586 (70.3)	248 (29.7)
Less frequent	504	330 (65.5)	174 (34.5)
Consumption of fruits			
Daily	422	312 (70.6)	110 (24.9)
Less frequent	916	655 (71.5)	261 (28.5)

Abbreviations: HT: hypertension; DM: diabetes mellitus
Note: The category “smoker” includes ex-smokers; * $p<0.05$; + $p<0.01$; ++ $p<0.001$
Missing data for ethnicity, religion, education, monthly household income, smoking status and BMI for 61, 17, 14, 66, 5, 15 subjects, respectively.
Source: Baseline Survey 2009

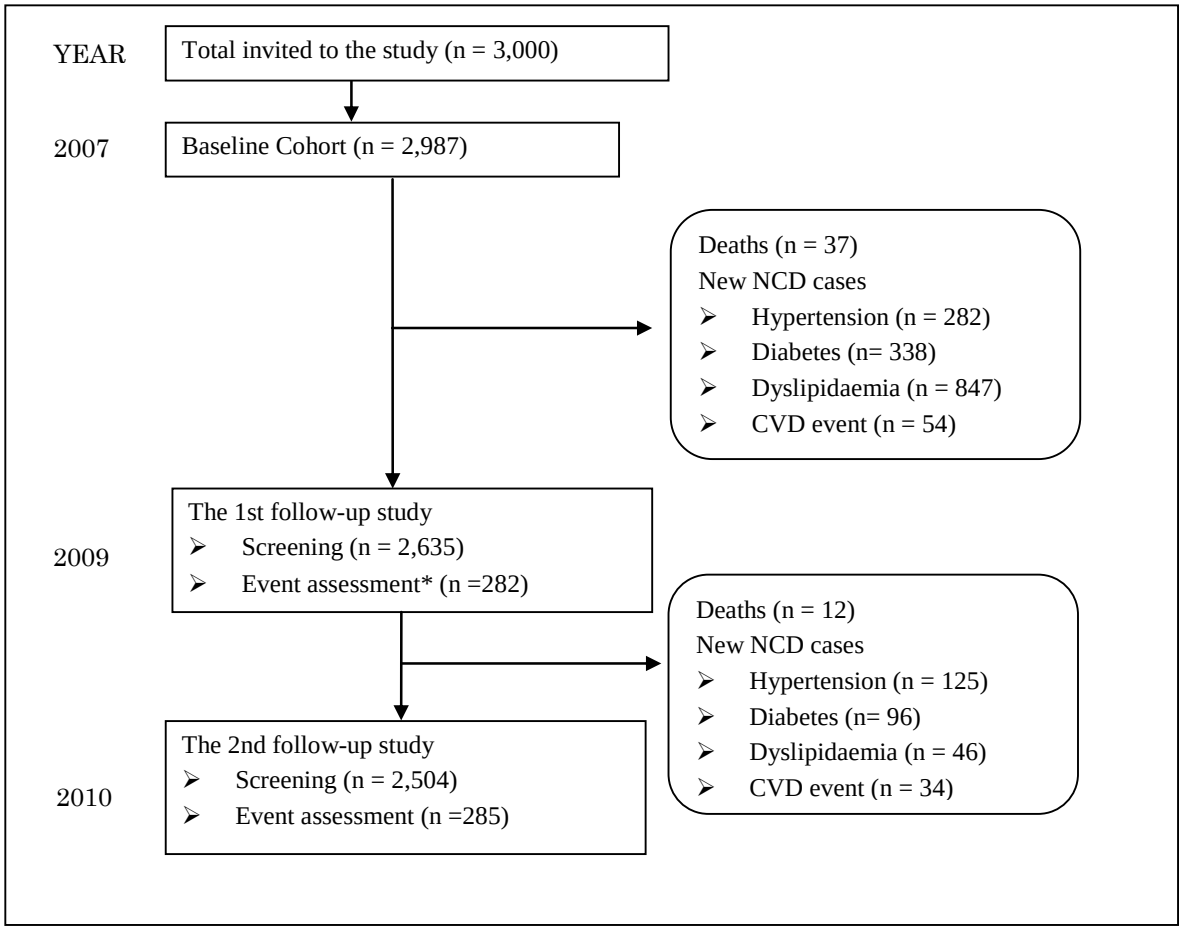
2.5 Results of the Follow-up Study

2.5.1 Participants

Out of the cohort of 2,987 subjects, 2,738 (93.2%) participated in at least one of the follow-up studies. The numbers of participants in each follow-up study are shown in Figure 2-1. The total period of observation of all 2,986 subjects was 9,186.46 person years.

The total number of deaths during the three-year follow-up was 49 (1.8%): 16 deaths (32.7%) were due to myocardial infarction (MI) or other IHD, 5 cases (10.2%) were due to stroke.

Figure 2-1: Recruitment and follow-up flow diagram



NOTE: * Those who didn't participate in the screening were visited/telephoned to confirm any occurrence of diseases.
Source: First Follow-up Survey 2009, Second Follow-up Survey 2010

2.5.2 Outcome data

(1) Incidence

Newly diagnosed cases during the follow-up period were 407 with hypertension, 434 with diabetes, 893 with dyslipidaemia, along with 88 confirmed CVD events. Table 2-8 shows the incidence of hypertension, dyslipidaemia and diabetes by gender. The incidence of dyslipidaemia was more than 2 times higher than hypertension and diabetes mellitus.

Table 2-8: Incidence of hypertension, diabetes mellitus and dyslipidaemia by sex and age group

	Sex Group	No. without the target disease at baseline	Number of new cases by 2010 (%)	Person years of follow-up	Incidence per 1000 person years	95% CI
Hypertension	Male	798	192 (24.1)	2465.43	77.88	(67.25-89.71)
	Female	846	215 (25.4)	2610.75	82.35	(71.71-94.13)
	Total	1,644	407 (24.8)	5076.17	80.18	(72.58-88.36)
Diabetes mellitus	Male	1,050	197 (18.8)	3242.63	60.75	(52.71-69.69)
	Female	1,227	237 (19.3)	3783.99	62.63	(55.03-70.99)
	Total	2,277	434 (19.1)	7026.62	61.77	(56.16-67.78)
Dyslipidaemia	Male	887	495 (55.8)	2725.29	181.63	(165.98-198.36)
	Female	558	398 (71.3)	1728.53	230.25	(208.18-254.02)
	Total	1,445	893 (24.8)	4453.82	200.50	(187.57-214.10)

Source: In-depth Analysis Report 2012

Table 2-9 shows the concurrent incidence of hypertension, dyslipidaemia, and diabetes mellitus. Dyslipidaemia and diabetes mellitus were the most common comorbidity in both sex groups.

Table 2-9: Concurrent incidence by sex group

	Sex Group	Number without both diseases at baseline	Number of new cases by 2010	Person years of follow-up	Incidence per 1000 PY	95% CI
HT and Dyslipidaemia	Male	540	83 (15.4)	1663.24	49.90	40.01-61.53
	Female	304	69 (22.7)	942.59	73.20	57.42-92.05
	Total	844	152 (18.0)	2605.83	58.33	49.60-68.17
HT and DM	Male	477	39 (8.2)	1476.02	26.42	19.07-35.73
	Female	511	40 (7.8)	1576.36	25.37	18.39-34.19
	Total	989	79 (8.0)	3052.38	25.88	20.64-32.07
Dyslipidaemia and DM	Male	706	84 (11.9)	N/A	N/A	N/A
	Female	419	60 (17.3)	N/A	N/A	N/A
	Total	1125	144 (12.8)	N/A	N/A	N/A

Abbreviations: HT: hypertension; DM: diabetes mellitus
Source: In-depth analysis Report 2012

During the follow-up period, 35 myocardial infarctions, 15 strokes, and 38 other ischaemic heart disease events were reported. The incidence densities are shown in Table 2-10.

Table 2-10: Incidence of MI, stroke, and ischaemic heart diseases by sex group

	Sex Group	Number of new cases by 2010	Person years of follow-up	Incidence per 1000 Person Years	95% CI
MI	Male	17	4146.94	4.10	2.47-6.43
	Female	18	5039.52	3.57	2.18-5.54
	Total	35	9186.46	3.81	2.70-5.24
Stroke	Male	9	4146.94	2.17	1.06-3.98
	Female	6	5039.52	1.19	0.48-2.48
	Total	15	9186.46	1.63	0.95-2.63
Other IHD	Male	12	3268.62	3.67	1.99-6.24
	Female	26	4248.57	6.12	4.09-8.83
	Total	38	7517.19	5.06	3.63-6.86

Abbreviations: MI: myocardial infarction, IHD: ischaemic heart disease
Source: Second Follow-up Survey 2010

(2) Risk factors

a) Hypertension

The subjects in the age group 55-64 years were twice as likely to develop hypertension as compared to those in the age group 35-44 years during the follow-up period ($p<0.001$). Presence of diabetes mellitus at the baseline, BMI over 25 kg/m^2 at baseline and physical inactivity were also independent predictors of incident hypertension (Table 2-11).

Table 2-11: Multivariate analysis of association between incidence of hypertension and risk factors (n=1,644)

Risk factors	%	HR	95%CI
Age 55-64 years	31.9	2.0	1.52 - 2.73 ++
BMI >=25	32.5	1.49	1.13 - 1.96 *
Waist circumference >80cm for males, >90cm for females	28.7	0.916	0.70 - 1.20
Diabetes mellitus at baseline	37.0	1.47	1.16 - 1.86 +
NAFLD	38.7	1.50	1.12 - 1.90
Regular alcohol consumption	21.0	0.83	0.64 - 1.07
Low level of physical activity	32.2	N/A	N/A *
Experience of stressful life-events	27.7	0.96	0.78-1.17

Note: * $p<0.05$; + $p<0.01$; ++ $p<0.001$ Abbreviation: HR: hazard ratio
Source: In-depth Analysis Report 2012

b) Diabetes mellitus

As shown in Table 2-12, presence of impaired fasting glycaemia (IFG) at baseline increased the risk of developing diabetes mellitus by more than three times ($p<0.001$). As with the incidence of hypertension, subjects in the age group 55-64 years were twice as likely to develop diabetes mellitus compared to those in the age group 35-44 years ($p<0.001$). Presence of non-alcoholic fatty liver disease (NAFLD) at the baseline was also shown to have a significant association with incidence of

diabetes mellitus (p<0.01). Among females, the relative risk of incident diabetes mellitus significantly increased with menopause (relative risk=1.61, 95%CI: 1.25-2.07).

Table 2-12: Multivariate analysis of association between incidence of diabetes mellitus and risk factors (n=2,277)

Risk factors	%	HR	95%CI
Age 55-64 years	23.2	1.92	1.38-2.65++
BMI >=23	22.6	1.36	1.03-1.79
Waist circumference >80cm for males, >90cm for females	22.4	0.82	0.62-1.09
IFG at the baseline	27.4	3.14	2.45-4.02++
Hypertension at the baseline	22.8	0.94	0.74-1.13
Family history of dyslipidaemia	242	1.12	0.84-1.48
Family history of diabetes mellitus	22.6	1.01	0.86-1.30
NAFLD at the baseline	28.6	1.54	1.21-1.98+

Note: * p<0.05; + p<0.01; ++ p<0.001
Abbreviation: IFG: impaired fasting glycaemia
Source: In-depth Analysis Report 2012

c) Dyslipidaemia

On multivariate analysis, independent predictors of incident dyslipidaemia were Sinhalese ethnicity and female sex (Table 2-13). Although no significant association with age was observed with adjustment for sex group, the younger age group had higher incidence in both males and females (Table 2-14).

Table 2-13: Multivariate analysis of association between incidence of dyslipidaemia and risk factors (n=1,455)

Risk factors	%	HR	95%CI
Female	71.3	1.39	1.18 – 1.62 ++
Age 45-54 years	63.3	0.96	0.79 – 1.16
Age 55-64 years	57.1	0.94	0.77 – 1.14
Sinhalese	62.3	2.12	1.39 – 3.24 +
BMI >=23	65.1	1.06	0.912 – 1.24
Hypertension at baseline	58.1	0.88	0.76 – 1.03
NAFLD at baseline	71.9	1.22	1.01 – 1.47
Regular smoker	54.7	0.92	0.74 – 1.16
Regular alcohol consumption	52.2	9.93	0.74 – 1.18
Unsatisfactory sleeping pattern	44.7	0.79	0.65 – 0.95 *

Note: * p<0.05; + p<0.01; ++ p<0.001
Source: In-depth Analysis Report 2012

Table 2-14: Incidence of dyslipidaemia by sex and age group

Age-Sex Group	Number without dyslipidaemia at baseline	Number of new cases by 2010	Person years of follow-up	Incidence per 1000 PY	95% CI
Male	887	495	2725.29	181.63	(165.98-198.36)
35-44	154	101 (14.6)	484.23	208.58	(169.89-253.44)
45-54	305	167 (20.7)	935.47	178. 52	(152.47-207.74)
55-64	428	227 (33.9)	1305.59	173.87	(151.98-198.02)
Female	558	398	1728.53	230.25	(208.18-254.02)
35-44	108	85 (19.6)	337.80	251.63	(200.99-311.15)
45-54	207	157 (26.1)	640.79	245.01	(208.18-286.48)
55-64	243	156 (29.6)	749.94	208.02	(176.65-243.34)
Total	1445	893 (24.8)	4453.82	200.50	(187.57-214.10)

Source: In-depth Analysis Report 2012

d) Concurrent incidence of hypertension, diabetes mellitus, and dyslipidaemia

The risk of concurrent incidence of hypertension and dyslipidaemia was statistically significant for the following variables: BMI ≥23 kg/m^2 at baseline (HR: 1.63; 95%CI: 1.05-2.53; p<0.05), female sex (HR: 1.49; 95%CI: 1.02-2.20; p<0.05), and presence of NAFLD at baseline (HR: 1.72; 95%CI: 1.13-2.62; p<0.05).

The risk of concurrent incidence of hypertension and diabetes mellitus was statistically significant for the following variables: BMI ≥23 kg/m^2 at baseline (HR: 2.11; 95%CI: 1.13-3.92; p<0.05), presence of NAFLD at baseline (HR: 2.50; 95%CI:1.41-4.45; p<0.05), age 45-54 at baseline (HR: 2.07; 95%CI:1.03-4.13; p<0.05), and age 55-64 at baseline (HR: 4.46; 95%CI:2.27-8.79; p<0.001).

The risk of concurrent incidence of dyslipidaemia and diabetes mellitus was statistically significant for the following variables: BMI ≥23 kg/m^2 at baseline (HR: 1.53; 95%CI: 1.05-2.23; p<0.05) and presence of NAFLD at baseline (HR: 1.64; 95%CI:1.06-2.54; p<0.05).

The risk of concurrent incidence of hypertension, dyslipidaemia and diabetes mellitus was statistically significant for the following variables: BMI ≥23 kg/m^2 at baseline (HR: 4.16; 95%CI: 1.45-11.93; p<0.05).

e) CVD events

Being older was a significant predictor of CVD events. Subjects in the age group 45-54 years were 2.7 times and age group 55-64 years were 3.3 times more likely to develop CVD events compared with those in the age group 35-44 years (Table 2-15). Even after adjusting for the effects of aging, hypertension was a significant predictor.

Table 2-15: Multivariate analysis of association between CVD events and risk factors

Risk factors	%	HR	95%CI
Age 45-54 years	1.2	2.73	1.05-7.09*
Age 55-64 years	3.1	3.34	1.29-8.64*
Experience of stressful life event	4.7	0.67	0.43-1.05
Hypertension	4.4	1.70	1.06-2.70*

Note: * p<0.05; + p<0.01; ++ p<0.001, Abbreviation: HR, hazard ratio
Source: Second Follow-up Survey 2010

The relative risk of CVD events significantly increased with comorbidity of hypertension, dyslipidaemia or/and diabetes mellitus (Relative Risk=2.45, 95%CI: 1.62-3.71).

(3) Dietary profile

Table 2-16 shows median energy intake, % of carbohydrates, fat intake, protein intake and median sodium intake among the 1,917 subjects in 2010.

Table 2-16: Nutrition intake of the subjects

	Male (n=830) Median (interquartile range)	Female (n=1,087) Median (interquartile range)
Energy Intake (Kcal)	2,950 (2,430-3,604)	2,370 (1,872-2,839)
Carbohydrate (%)	72.7 (68.5-76.3)	72.7 (68.1-76.4)
Fat (%)	16.5 (13.5-20.1)	16.8 (13.6-20.6)
Protein (%)	10.4 (9.7-11.4)	10.2 (9.5-11.1)
Salt intake (g)	7.6 (5.6-10.3)	6.1 (4.8-7.9)

Note: Amount of salt was converted from amount of sodium intake by multiplying 2.5
Source: In-depth Analysis Report 2012

Over 94% of both males and females receive more than 60% of their energy from carbohydrates. About 66% (n=1,271) receive more than 70% of their daily energy from carbohydrates. Those who receive >60% of their daily energy intake from carbohydrates are more likely to have dyslipidaemia (OR=1.64, 95%CI: 1.02-2.65, p<0.05), while diabetes mellitus is less prevalent among them (OR=0.63, 95%CI: 0.42-0.92, p<0.05).

A larger percentage of subjects (44.6%) receiving >10.3% of their daily energy intake from protein have prevalent diabetes mellitus as compared to subjects recenving <=10.3% of their daily energy intake from protein (36.6%). The association was statistically significant (OR=1.397, 95%CI: 1.16-1.68, p<0.001).

Approximately 18% (n=348) of the sample consumed more than 10g of salt daily. The percentage consuming more than 5g of salt was 75.1% (n=794). No significance was observed in the association between consumption of salt and prevalence/incidence of hypertension.

2.6 Discussion

2.6.1 Prevalence of NCDs

This was the first cohort study to investigate incidence of hypertension, diabetes mellitus and dyslipidaemia and CVD risk factors in Sri Lanka. Age-adjusted prevalence of diabetes mellitus at baseline was around 19%. The prevalence is similar to that of another study in Sri Lanka[9]. On the other hand, the baseline result shows somewhat/significantly higher prevalence of hypertension (33% in males and 37% in females) than in previously available data in Sri Lanka (Wijewardene, 2005[10]; Katulanda, 2008). Although it was reported that the prevalence of hypertension in Sri Lanka is lower than international averages (Engelgau, 2008), the results of the baseline study indicate that hypertension is almost at the same level as the average prevalence of developing countries (32.2 % in males, 30.5% in females)[11]. Prevalence of dyslipidaemia has not been well researched in Sri Lanka. The mean total cholesterol levels were reported in the 200-236mg/dl category in Western Province (Sri Lanka Medical Association, 2004) and were at a significantly higher level in females than in males (Katulanda, 2008). The RHS population had a similar level of mean total cholesterol: 205.3 in males and 217.5 in females; and mean LDL cholesterol 129.0 in males and 141.9 in females with significant differences between males and females.

2.6.2 Risk factors

Increasing age and presence of hypertension were significant risk factors for CVD events. In bivariate analysis, comorbidity of hypertension, dyslipidaemia, or/and diabetes mellitus and presence of dyslipidaemia had a significant association with CVD events.

The risk of developing hypertension in the RHS population was associated with increasing age, physical inactivity, presence of diabetes mellitus and BMI over 25. Increasing age, presence of IFG, NAFLD were significant risk factors associated with diabetes mellitus. Sinhalese ethnicity and female sex were significant risk factors for dyslipidaemia.

The results reinforce the importance of detecting hypertension and diabetes mellitus through CVD prevention strategies, especially among older age groups. As modifiable risk factors, our study found a BMI of over 23 as a significant risk factor for concurrent incidence of hypertension, diabetes mellitus and/or dyslipidaemia. This implies BMI 23 is a useful cut-off to achieve in health guidance and health promotion in order to reduce CVD risk level.

With the limitations of the validated food frequency questionnaire in mind, the RHS population

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[9] Katulanda P., Constantine G.R., Mahesh J.G., Sheriff R., Seneviratne R.D., Wijeratne S., *et al.* (2008). Prevalence and projections of diabetes and pre-diabetes in adults in Sri Lanka - Sri Lanka Diabetes, Cardiovascular Study (SLDCS). *Diabet Med.* 25(9): 1062-9.

[10] Wijiwardene, K, *et.al,* 2005, "Prevalence of Hypertension, Diabetes and Obesity: Baseline Findings of a Population-based Survey in Four Provinces in Sri Lanka", Ceylon Medical Journal 50 (2); 62-70.

[11] Ibrahim, M. Mohsen, Damasceno, A. (2012). Hypertension in developing countries. *Lancet, 380*(9841), 611-619.

indicated relatively higher energy intake (median 2,950kcal in males and 2,370kcal in females) than previously available data[12]. In Sri Lanka, it is recommended to receive 50 to 65% of daily requirement of energy from carbohydrates, 10 to 15% from protein, 15-30% from fat, and consume less than 5g of salt[13]. Our study observed 73% from carbohydrates 10% from protein, 17% from fat and 7.6g of salt in males and 6.1 g in females as mean value of daily energy intake. Relatively higher intake of carbohydrates in the South Asian region was reported in several studies[14], and it has been pointed out that consumption of large carbohydrate meals may lead to hyperinsulinaemia, high serum TAG and low HDL-cholesterol levels among the population. The result also found a significant association between high intake of carbohydrates and presence of dyslipidaemia. The association between low intake of carbohydrates and the presence of diabetes mellitus in our study may be due to dietary modification according to nutritional guidance in their treatment. No significant association was observed between the presence of dyslipidaemia and amount of fat intake. It may due to the high ratio of saturated fats to polyunsaturated fats compared to a recommended ratio of <1:1 has been pointed out in other studies[15]. In this study, type of fat was not investigated and therefore the ratio of saturated fats to polyunsaturated fats was not known.

2.7 Recommendations

The following recommendations have been made by the project.

1) To address the unhealthy lifestyle factors identified in the RHS, promotion of a healthy balanced diet, physical activity and encouraging maintenance of a BMI <23 is necessary.

2) Considering the strong impact of hypertension on CVD events, it is recommended to create an opportunity to measure blood pressure regularly in community such as at antenatal clinic centres and Public Health Inspector (PHI) offices, MOHs and hospitals. Since presence of diabetes mellitus is a significant risk factor for hypertension and IFG is an important risk factor for diabetes mellitus, health guidance programs that target people with IFG are important to prevent both diabetes mellitus and hypertension.

3) Older age groups should be given priority for screening since the risk of hypertension, diabetes mellitus and CVD events significantly increase with age, especially after 55 years of age.

4) Comorbidity of dyslipidaemia with hypertension or/and diabetes mellitus significantly increases CVD event risk. Therefore it is strongly recommended to test lipid profiles for those who develop

[12] Jayawardena, R., Swaminathan, S., Byrne, Nuala M. *et al.*, (2012). Development of a food frequency questionnaire for Sri Lankan adults. *Nutrition Journal*, *11*(1),63.
[13] Ministry of Health, Nutrition Division, Sri Lanka.2011. Food Based Dietary Guidelines for Sri Lankans.
[14] Misra A., Khurana L., Isharwal S. & Bhardwaj S., South Asian diets and insulin resistance. *Br. J Nutrition 2009, 101*(4), 465-473.
[15] Abeywardena, M.Y., 2003, Dietary fats, carbohydrates and vascular disease: Sri Lankan perspectives, Elsevier Ireland Ltd.

hypertension and/or diabetes mellitus.

5) Longer follow-up is needed for identification of risk factors for CVD incidences in Sri Lanka. It is strongly recommended that this cohort be maintained and the study continued.

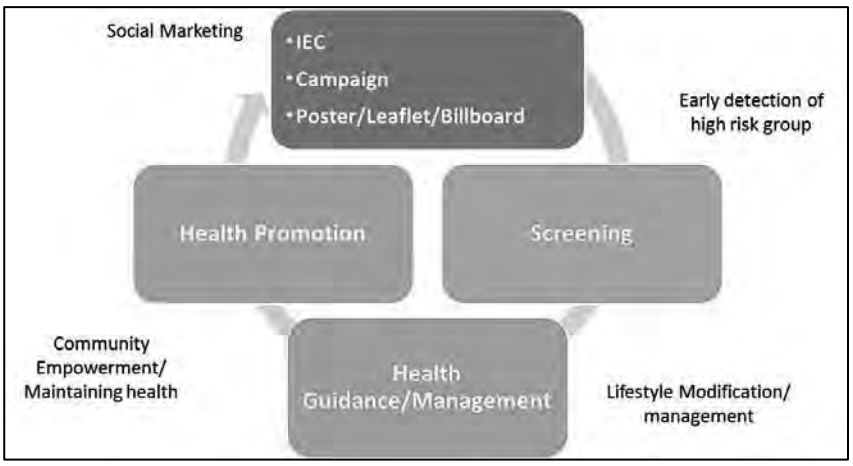
2.8 Limitations

A limitation of the study was that the short period of follow-up was inadequate to obtain a sufficient number of CVD events. This study did not have the statistical power to identify an association between dyslipidaemia and diabetes and CVD events. It may be due to the small sample of CVD events. Although dietary habits are considered to be one of the strong risk factors and hence may lead to the finding of specific Sri Lankan risk factors, our food questionnaire did not enable detailed information such as type of fat and amount of sugar.

CHAPTER 3 NPP models for NCD prevention

As described in Chapter 1, the purpose of the NCD Prevention Project (NPP) is to develop effective and efficient implementation models to prevent and control NCDs. The main interventions of NPP consist of (1) screening, (2) health guidance and management, (3) health promotion and (4) social marketing. The complete NPP model is shown in Figure 3-1.

Figure 3-1: Complete NPP model



Abbreviation: IEC: Information, Education and Communication

The NPP models and interventions are in accordance with the National Policy and Strategic Framework for Prevention and Control of Chronic Non-Communicable Diseases 2010, and provide support for national strategies II and IV.

- Strategy II: Implement a cost-effective NCD screening programme at community level with special emphasis on cardiovascular diseases, and
- Strategy IV: Empower the community for promotion of healthy lifestyles for NCD prevention and control.

This Chapter will discuss descriptions, the development process and way forward for each model, along with how they were compiled into the Guidelines for NCD Prevention.

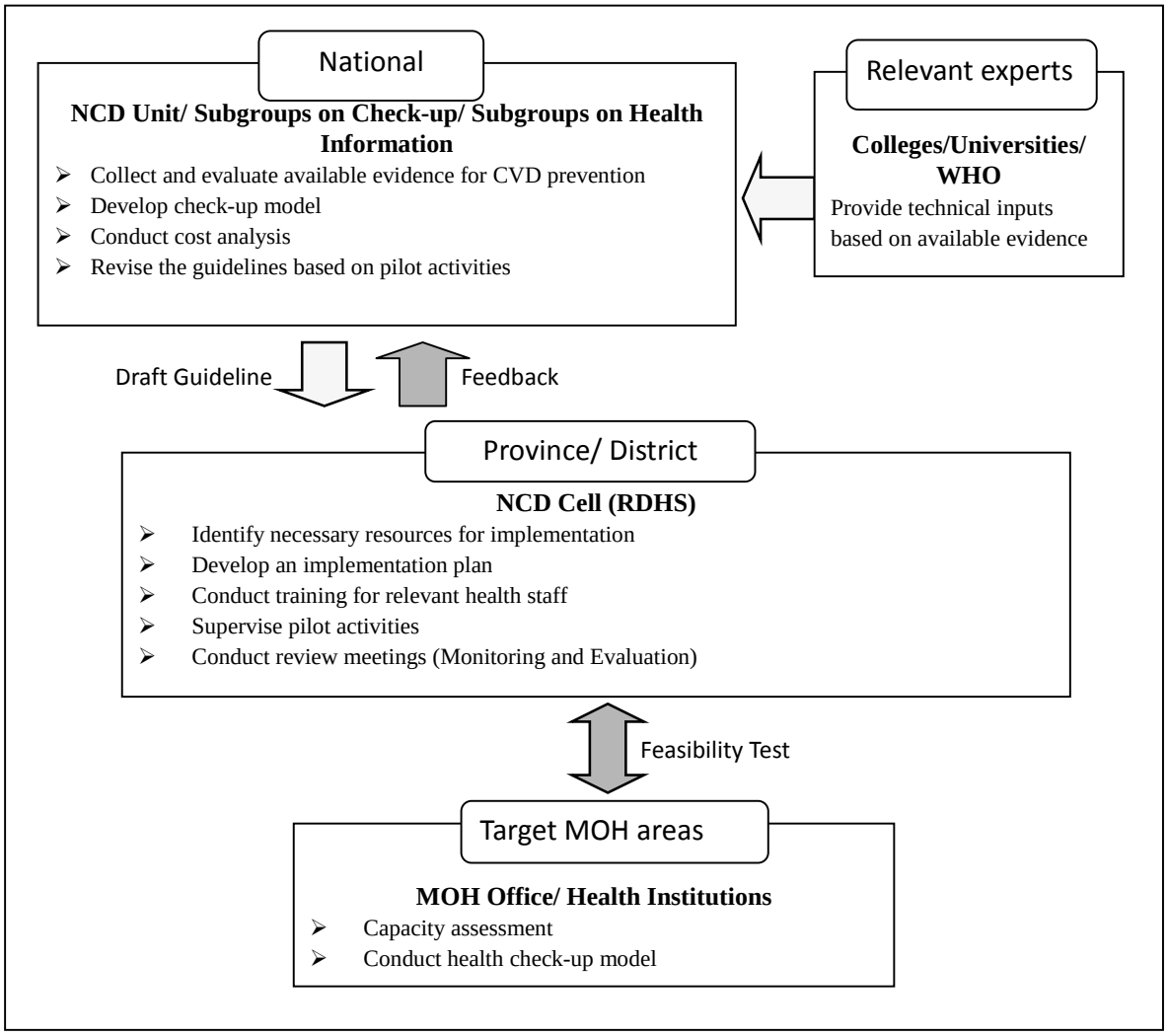
3.1 Screening Model

3.1.1 Development structure and system

At the national level, TWG subgroups on health check-ups and health information were established in the Ministry with relevant experts, including professionals from several colleges, universities, and the WHO, to develop a screening model ensuring technical soundness. The health check-up subgroup was

co-chaired by the DDG MS 1 and 2, and the health information subgroup was co-chaired by DDG PHS 1 and DDG Planning. Both groups met very frequently to discuss the most suitable screening and data collection system for Sri Lanka during the first and second year. At district level as well, many meetings and workshops were held to discuss the financial, technical, operational and institutional feasibility of the model under the leadership of the RDHS in order to provide feedback to the subgroups for further discussion. The development structure of the check-up model was as visualised in Figure 3-2.

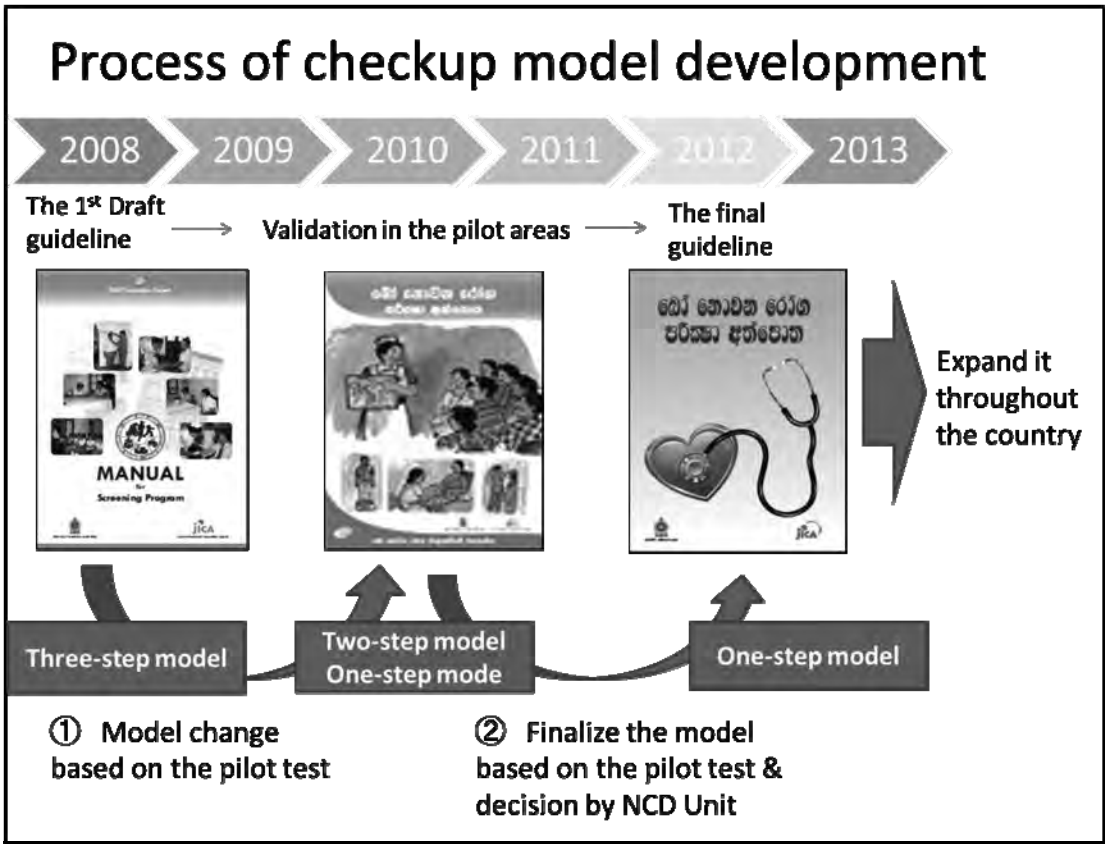
Figure 3-2: Development structure of check-up model



3.1.2 A transition of screening models

Figure 3-3 shows the process of development for the check-up model. During the project period, three check-up models were developed. The first model, a three-step model (Figure 3-4), was developed and pilot tested from January to March 2009. Reflecting the results of piloting, the first model was revised into the two-step model (Figure 3-5) and pilot implementation started in Polonnaruwa from July 2009. In the meantime, a one-step model (Figure 3-6) was suggested for Kurunegala, as it is a more urban and densely populated than Polonnaruwa, and pilot implementation started from August 2009.

Figure 3-3: Development process of check-up model



After piloting two models, all the lessons and results were discussed in the Ministry and these crystallised into a final model that has been included in the NPP Guidelines. The basic characteristics of each model are summarised in Table 3-1.

Figure 3-4: Three-step approach to health check-up

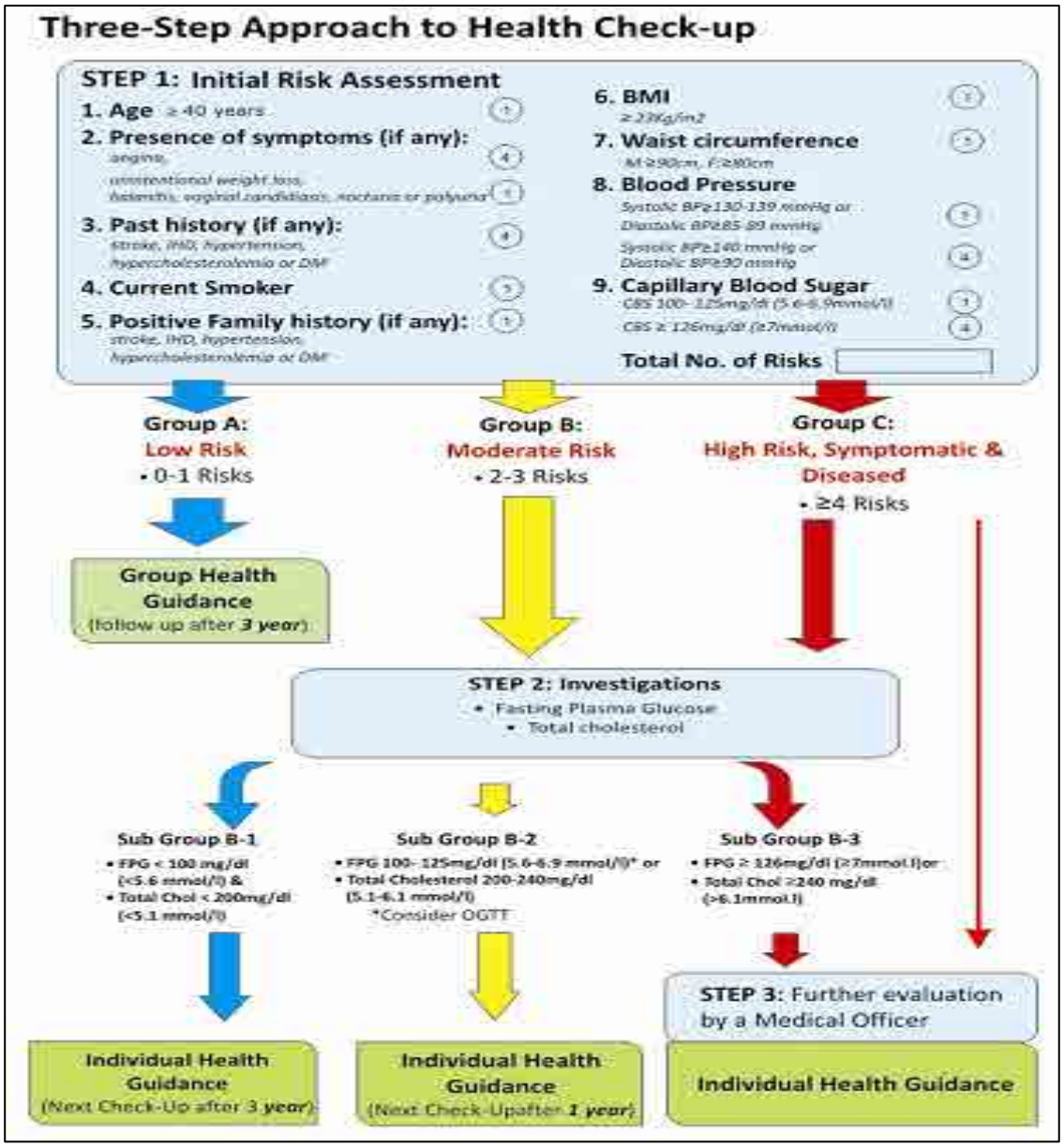


Figure 3-5: Two-step check-up model (Polonnaruwa model)

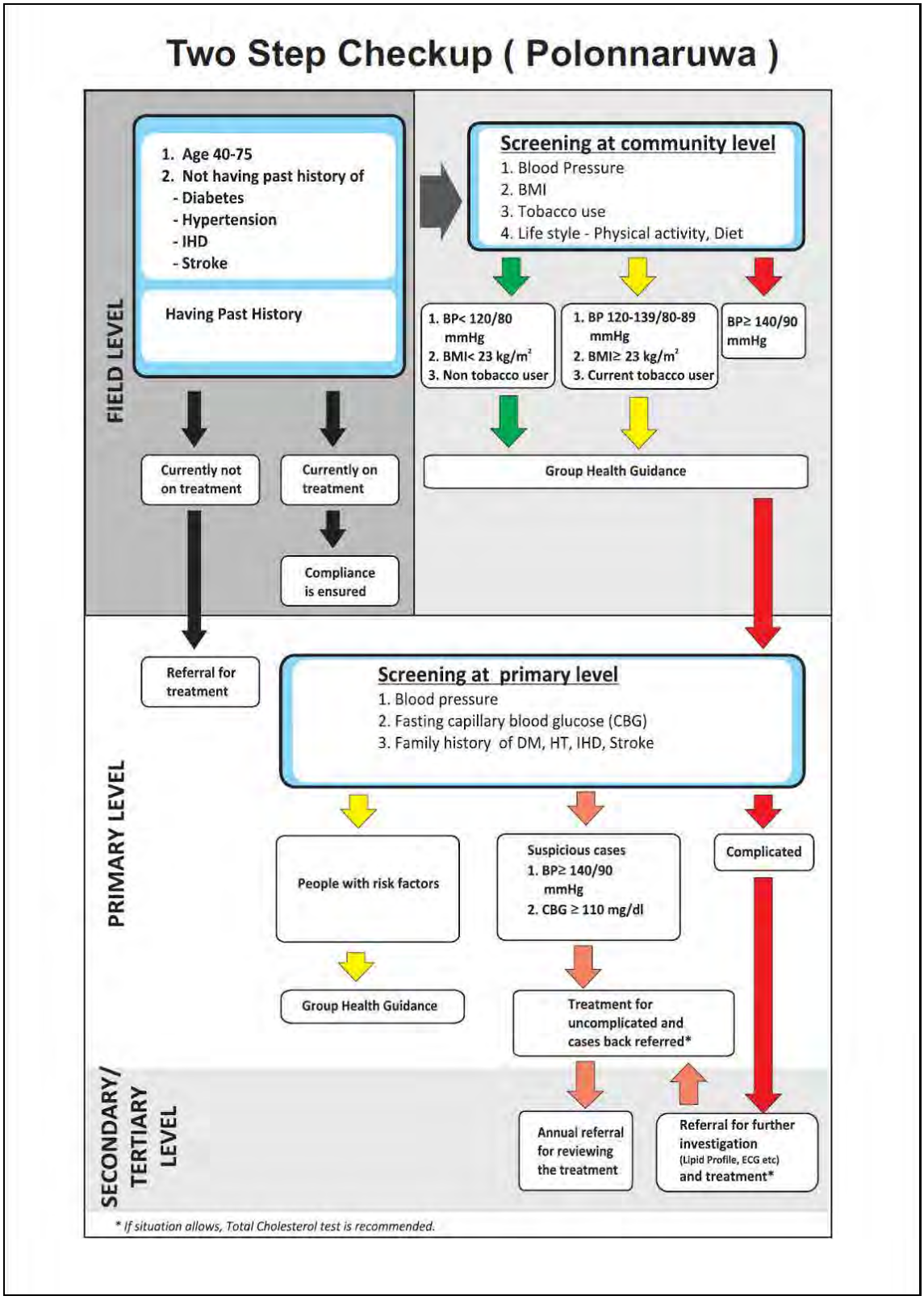


Figure 3-6: One-step check-up model (Kurunegala model)

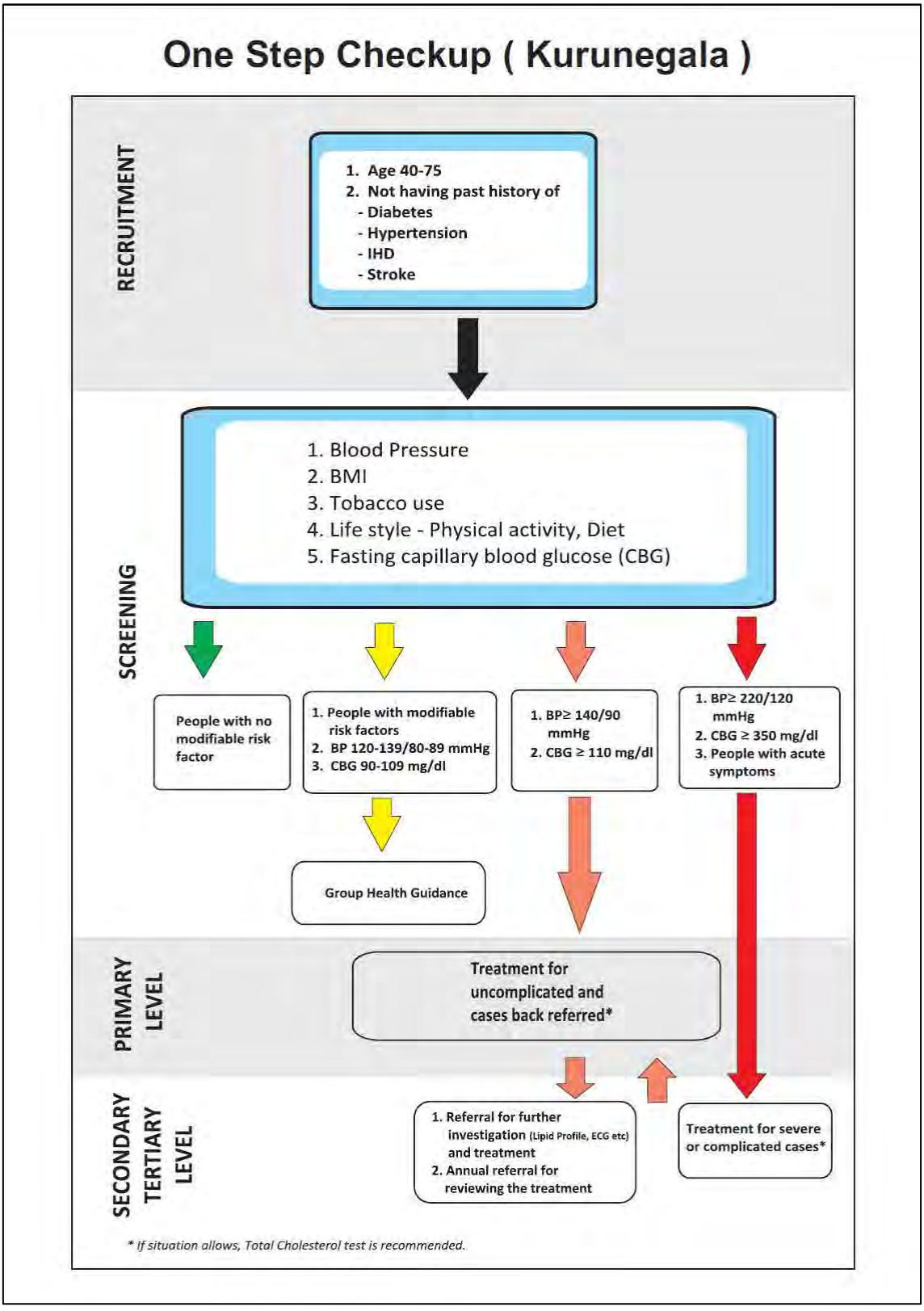


Table 3-1: Major changes in check-up strategies and reasons

	Three-step model (1st year model)	Two-step model (Polonnaruwa model)	One-step model (Kurunegala model)	Final model in the NPP guidelines
Pilot test period	2008-2009	2009-2011	2009-2012	2012-
Target population	All people above 20 years	People aged 40 to 75 years who do not have any past history of hypertension, diabetes mellitus, dyslipidaemia, stroke, or/and IHD and do not have any indicative symptoms.		People aged 40 to 65 years without diagnoses of hypertension, diabetes, hyperlipidaemia and CVD.
Examination items for all participants	(Step 1) ➢ Presence of any symptoms ➢ Past history ➢ Smoking ➢ Family history ➢ BMI ➢ Waist circumference ➢ Blood pressure ➢ Fasting capillary blood glucose (Step 2) ➢ Fasting plasma glucose (Step 3) ➢ Further investigations	(Step 1) ➢ Lifestyle questions: tobacco, physical activity, intake of vegetables and fruits ➢ BMI ➢ Blood pressure (Step 2) ➢ Fasting capillary blood glucose ➢ Blood pressure	➢ Lifestyle questions: tobacco, physical activity, intake of vegetables and fruits ➢ BMI ➢ Blood pressure ➢ Fasting capillary blood glucose ➢ Blood pressure	➢ Lifestyle questions: tobacco, physical activity, intake of vegetables and fruits ➢ BMI ➢ Blood pressure ➢ Fasting capillary blood glucose ➢ Blood pressure (Optional) ➢ Urine protein test ➢ Total cholesterol test
Recruitment	Targeted health staff as a part of on the job training.	Systematic recruitment organized by Medirigiriya MOH office	Recruitment method depends on feasibility within health institutions, such as recruitment at OPD clinic, by health staff, by community health workers, by announcement board etc.	Recruitment method depends on feasibility within health institutions, such as recruitment at OPD clinic, by health staff, by community health workers, by announcement board etc.
Cases to refer	All suspicious cases	Timing of referral was stratified based on physical condition of referee: within a day, within a week, within a month, within 3 to 6 months, and within a year.		Based on the Guidelines for Management of NCDs in Primary Health Care (Total Risk Assessment Approach)

3.1.3 Information system

(1) Data to be collected

The subgroup on health information and check-ups recommended five core indicators: number of participants, BP level >=140/90mmHg, fasting capillary blood glucose level >=110mg/dl, BMI >=23 cases, and number of referred cases. However, the information to be collected has changed from time to time and the NCD Unit finalised it for national use as shown in Figure 3-7.

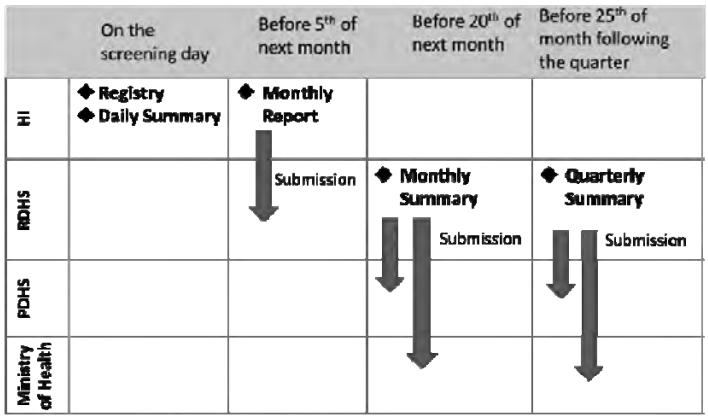
Figure 3-7: Contents of information to be collected by MoH

- Number of eligible participants
- Number of smokers
- Number of people who use chewing tobacco
- Number of heavy alcohol users
- BMI distribution (<18.5, 18.5-24.9, 25-29.9, >=30)
- Number of people with BP >=140/90mmHg
- Number of people with FBG >=126mg/dl
- CVD risk distribution (<10%, 10-<20%, 20-<30%, >=30%)

(2) Information flow

During the pilot testing, a method to collect and aggregate data by MOH offices was tested to reduce the burden on MO/NCDs. This system functioned well in Polonnaruwa but not in Kurunegala, where institutions have more frequent access to RDHS rather than to MOH offices. Finally, it was decided that all data should be sent from each institution directly to MO/NCDs as shown in Figure 3-8.

Figure 3-8: Screening data flow



HI: Health institution where screening implemented,
RDHS: MO/NCD,
Ministry of Health: NCD Unit

(3) Registries and formats

The registry and formats were standardised in 2009 by the subgroup on health information and check-ups. Based on the pilot test, the MoH finalised all the formats to be used at the Healthy Lifestyle Centres.

Table 3-2: Finalised formats for screening at Healthy Lifestyle Centres

Title	MoH Registry Number	Purpose
Participants' Registry for Healthy Lifestyle Centres	H 1236	To record participants' basic information and result of the screening in HLC.
Daily Summary of the NCD Screening Activities	H 1237	At the end of clinic session, summary of the day's activities extracted from H1236 should be entered by the MOIC/ Nursing Officer.
Monthly Report of the NCD Screening Activities	H 1238	MOIC needs to prepare this at the end of the month. The copy needs to be submitted to the District MO/NCD by 5th of following month with the signature of the MOIC.
Monthly Summary of the NCD Screening Activities in the District	H 1239	District MO/NCD needs to develop this by consolidating all H1238 sent by the MOIC. A copy needs to be sent to both PDHS and the central NCD Unit before the 25th of the following month with the signature of RDHS.
Quarterly Summary of the NCD Screening Activities in the District	H 1240	District MO/NCD needs to consolidate H 1239 and two copies should be sent to PDHS and NCD Unit respectively before 25th of the following month duly signed by the RDHS of the area.
Follow-up Register for Healthy Centres	H 1241	To record follow-up status of people at high risk in HLCs after the screening.

3.1.4 Treatment strategies

The importance of assessing overall cardiovascular risk was emphasized when developing the screening strategy in order to optimise the risk-benefit ratio. The treatment strategy and referral & back-referral criteria were developed after several consultation meetings with the experts who developed the current National Treatment Guidelines on Hypertension and Diabetes Mellitus. The basic concept is that uncomplicated cases should be managed within primary-level curative care.

In the 4th year, the MoH developed the Guideline for Management of NCDs in Primary Health Care (Total Risk Assessment Approach) in collaboration with the Ceylon College of Physicians,

College of Community Physicians of Sri Lanka, College of General Practitioners, WHO and the NCD Prevention Project. The principles of the guidelines are identical to NPP and were introduced to the pilot areas from 2012.

3.1.5 Referral and back-referral

In Sri Lanka, where people can choose any government and private hospital for initial consultation and treatment, a referral and back-referral system does not currently exist. In addition, in a system where personal medical records are not maintained in outpatient departments, it is difficult to monitor referral and back-referral status of people at high risk and patients after screening. Despite this situation, NPP considered that a referral and back-referral system would be important for adequate allocation of patients in situations of limited health resources. Therefore, NPP assisted MoH in formulating referral criteria and to make these generally available. A consensus must be built among all-level health institutions to strengthen the referral and back-referral system for NCD prevention.

At the field level, NPP has tested some tools such as rubber stamps and a referral book on a trial basis. The referral book was later integrated into a Personal Medical Record for HLCs, while the rubber stamps are available as an option to be chosen by each physician.

3.2 Result of Feasibility Test in Pilot Areas

At the district level, the Medirigiriya MOH in Polonnaruwa district and the Narammala MOH in Kurunegala district were selected as pilot areas based on four criteria: 1) NCDs are health problems in the area, 2) the area is not thinly populated compared with other MOH areas, 3) there is a secondary health care facility to which patients can be referred and treated, 4) there are several types of health facilities. The Narammala MOH area was subsequently divided into two MOHs, namely Narammala and Alawwa.

3.2.1 Main results in Kurunegala

In Kurunegala, the one-step screening model was tested from August 2009 to October 2012. During this period, 53% of the population over 40 years (22% male; 83% female) was screened in nine health institutions: 1 Base Hospital (BH), 3 Divisional Hospitals (DH[16]), 3 Primary Medical Care Units (PMCU[17]), and 2 MOHs in Alawwa and Narammala MOH areas. Two MOHs conducted screenings at the community level as well as in workplaces, while other

[16] Former district and rural hospitals
[17] Former central dispensaries

curative health care institutions conducted screenings on the premises.

The prevalence of hypertension among participants was 26% of males and 25 % of females. The prevalence of high blood glucose level (>=110mg/dl) was 18% of males and 16% of females. The number of screening participants needed to detect one case of CVD Risk >=20% was 33 for males and 29 for females. Group health guidance was provided to all participants by health staff including doctors in all institutions.

3.2.2 Main results in Polonnaruwa

In Polonnaruwa, the two-step model was pilot tested from July 2009. By the end of 2011[18], 42% of the target population (23% male; 66% female) was screened in Medirigiriya MOH area. In the two-step model, the initial screening (step one) was conducted by Public Health Inspectors (PHIs) and Public Health Midwives (PHMs) at community health centres of all PHM areas. The next step (step two) was conducted in four curative institutions: 1 BH and 3 PMCUs.

The prevalence of hypertension among participants was 29% of males and 32 % of females. The prevalence of high blood glucose level (>=110mg/dl) was 6% of males and 9% of females. The number of screening participants needed to detect one case of CVD Risk >=20% was 63 for males and 53 for females. Group health guidance was provided to all the step-one participants by MOH staff. Due to lack of manpower, however, health guidance was not provided for step-two participants at PMCU. Instead, minor staff at PMCU assisted people at high risk of CVD in monitoring their BMI on their follow-up visits. At BH, group health guidance was provided at step 2.

3.3 Initial Effects of Health Check-up

In order to evaluate effectiveness of the screening models, two surveys were conducted during the project period.

3.3.1 Follow-up survey for people at high risk of CVD

(1) Objective

To understand current situation of people at high risk of CVD who have participated in the check-ups.

[18] The pilot test finished in Medirigiriya by the end of 2011 and Healthy Lifestyle centres (HLCs) started at curative health institutions at the instruction of the MoH.

(2) Method

All check-up participants from August 2009 to October 2010 whose CVD event risk was more than 20% were listed based on the check-up registries from the all target institutions. Knowledge of lifestyle modification and CVD risk, treatment status, and current CVD event risk was investigated by using a questionnaire that was prepared by NPP with NCD Unit.

(3) Results in Kurunegala

During the survey period, 6,867 people participated in the check-up in Narammala and Alawwa MOH areas. Of these, 228 people (3.3%) were identified as being in the CVD high risk group. Although the follow-up survey started at the same time as Polonnaruwa, only 31 people (13.6%) were surveyed regarding their current CVD event risk and 13 people (5.7%) were able to answer at least some questions over the phone. The relatively low coverage in Kurunegala was mainly due to following reasons:

- The address written in the check-up registries did not have sufficient information to locate their residence. The telephone number was not written in the check-up registries for 70% of subjects.
- Community health workers, such as PHIs and PHMs, were not involved in either recruitment or check-up in most of the cases. Therefore, staff could not obtain their assistance in the survey.

Table 3-3: Target population of the follow-up survey in Alawwa and Narammala MOH areas, Kurunegala

CVD event risk at check-up	No. of participants at check-ups	No. of people examined in the follow-up survey			Number of deaths confirmed	No. of people who couldn't be located in the survey
		By phone	By visiting	Total (% of coverage)		
20%-<30%	94	6	11	17 (18.1%)	0	77
30%-<40%	87	3	9	12 (13.8%)	0	75
>=40%	47	4	11	15 (31.9%)	0	32
Total	228	13	31	44 (19.3%)	0	184

As shown in Table 3-4, all except one participant[19] confirmed that they had improved their CVD event risk after the check-up. Out of 44 subjects covered in this survey, all subjects who were instructed to receive medical treatment confirmed their compliance, while 12 subjects were instructed to modify their lifestyle without any medication.

[19] Her blood glucose level was controlled after the check-up but her BP level remained high at the time of the study and therefore her CVD event risk level was still 30-<40%.

Table 3-4: Current health status and treatment status

	CVD risk		Treatment		
	Reduced	**Not improved**	**Continued**	**Not necessary***	**Stopped by own will**
20%-<30%	11	0	11	6	0
30%-<40%	8	1	7	5	0
>=40%	11	0	14	1	0
Total	30	1	32	12	0

Note: Treatment status includes the people who were confirmed by phone.

Most people at high risk of CVD do not know their ideal weight (86%), blood pressure (82%), or blood glucose level (95%). Just 25% of people at high risk of CVD were able to recognize their CVD event risk. The most common health instruction that they remembered was salt reduction (77%), increasing the amount of daily vegetables and fruits (61%), and sugar reduction (57%). Fewer people remembered receiving instructions to increase their physical exercise compared with dietary instructions.

In addition to this study, the NCD cell in Kurunegala RDHS confirmed the percentage of people who returned for a follow-up at a medical clinic. According to their data, based on a survey from the first quarter of 2012, 78% of people at high risk of CVD are under treatment.

(4) Results in Polonnaruwa

During the survey period, 1,937 people participated in the check-ups. Out of them, 61 people (3.1%) were identified as CVD event risk >=20%[20]. The survey was conducted with the consistent assistance of Medirigiriya MOH. All PHMs visited the target subjects using the address written in the check-up registries. They measured weight, re-calculated BMI, tested fasting blood glucose and blood pressure.

Table 3-5 shows follow-up status by CVD risk status. It turned out that four subjects had already passed away and another four subjects were untraceable due to change in their residences. In Polonnaruwa, the survey coverage reached 86.9%. This high coverage was made possible since it was relatively easy for PHMs to find the subject's residence after their initial recruitment for step-one screening. Having filled in the registries by themselves also facilitated the high coverage.

[20] The reason why Polonnaruwa had a lower number of people at high risk was due to the screening model.

Table 3-5: Survey population in Medirigiriya MOH area, Polonnaruwa

CVD event risk at check-up	Number of people identified at check-up	No. of people covered in the survey (% of coverage)	Number of confirmed deaths	Number of people who could not be traced by the survey
20%-<30%	24	20 (83.3%)	1	3
30%-<40%	18	15 (83.3%)	2	1
>=40%	19	17 (89.5%)	1	1
Total	61	52 (85.2%)	4	4

As shown in Table 3-6, 32 subjects confirmed their compliance after the screening while 7 people were instructed by medical officers to modify their lifestyles without medicine and 13 subjects stopped their treatment of their own accord. It was confirmed that all interviewed subjects reduced their CVD event risk after the check-up by controlling their blood pressure level and/or blood glucose level.

Table 3-6: Current health status and treatment status

	CVD risk		Treatment		
	Reduced	Not improved	Continued	Not necessary*	Stopped by own will
20%-<30%	20	0	9	4	7
30%-<40%	15	0	11	0	4
>=40%	17	0	12	3	2
Total	52	0	32	7	13

*A medical officer instructed the patients that no further treatment was necessary.

This survey revealed that most of the subjects did not know their ideal weight, blood pressure and/or blood glucose level. Fewer subjects recognized their CVD event risk although most of the participants remembered that they received some instructions to modify their lifestyle during the check-up. More common instructions remembered by the subjects were salt reduction and increasing intake of vegetables and fruits. Fewer people remembered instructions to increase their physical exercise in comparison to dietary instruction.

Table 3-7 Number of people who recall key information provided during check-ups

Key information provided during check-ups	Number of people who knows	Number of people who do not know
Ideal weight to achieve	9	44
Ideal blood pressure level to achieve	8	45
Ideal fasting blood glucose level to achieve	5	48
Current CVD event risk	25	28
Reduce sugar consumption	27	26
Reduce salt consumption	45	8
Increase vegetable and fruits consumption	45	8
Avoid tobacco use	19	34
Avoid alcohol use	6	47
Increase physical exercise	23	30

3.3.2 Effects of health check-up on improving health promoting behaviours

According to the study conducted in Medirigiriya[21], 254 people (36.6% male) participated in the check-ups from July to August 2010 in Medirigiriya MOH. Although almost half of the participants were in the pre-contemplation stage[22] in regard to healthy diet (50.5% of males 47.2% of females) and physical exercise for health (54.8% of males, 47.2% of females) before participating in the check-up, more than 70% moved onto the action stage after three months (80.2% of males, 83.2% of females with regard to healthy diet, 72.5% of males and 70.8% of females in regard to physical exercise for health). The most popular changes in dietary habits were reduction of fat (73.9%), reduction of salt (70.8%) and reduction of sugar (60.9%). Females were more likely to step up to the action stage in regard to healthy diet compared with physical exercise habits. The participants who had a good understanding of the contents of the general guidance in the screening showed positive changes in both dietary and physical exercise habits compared with those who felt the content of the guidance was difficult to understand.

The study findings imply that the screening programme is effective in promoting healthy behaviour, especially when people clearly understand messages of general health guidance. The limitation of the study is the short follow-up. The behaviour change that formed in this study needs to be maintained over time so that the participants will improve their health status and eventually contribute to preventing hypertension, diabetes mellitus, dyslipidaemia or CVD events. The participants are expected to receive regular check-ups based on their current CVD

[21] Koyama, K. (2011). Effects of Health Check-ups on Improving Health Promoting Behaviour with Regard to Lifestyle-Related Diseases in Sri Lanka.

[22] According to the Transtheoretical Model of Behaviour Change, the 'stages of change' consist of five steps along a continuum that reflect an individual's interest and motivation to alter a current behaviour. These stages include precontemplation, contemplation, preparation, action and maintenance.

risk status and hence it would be ideal to monitor how regular check-ups contributes to their health seeing behaviour and health status.

3.4 Health Guidance Model

3.4.1 General health guidance

It is presumed that health guidance to mobilize people to healthier lifestyles is essential for NCD prevention. In the NPP period, the health guidance component has covered establishing health guidance methodology, tools, a training program and monitoring system. From the beginning of the project, the health promotion/health guidance (HP/HG) subgroup spent many hours preparing guiding principles and initial tools for general health guidance to be conducted after the screening. After consecutive meetings and discussions, a draft flip chart was developed by the second year for pilot testing. This flip chart was used for group guidance after the general CVD screening and it was modified repeatedly until it was approved by JCC at the end of the 3rd year of the project. By that time, the general health guidance using the flip chart had become an integral part of the screening, and had become widely prevalent among institutions in the pilot areas. The basic strategy for the general health guidance is below in Table 3-8.

Table 3-8: General health guidance strategy

Target	➢ Participants of CVD screening
Contents	➢ General information on CVD and risk factors ➢ How to assess own risk status ➢ How to reduce the risk level
Conductors	➢ Trained health staff
Timing	➢ After CVD screening (first risk assessment)
Approach	➢ One conductor for 20 to 30 people ➢ Desirably include mutual communication or group discussion
Duration	➢ Sufficient time to cover the topic (45 to 60 minutes)

3.4.2 Follow-up health guidance

Having developed a strategy for general health guidance, the focus shifted to the follow-up health guidance for high risk populations, how to implement this, and what the details should be. The discussion continued between the Health Education Bureau (HEB), NCD Unit, RDHS and MO/NCDs of Kurunegala and Polonnaruwa, DDG Planning, and the JICA team. All the members agreed that follow-up health guidance should be provided for people at higher risk,

however, shortage of manpower at health institutions has delayed developing a standard procedure. In addition, the category of "high risk group" was not defined until the end of the 4th year when lessons from the pilot implementation ended the discussion.

During the 5th year, the MoH developed the "Guideline for Management of NCDs in Primary Health Care (Total Risk Assessment Approach)". The guideline contained the definition of "high risk" and the principles of the follow-up schedule. Consequently, the NCD Unit developed official formats such as "Personal Medical Record" and "Follow-up Registry" to monitor the high risk group and to collect data.

Table 3-9: Follow-up health guidance strategy

Target	➢ People whose 10 year CVD risk is 20% or more ➢ People who are referred by medical officers (serious obesity, heavy smoker and other cases)
Contents	In addition to general guidance; ➢ Support for risk assessment and individual goal setting ➢ Observation, monitoring and reassessment
Conductors	➢ Medical officers, education nursing officers, health education officers
Timing	➢ After 3 months for people whose 10-year CVD risk is 30% or more ➢ After 6 months for people whose 10-year CVD risk is between 20% to 30%
Approach	➢ Individual or small group discussion
Duration	➢ At least 5 minutes per person

3.4.3 Methodologies and tools

(1) Flip Chart

During the 1st year of NPP, the health promotion and guidance subgroup examined as many existing educational materials in Sri Lanka and other countries as possible from the viewpoints of utility, effectiveness, feasibility and attractiveness. The group concluded that it would be necessary to develop a flip chart as a tool for carrying out both the general and follow-up health guidance. The first draft was developed as 4 sets of flip charts with 5 chapters (introduction, diet, physical activity, cessation of tobacco use and summary) with nearly 100 pages in total. In order to make it more suitable for general health guidance, 21 pages were selected and compiled as one flip chart.

Table 3-10: Contents of compiled flip chart and average time

Topics	Contents of flipchart	Minutes	Page No.
Introduction	➢ Self-introduction	2	1
What are CVDs?	➢ Cardiovascular diseases ➢ We can check and control them ➢ Modifiable or unmodifiable?	5	2, 3, 4
Why is being overweight unhealthy?	➢ Being overweight results in several bad effects ➢ The balance of food and exercise ➢ The importance of food choice ➢ How does sugar damage vessels and cause embolism?	3	5, 6, 7, 8
What are heart friendly foods?	➢ Healthy and necessary carbohydrates ➢ Vegetable oils and fish oils ➢ Vegetables ➢ Fruits	5	9
What are risky foods for CVDs?	➢ Salt ➢ Unhealthy carbohydrates ➢ Animal fats ➢ Processed foods	5	10
The effect of exercise	➢ What kind of exercise is effective? ➢ How can you manage to make time to be active? ➢ The effect of sports	5	11, 12, 13
Make your own goals!	➢ Let's set up your own goals and start doing them!	3	14
Why is tobacco bad?	➢ Do you know the bad effects of tobacco? ➢ Tobacco not only refers to smoking but also… ➢ Do you know you smell bad? ➢ Let's make you and your family happy and healthy by discarding tobacco and alcohol	5	15, 16, 17, 18
Summary	➢ What are the bad effects of NCDs? ➢ The decision is yours! ➢ How can you act to prevent NCDs in different settings? ➢ What's your impression of this session?	2	19, 20, 21, 22
Total		35	

After pilot testing in the field, the compiled flip chart was approved by JCC for island-wide distribution. As shown in the above table, this flip chart contains explanations of priority risk

factors for CVDs as well as ways to prevent them. It is designed to be used with interactive dialogue or discussion in order to make participants recognise their own problems.

(2) Flip chart guidebook

As described above, the first draft of the flip chart had nearly 100 pages. Additionally, it had facilitator's pages on the back that instructed users on how the front page should be explained to the audience. These instructions were developed during the 1st and 2nd years with consecutive consultations among many experts, however in the process of finalisation, the text on the back of the pages was removed to avoid the problem of health guidance conductors reading the text and not communicating with the audience.

Instead, these texts were compiled into the flip chart guidebook, with pages that show both front and back side of chart on one page. The purposes of this guidebook are 1) to review and self-study how to conduct the general health guidance with the flip chart, 2) to deepen the understanding of CVD prevention and health guidance and 3) to be applied to the follow-up health guidance.

(3) Other tools

As shown in Annex 6, NPP developed aiding materials and tools for BMI measurement, healthy diet and physical exercise with contributions from local and international experts. In addition, tools for primary care facilities and public health settings were developed in collaboration with the Director, Policy Analysis and Development, MoH.

3.4.4 Training module and mechanisms

The Health Education Bureau (HEB) has taken the initiative in implementing the training programme for health guidance. They provided two training of trainers (TOTs) sessions for health guidance during the 2nd year to train relevant health professionals in pilot areas in conducting general health guidance activities. The first training focused on providing general NCD knowledge and skills for using the flip chart, and the other was designed to strengthen the communication skills of those health guidance providers. Both of these were intensive trainings taking 2 to 3 days. In order to evaluate the initial training and to identify the contents of further training needs, HEB conducted a skill assessment one year after the TOTs. Based on its results and with consultation with respective MO/NCDs, the assessment team identified several topics to be reinforced.

Consultant physicians in the pilot areas conducted specialised trainings related to NCDs, a physiotherapist provided training on physical exercise, the Nutrition Division of the Ministry

provided training on nutrition, and the MO/NCDs provided lectures on general NCD knowledge to field staff at regular review meetings. To improve communication skills, HEB held workshops in each pilot district. After several TOT trainings, exercise training programmes can now be conducted by physiotherapists in each district, while the Nutrition Division has agreed to dispatch lecturers to district level upon request until district nutritionists have developed sufficient knowledge. District Health Education Officers (HEOs) are able to facilitate TOTs or trainings on communication skills.

Table 3-11: Training programmes designed for health guidance under NPP

Contents	Trainers	Trainees	Level and materials
Communication skills	HEB of MoH District HEO	Health guidance (HG) conductors Health staff	District level Flip chart
Nutrition	Nutrition Division Nutrition Coordination Division of MoH	Health staff HG conductors	Central/ District "Food Based Dietary Guideline for Sri Lanka" "Food Guide for General Public"
Exercise	Physiotherapists in districts	Health staff HG conductors	District level "Physical Exercise for the Elderly" （DVD） "Exercise Instruction books"
NCD management	Consultant physicians in districts	All MOs in districts	District level "Guideline for Management of NCDs in Primary Health Care"
General information/ knowledge on NCDs	MO/NCD	Health staff	District level

The teaching skill of the trainees of TOTs was not monitored during the project. In order to scale up, it would be better to ensure the effectiveness of the TOT system.

3.5 Health Promotion Model

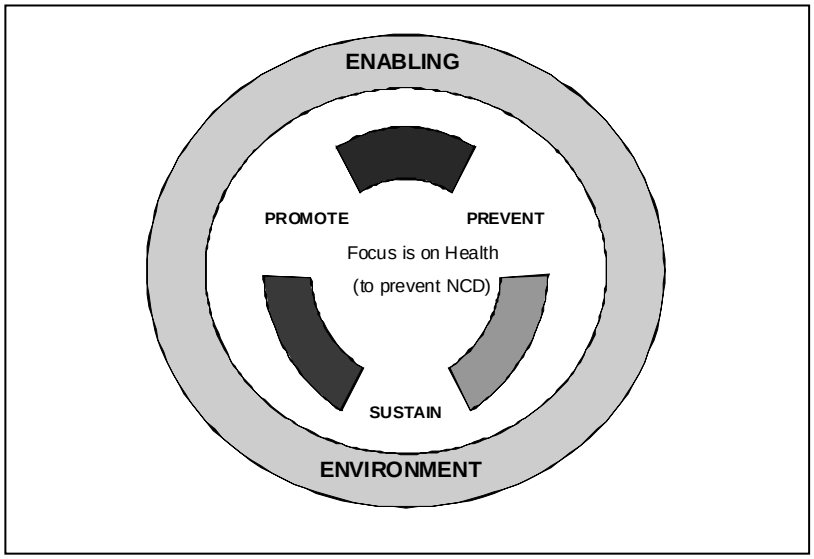
3.5.1 Health promotion – an overview

Health Promotion is a process of enabling people to increase control over and to improve their health. The goal of health promotion is to reach a state of complete physical, social and mental wellbeing in that an individual or group must be able to identify and realise aspirations, to satisfy needs and to change or cope with the environment[23]. It is centred on preventing,

[23] First International Conference on Health Promotion. Ottawa, 21 Nov. 1986- WHO/HPR/HEP/95.1. www.who.int/hpr/NPH/docs/ottawa_charter_hp.pdf

promoting and sustaining health and not on illnesses or diseases. The concept and practice of health promotion is grounded on 7 principles:

Figure 3-9: The health promotion model



- **Empowerment** – Health promotion enables individuals and communities to assume more power over their personal, socio-economic and environmental factors that affect their health;
- **Participatory** – Health promotion engages those concerned in all stages of planning, implementation and evaluation;
- **Equity** – Health promotion asserts the importance of providing all people with equal opportunities to develop and maintain their health through fair and just access to resources for health;
- **Holistic** – Health promotion recognises the links between social and economic conditions, physical environment, individual lifestyles and health and as such, it fosters physical, mental, social and spiritual health;
- **Inter-sectoral** – Health promotion is a shared responsibility among several sectors and as such it is inclusive and actively engages stakeholders;
- **Multi-strategy** – Health promotion uses a variety of strategies, including policy development, community capacity building, advocacy, social marketing, health education, research, program development and evaluation; and
- **Sustainability** – Health promotion results in durable changes that individuals and communities can maintain or even further improve on their own.

Sri Lanka is passing through an epidemiological and demographic transition leading to the emergence of NCDs as a major public health problem. As the country moves into the middle-income range with concurrent social and economic development, NCDs are looming as an increasingly significant threat. As stated in the previous sections, by modifying the risk factors, the premature onset of NCDs and complications may be prevented or delayed. Health promotion contributes to risk reduction by addressing the underlying determinants of NCDs, thereby, ensuring a durable change. Aside from promoting healthy lifestyles, health promotion can improve compliance with treatment and follow-up.

3.5.2 Standard procedures for implementing health promotion settings

(1) Settings approach for health promotion

A setting is a "place or social context in which people engage in daily activities in which environmental, organizational, and personal factors interact to affect health and wellbeing[24]". Through health promotion, settings will be developed so that living and working conditions will be conducive to health, the practice of healthy lifestyles and the promotion of wellbeing. The priority settings for NCD prevention are health facilities, schools, villages and workplaces. Health facilities are defined as the institutions and MOHs that have established Healthy Lifestyle Centres. Villages may be defined by their geo-political boundaries or by a group of people who are engaged in shared health-promotive activities.

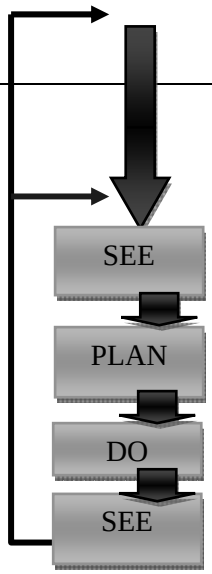
(2) Overall process

The health promotion and health guidance sub-group met several times during the 1st year and agreed on the overall process to develop settings as shown in Figure 3-10. Each of the health promotion settings are designed to be implemented as part of a 12-step process. The step-wise approach helps to ensure the following: a) capacity building of human resources; b) empowerment of individuals and community; and c) planning of successful interventions which meet the needs and conditions of the target population.

[24] WHO (1998). Health promotion Glossary. World Health Organization: Geneva. (WHO/HPR/ HEP/98.1). Retrieved from http://www.who.int/hpr/NPH/docs/hp_glossary_en.pdf

Figure 3-10: Health promotion process - 12 steps

Central/ Provincial	Develop guidelines and advocate authorities Human resources and policy development	
District	**STEP 1**	**Inception Meeting**
	STEP 2	**TOT for Resource Group**
	STEP 3	**Advocacy for stakeholders & leaders**
Setting	**STEP 4**	**Training for grass-roots health workers**
	STEP 5	**Setting formation and leaders/community orientation**
	STEP 6	**Training HP workers**
	STEP 7	**Situation assessment**
	STEP 8	**Issues/priority/target setting**
	STEP 9	**Develop and disseminate plans**
	STEP 10	**Implementation of activities**
	STEP 11	**Monitoring and evaluation**
	SETP 12	**Review and adjust**



The 12 steps procedure and its intended outputs are as follows:

Step 1 – Inception meeting: At the beginning of the process, organise an inception meeting to explain the purpose and concept of health promotion, introduce the roles/responsibilities of management structures for health promotion at district level, select members of the management structure at district level and decide on participants for the training of trainers (TOT).

Step 2 - TOT for Resource Group: The TOT aims to develop human resources in the district with sufficient knowledge/skills for health promotion such as self-improvement, advocacy, resource mobilization, program management, marketing and evidence-based information. The resource group is expected to implement health promotion interventions and train others in health promotion approaches in preventing NCDs in their respective districts. As other outputs of the TOT, priority issues of health promotion will be discussed, district plans will be developed and behavioural indicators will be agreed upon which are locally relevant, specific and measurable.

Step 3 - Advocacy for stakeholders & leaders: Because a supportive social environment is an essential part of health promotion, advocacy for the involvement of district level stakeholders needs to be undertaken through workshops or meetings**.** Also, indicators and guidelines should be agreed on.

Step 4 - Training for grass-roots health workers: In stages, basic knowledge of health promotion will be provided to the grass-roots health workers.

Step 5 - Setting formation and leaders/community orientation: Identify appropriate settings and a leader for each setting. Then, advocate for health promotion to the settings' leaders and members.

Step 6 - Training for setting HP workers: Identify setting-level health promotion workers who will be trained by the resource group on basic knowledge of health promotion.

Step 7 - Situation assessment (community diagnosis): In order to plan effective interventions, the needs, resources and constraints of the target population must be understood. At each setting, local norms and positive/negative behaviours (lifestyles) will be assessed while the underlying determinants of negative behaviours are understood. Also, local stakeholders will be analysed. The target population may need to be segmented by age, occupation, sex and socio-economic conditions.

Step 8 - Issues/priority/target setting: Based on results of the assessment, important health promotion issues and key messages will be identified while behavioural indicators and targets to be achieved will be reviewed and refined. The generic key messages are attached as Annex 5.

Step 9 - Develop and disseminate plans: An implementation plan will be developed to achieve the target based on the situation assessment. Once the plan is developed, the members of the settings will be oriented and mobilised. If necessary, networks will be developed with new partners.

Step 10 - Implementation of activities: The planned activities will be implemented with the participation of the setting members and key messages will be marketed.

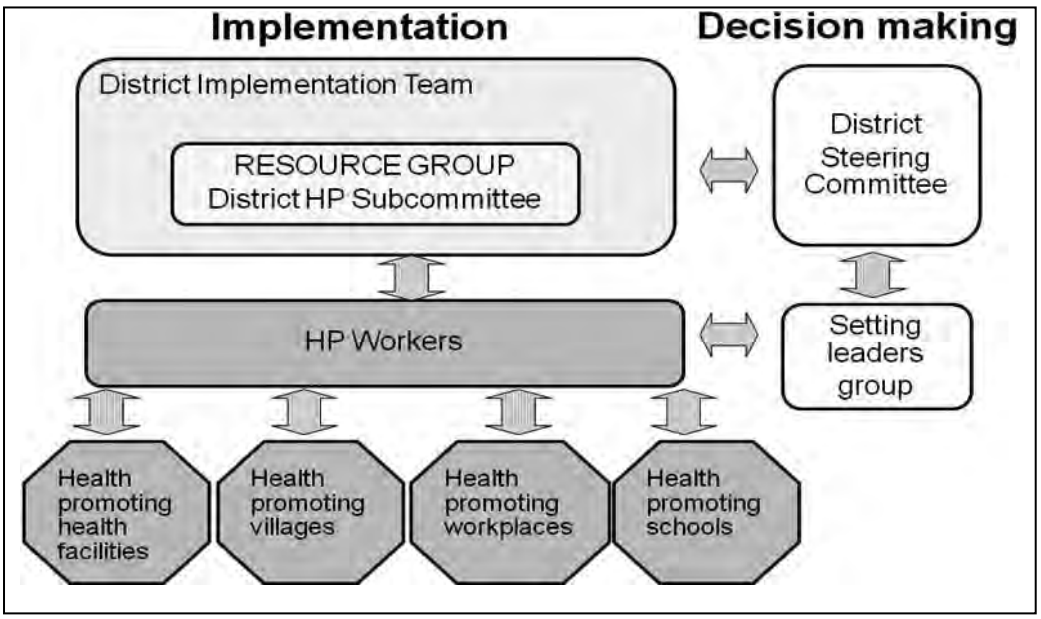
Step 11 - Monitoring and evaluation: Regular monitoring and review will be conducted. Aside from the outcome indicators, the process should be assessed and evidence-based information generated. Results of evaluations should be shared with stakeholders and reflected in the subsequent plans. Responsibilities will be delegated to setting members when evaluating.

Step 12 – Review and adjust: After a review of the monitoring/evaluation results, the plan and steps will be adjusted accordingly. Emphasis should be put on empowering setting members to pay attention to any other emerging or re-emerging health problems.

3.5.3 Implementing health promotion activities

The implementation structure shown in Figure 3-11 may be established at the district level.

Figure 3-11: Coordination and management structures



Several basic principles were considered in designing the structures. 1) the management structure should include non-heath sectors because the health promotion process involves coordinated actions with non-health sectors such as the education and business sectors; 2) in order to increase potential for sustainability, the resource group at the district level will be expected to provide training and instructions for the implementation of health promotion under the supervision of the steering committee; 3) each setting will decide a setting leader and assign setting-level health promotion workers who will be supervised by the resource group.

Focal points for health promotion related to NCDs should be designated as:

- RDHS office – Medical Officer Non-Communicable Diseases;
- MOH office – Medical Officer of Health;
- Divisional health care institutions – the head of institution; and
- Higher level hospitals (BH) – Medical Officer Public Health or health education nurses

3.5.4 Training of trainers (TOT)

From the end of the 1st year to the 2nd year, NPP implemented a TOT with the technical assistance from the Foundation for Health Promotion. Between March and October 2009, two six-session TOT trainings were conducted in Kurunegala and Polonnaruwa districts, with 19 and 21 persons receiving the training in each district, respectively. The purpose of the trainings was to provide knowledge and skills to the resource groups for implementing health promotion

interventions in each of the pilot districts. Training sessions for grassroots health workers commenced in September 2009, with 5 follow-up sessions held over the ensuing six months. Topics covered included monitoring indicators, tactics for health promotion, proper messages and contents of activities as well as trouble-shooting sessions.

3.5.5 Health promotion activities in the settings

Following the TOT training, a number of health promotion settings were initiated in Polonnaruwa (22) and Kurunegala (19). The trainings sessions were followed by field visits from the trainers to view the activities of the TOT participants in their respective settings. This was expanded to 30 settings per MOH in the following year (2010) based on a decision by the Joint Meeting of the Sub-Group on Health Check-up and Sub-Group on Health Promotion/Guidance. As of June 2012, a total of 59 settings were active in Polonnaruwa and 25 were active in Kurunegala. Tables 3-12 and 3-13 indicate the setting category as well as the strengths and weaknesses of each category for each of the pilot districts.

Table 3-12: Summary of health promotion (HP) activities in Kurunegala (as of June 2012)

Number of health promotion settings developed		
Breakdown by category	School	14
	Village	2
	Work place	2
	Hospital	7
	Total	**25**
Strengths and weaknesses of each category		
HP category	Strengths	Weaknesses
School	➢ School staff is willing to participate ➢ Children are more enthusiastic than adults ➢ Parents are supportive ➢ Starting HP among young age group is a long term investment	➢ Time is the key factor ➢ Difficult to allocate enough time due to busy schedule ➢ Some teachers are not willing to contribute ➢ To arrange HP activities for all age groups is rather difficult
Village	➢ Villagers already have various societies in their village. By using those societies it is very easy to introduce the HP activities ➢ Religious leaders are ready to play a pioneering role in conducting this event	➢ Some people, especially males, are not willing to accept some concepts of HP
Work Place	➢ Co-operative leaders	➢ Negative attitudes and lack

	➢ Enthusiastic workers	of motivation ➢ Workload
Hospital	➢ Good knowledge ➢ Accessibility to sources of knowledge and availability of resources	➢ Increased workload due to lack of staff
Methods taken to overcome the above weaknesses		
➢ In collaboration with the Ministry of Education, the health promoting school concept has to be reactivated in sustainable way. ➢ Improving knowledge of healthy lifestyles will promote male participation in health promoting activities. ➢ Identifying enthusiastic leaders in communities and promoted HP activities by providing knowledge and concepts. ➢ Using effective & efficient health promoting settings as models for extension of setting mechanisms.		
Methods taken to promote NCD in health promotive settings		
➢ Health workers who are involved in these activities need to be given knowledge of NCDs & risk factors. ➢ Identifying NCD-related health problems in setting members and provide solutions. ➢ Maintaining records and showing them improvements. ➢ Organising community base-promoting activities that are relevant to special days.		
Monitoring health promotive settings		
➢ Health promotive setting problems have to be assessed by the trainer. ➢ Introduce a method to assess the HP setting process & sustainability. ➢ Maintain records relevant to activities that have taken place. ➢ Assess setting activities at regional level and share experiences with each other. ➢ Introduce a recording system to maintain activity progress ➢ Develop mechanisms to assess setting process & sustainability. ➢ Review progress at regional level.		
Future plans for establishing health promotive settings		
➢ Establish three settings for each MOH division. ➢ Facilitate training programmes for health staff. ➢ The health promoting workplace concept has to be introduced in all health institutions.		
Necessary support from the Ministry		
➢ Financial allocation from MoH for HP-setting approach. ➢ Support from HEB for resource development and implementation of guidelines. ➢ Development of manuals for health promotion setting mechanisms. ➢ Support from MoH to develop criteria for monitoring & evaluation.		

Source: Kurunegala RDHS

Table 3-13: Summary of health promotion (HP) activities in Polonnaruwa (as of June 2012)

Number of health promotion settings developed		
Breakdown by category	School	18
	Village	16
	Work place	14
	Hospital	11
	Total	**59**

Strengths and weaknesses of each category		
HP category	Strengths	Weaknesses
School	➢ Principals and teachers were willing to promote activities ➢ Children were more enthusiastic to take part compared with adults	➢ Difficulties faced in time allocation
Village	➢ The already existing community gatherings are the grounds for HP settings	➢ Negative attitudes, especially regarding females doing exercises ➢ Workload at the times of harvesting
Work Place	➢ Co-operative leaders ➢ Enthusiastic workers	➢ Negative attitudes and lack of motivation ➢ Workload
Hospital	➢ Good knowledge ➢ Ability to access sources of knowledge and availability of resources	➢ Increased workload due to lack of staff

Methods taken to overcome the above weaknesses

- In schools, after discussing with the principals, let them allocate the time and decide on the frequency.
- In villages and workplaces, help to overcome negative attitudes and social norms by giving continuous health education through field workers. Give them the opportunity to take part in health promotion activities in order to obtain knowledge and skills. Volunteers helped in many activities to overcome these problems.

Methods taken to promote NCD prevention in health promotive settings

- Giving the community skills and knowledge through health care workers and volunteers.
- Introducing self-monitoring methods.
- Encouraging HP settings by organizing small competitive activities.
- Advising organisation of gatherings of members of HP settings to have their own discussions regarding how to sustain the setting and activities.
- Arranging meetings on a regional basis to discuss different HP settings in which one or two members from each HP setting can participate.

Monitoring health promotive settings

- In meetings, let each setting member present their HP activities, problems they faced and the strategies they think of. Then help them to discuss and choose the best solution.
- Provide opportunities to local setting members to learn how to maintain personal records as well as group data and go through them in meetings.

Future plans for establishing health promotive settings

- Continuously conduct programmes targeting health care workers and volunteers to ensure the knowledge and skills are maintained with regard to health promotion.
- Expand health promotion settings to more places with the help of MOH and staff.
- Ensure that each setting has sufficient resources to conduct their programmes.
- Start HP settings in each institution, gathering the staff and assisting them through HLC staff.

Necessary support from MOH
➢ Field workers should be empowered with knowledge and skills in HP to assist HP settings. MOH has to help with this process. ➢ Involvement of MOH is necessary for monitoring and evaluation of HP settings. ➢ MOH office should be accessible to the staff themselves, volunteers and even for community members with regard to health promotion.

Source: Polonnaruwa RDHS

3.5.6 Monitoring and evaluation

The following table shows generic activities and indicators for monitoring and evaluation during the establishment of health promotion settings. The location of health promotion settings, (often small villages in remote locations), the localised and community-based nature of health promotion actions, and the differences in motivation and resources between settings, makes monitoring of activities and effectiveness an especially challenging task. This is one reason why developing indicators at an early stage of a health promotion activity is important.

Table 3-14: Generic activities and indicators

Level	Activities	Indicators
Central/ Provincial	➢ Develop a strategic plan	a. Strategic plan available
	➢ Develop guidelines for establishment of health promotion settings	b. Guidelines for establishment of health promotion settings available
	➢ Develop indicators for monitoring and evaluation	c. Indicators for monitoring and evaluation available
	➢ Advocate national and provincial level authorities	d. Number of advocacy programmes conducted at national and provincial levels
	➢ Develop human resources at national and provincial levels	e. Number of trainings conducted at national and provincial levels.
District/MOH	➢ Develop district implementation plan	a. Implementation plan available b. Operational level indicators available
	➢ Advocate stakeholders	c. Number of advocacy programmes conducted
	➢ Develop human resources at district level	d. Number of staff trained in health promotion.
	➢ Provide necessary logistics	e. % of fund utilised for logistics according to the annual plan
	➢ Identify priority health promotion related issues in the district/MOH	f. List of priority health promotion related issues available
	➢ Establish health promotion settings	g. Number and types of health promotion settings
	➢ Review health promotion activities in the monthly conference.	h. Review results

From September to November 2010, NPP conducted a monitoring survey among the health promotion settings in order to identify their activities. Among the findings of the survey were:

i) From March 2009 to November 2010 (18 months), more than thirty (30) settings were approached by volunteer health promoters and started activities related to NCD prevention;

ii) On September 2010, twenty-four (24) settings continued their activities related to NCD prevention;

iii) Number of participants in all the settings were five-hundred and seventy-four (574) people, among which were in 224 in Kurunegala and 346 in Polonnaruwa;

iv) Average number of members per one setting was eighteen (18);

v) Setting members generally meet once per month for activities;

vi) Most popular activity types are, in order of frequency, 1) gardening for cultivating vegetables and fruits, 2) guidance for healthy life styles, 3) doing exercises together such as brisk walking, and, 4) measuring BMI;

vii) Under 39 year-olds as well as those in their forties comprise one third of total participants, while those in their fifties comprise 10~15%;

viii) Proportion of male participants is slightly higher in Kurunegala than in Polonnaruwa.

This survey also revealed the following challenges felt by trained health promoters:

i) Difficulty in allotting time to visit settings within routine work schedule.

ii) Coordination with competing entities to organise activities related to NCD prevention, e.g. Department of Ayurveda.

iii) Difficulty in raising awareness about and giving explanations of NCD prevention to people.

iv) Difficulty in involving male participants, and involving the broader community.

v) Lack of adequate spaces for physical exercises.

vi) Lack of measuring equipment for weight and height (BMI).

These challenges were also reiterated at the occasion of refresher training offered by NPP in December 2010. As a response, NPP started working on a resource book for setting facilitators in collaboration with the Health Education Bureau and the Foundation for Health Promotion.

The results from the monitoring survey provided a basis for the development of additional training materials (see next section).

3.5.7 Capacity development

As mentioned earlier, during the 1st and 2nd year, NPP entrusted the Health Promotion Foundation to conduct pilot TOT trainings in Kurunegala and Polonnaruwa. By utilising the resources and documentation used for these trainings, and with technical inputs from local experts, NPP developed a "Health Promotion for the Prevention of Lifestyle Diseases: A Resource Book for Setting Facilitators" which was approved by JCC in July 2012.

The objective of the resource book is to introduce and disseminate the basic concepts and knowledge of health promotion among concerned professionals such as doctors, health education nurses, school teachers, and community leaders. Table 3-15 provides a breakdown of the contents.

Table 3-15: Contents of the Resource Book for Setting Facilitators

Sections	Major contents
Section 1	Introduction to health promotion ➢ Concept of health ➢ Necessity of health promotion
Section 2	What is health promotion? ➢ Actions of health promotion ➢ Approaches of health promotion
Section 3	Initiating and maintain the health promotion process ➢ What is the health promotion process? ➢ How to maintain it with some tips
Section 4	Addressing determinants ➢ What are the determinants of health? ➢ How to deal with determinants
Section 5	Measuring changes ➢ Why should we measure changes? ➢ How can we measure changes?
Section 6	Prevention of NCDs ➢ NCDs in Sri Lanka ➢ What are the causes of NCDs? ➢ How can we prevent NCDs?
Section 7	Community interventions – knowledge and skills needed ➢ Why do we focus on community in health promotion? ➢ Building partnerships with the community

NPP also attempted to develop a TOT module by using this resource book to establish a training mechanism for health promotion. Through several meetings and workshops, a TOT module was drafted, however, it was not tested due to time constraints. Establishment of training mechanism for health promotion was a relatively difficult task for the project since health promotion not

only covers NCD prevention but also all aspects of health. The development of health promotion settings is not prescriptive in that community action emanates from a holistic participant-centred assessment of the situation as well as a better understanding of the underlying determinants of health and NCD risk factors through critical analysis. Nevertheless, many stakeholders in the Ministry have recognised the need for resources for health promotion training under the NCD policy.

3.6 IEC and the Social Marketing Model

The fourth model for NCD prevention is to disseminate information on the importance of NCD prevention and invite people to HLCs. During the project, NPP produced the following materials to strengthen advocacy for NCD prevention: billboards and posters were prepared with cooperation from Mr. Sidath Wettimuny, a former cricket player. In addition, 25 digital BP monitors were distributed in public places in Colombo, Kurunegala and Polonnaruwa for awareness-raising.

Billboard in Colombo

Posters for Healthy Lifestyle Centre

Digital BP monitor for public use

For HLCs in Kurunegala and Polonnaruwa, colourful banners were introduced to attract the general public to attend a screening.

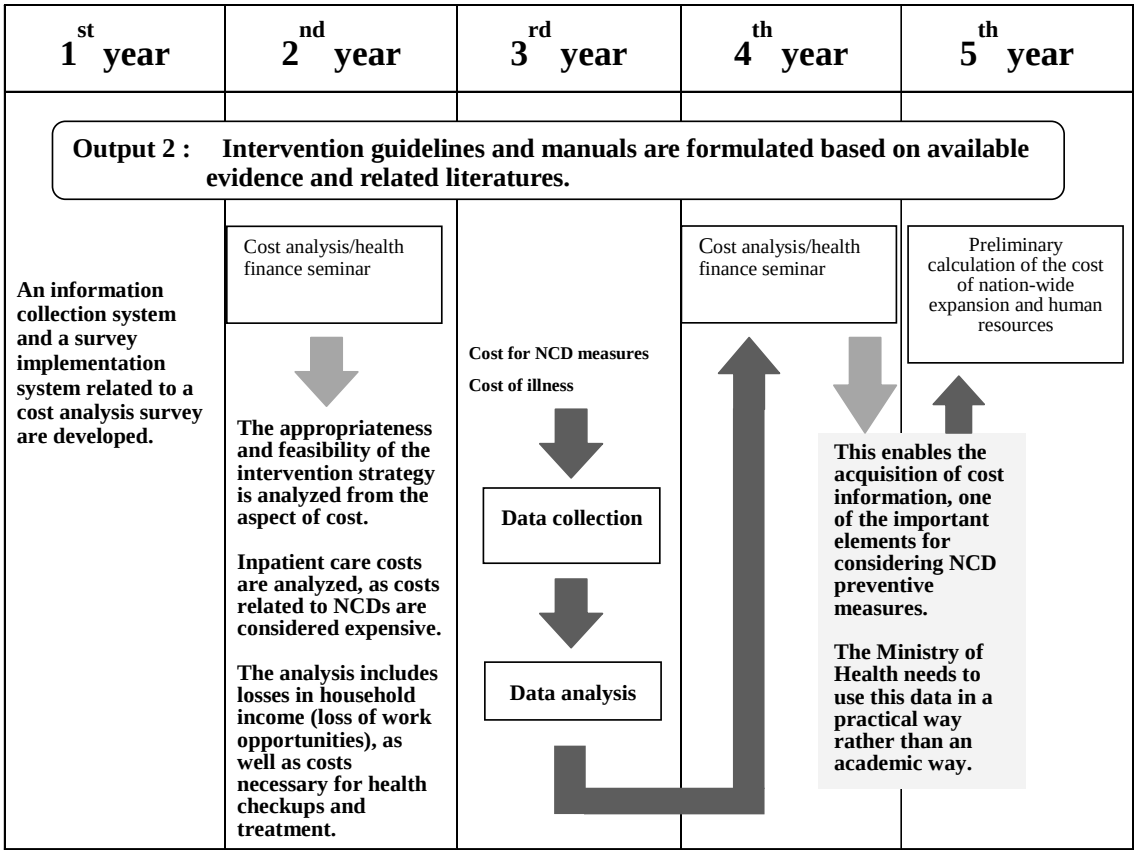
HLC name board in Kurunegala

3.7 Cost Analysis Survey

3.7.1 An outline of cost analysis survey

In consultation with the cost analysis sub-group, the cost analysis survey was implemented to (a) analyse the financial feasibility of NPP screening model, (b) analyse the costs of disease-based inpatient care, as costs related to lifestyle-related diseases are widely considered to be expensive; and (c) to analyse not only the costs for screening and treatment but also the opportunity costs. The flow chart of cost analysis activities implemented during the 5-year project period is shown in Figure 3-12.

Figure 3-12: Cost analysis study flow chart



The cost analysis can be generally divided into 2 categories: costs required for the actual interventions (i.e. introducing screening and health guidance activities for preventing NCDs) and the costs of illness.

The survey on the intervention cost was carried out separately in Kurunegala District and Polonnaruwa District, as they have introduced different screening models. The intervention cost was divided into 2 groups: direct costs, such as those for personnel, supplies and equipment required for actual implementation, and indirect costs, such as those for the training of human resources and for the establishment of the screening and health guidance programme.

The costs of illness were also divided into direct costs (hospitalization, nursing personnel, medical personnel, treatment, tests and drugs) and indirect costs (cost of traveling to the hospital, medication, meals, and loss of income).

3.7.2 Cost analysis survey results

Costs required for the implementation of screening/health guidance were analyzed for 157 out of 318 screening sessions (Total time taken: 387 hours; Total number of check-up participants: 4,253 people; Total number of staff: 822 people) conducted in Kurunegala and Polonnaruwa for one year from October 2009 to September 2010.

An outline of the screening programme used for the survey is shown in Table 3-16. A total of 111 check-up sessions were surveyed in Kurunegala District; the average number of participants per session was 27.3 people, the average time taken was 1.7 hours, and the average number of allocated personnel was 4.1 people. In Polonnaruwa, 46 sessions (step one) were surveyed; the average number of participants was 26.5 people, the average time taken was 1.5 hours, and the average number of allocated personnel was 4.2 people. Although it seems there were no major differences between the districts, one must take into account that the screening models were different as described in Section 3.1.

A survey on health guidance was also conducted after each check-up. In Kurunegala, the average number of participants per guidance was 24.5 people, the average time taken was 0.9 hours, and the average number of allocated personnel was 1.2 people. In Polonnaruwa, the average number of participants was 22.8 people, the average time taken was 0.5 hours, and the average number of allocated personnel was 1 person.

Table 3-16: An analysis of screening programme

Item \ District		Kurunegala		Polonnaruwa	
Check-up	No. of check-ups	111	times	46	times
	Total no. of participants	3,035	people	1,218	people
	Total time taken for check-ups	194.04	hours	70.25	hours
	Total no. of allocated personnel	454	people	194	people
Health guidance	No. of health guidance sessions (HG)	109	times	46	times
	Total of HG participants	2,666	people	1,049	people
	Total time taken for HG	99.3	hours	23.6	hours
	Total no. of allocated personnel	128	people	46	people
Average per session	No. of check-up participants	27.3	people	26.5	people
	Time taken for check-up	1.7	hours	1.5	hours
	No. of allocated check-up personnel	4.1	people	4.2	people
	Total no. of HG participants	24.5	people	22.8	people
	Total time taken for HG	0.9	hours	0.5	hours
	Total no. of allocated personnel for HG	1.2	people	1.0	people

A questionnaire regarding the costs incurred personally in order to receive the check-up was

given to 800 people who had the check-up. The median value of the travel cost to the check-up site was Rs.84 in Kurunegala and Rs.40 in Polonnaruwa. As another point to consider, the number of participants whose income decreased due to their absence from work to attend the check-up was very low as the pilot districts are rural areas and 70% of the participants were female.

With regard to the cost of inpatient care for lifestyle-related diseases, medical records of 245 inpatients (approximately 60 people per disease) who received treatment at the tertiary hospitals in the pilot districts were analysed to calculate the treatment cost per patient. This enabled us to estimate the potential increase in medical expenses that could occur if NCD preventive measures were not carried out. Furthermore, a questionnaire of the costs incurred for inpatient care and loss of opportunities (tests conducted outside the hospital, drugs, traveling costs, loss of income, etc.) was given to 243 in-patients with lifestyle-related diseases. According to the survey results, the effect of a family member's hospitalization on household finance was estimated as a cost of Rs.1,500 - Rs.3,000. The disease-based cost of inpatient care and the increased burden on household finances is shown in Table 3-17.

Table 3-17：Total cost of in-patient care for four major NCDs and total household cost of hospitalization

Hospital	Kurunegala				Polonnaruwa			
	TH Kurunegala		BH Dambadeniya		GH Polonnaruwa		BH Medirigiriya	
Diagnosis	Hospitalization cost**	day	Hospitalization cost	day	Hospitalization cost	day	Hospitalization cost	day
Cerebro-vascular accident	11,318	6	3,072	3	4,260	2	8,457	5.5
Myocardial infarction	11,695	4.5	8,425	5.5	9,066	4	4,182	3
Ischaemic heart disease	3,967	3	6,190	4	6,721	3.5	4,880	4
Diabetes mellitus	6,631	4.5	5,242	4.5	5,670	3	4,829	4
Total household cost*	3,020		3,053		2,460		1,535	

Note: *Direct and indirect opportunity cost incurred by hospitalization
** in Sri Lankan Rupees
TH (Teaching Hospital), BH (Base Hospital), GH (General Hospital)

3.7.3 Cost Analysis and Health Finance Seminar

On the 21st of November, 2011, a cost analysis/health finance seminar was held at Cinnamon Lakeside Hotel in Colombo City co-hosted by the Sri Lanka Ministry of Health and JICA. This

seminar, the second one of its kind since the commencement of the project, had two objectives: 1) to share the cost analysis survey result among a wide range of people concerned, and discuss effective intervention methods for preventing non-communicable diseases; and 2) to examine how to utilise the data obtained from the survey in regard to Sri Lanka's national health finances.

A discussion session was held after presentations, and the question of how to utilise these newly shared survey results was raised with the participants. The following comments were obtained: "It is the first time the results of such a survey were obtained in Sri Lanka"; "a follow-up survey is also necessary after the check-ups"; "WHO has been experimenting with a PEN model, so how about comparing 3 models?"; "We need to consider the fact that there are fewer male participants more closely"; "The Ministry of Health has been investing in non-communicable disease preventive measures with substantial budget. The obtained evidence will be very useful for examining policies in the future". After the seminar, a report was finalised and is included as Annex 7.

CHAPTER 4 Expansion of NPP models with Healthy Lifestyle Centres

4.1 Introducing Healthy Lifestyle Centres

In Sri Lanka, new NCD cases are typically diagnosed at one of two locations: outpatient short-term care within the outpatient department or in the hospital when they are admitted as an inpatient. For newly diagnosed cases, no systematic procedures are in place in most institutions to ensure that standard diagnostic and treatment procedures are followed, leaving diagnosis and treatment dependent on the clinical awareness and training of physicians involved.

Under the NCD policy, implementing a cost-effective NCD screening program at community level with special emphasis on cardiovascular diseases has been identified as one of the key strategies for NCD management. The strategy proposed establishing a cost effective high risk NCD screening programme linked with curative healthcare options and a health guidance programme for lifestyle modifications for early detection and management of major chronic NCDs, with a special focus on disadvantaged communities. The private health sector and community-based organizations were encouraged to participate in NCD screening programmes within a regulatory framework.

In September 2011, the Ministry of Health started the National NCD programme by introducing Healthy Lifestyle Centres (HLCs) in selected primary health care institutions in all districts to screen for the risk of non-communicable diseases and enhance subsequent management among people aged 35 to 65 years. Guidelines for establishment of healthy lifestyle clinics, personal health records and a management information system were formulated. This was carried out with the consensus of relevant stakeholders involved in the NCD Control and the Prevention Programme island-wide with the guidance of the Working Group of Non Communicable Diseases in the Ministry of Health. The essential drug list for treatment of chronic NCDs, and a management protocol prepared by the Policy Analysis Unit with the consultation of experts were distributed to districts with the guidelines, personal health records and management information system.

The HLCs are open to the public at least once a week and are intended for about 20 participants per session. It is recommended to utilise available spaces within existing premises with the following furniture and equipment (as shown in Table 4-1).

Table 4-1: Furniture and equipment for HLCs

Items	Quantity
Tables	3
Chairs	Not specified
TV/DVD	Not specified
Display boards	2
Cupboard for health education materials	Not specified
Weighing scale, height measuring instrument (stadiometer), waist tape, mercury BP apparatus, stethoscope, glucometer, BMI calculator, calculator and peak flow meter	Not specified
Invitation forms, registration forms, monthly summary, personal health records, follow-up clinic guidelines, IEC materials	Not specified

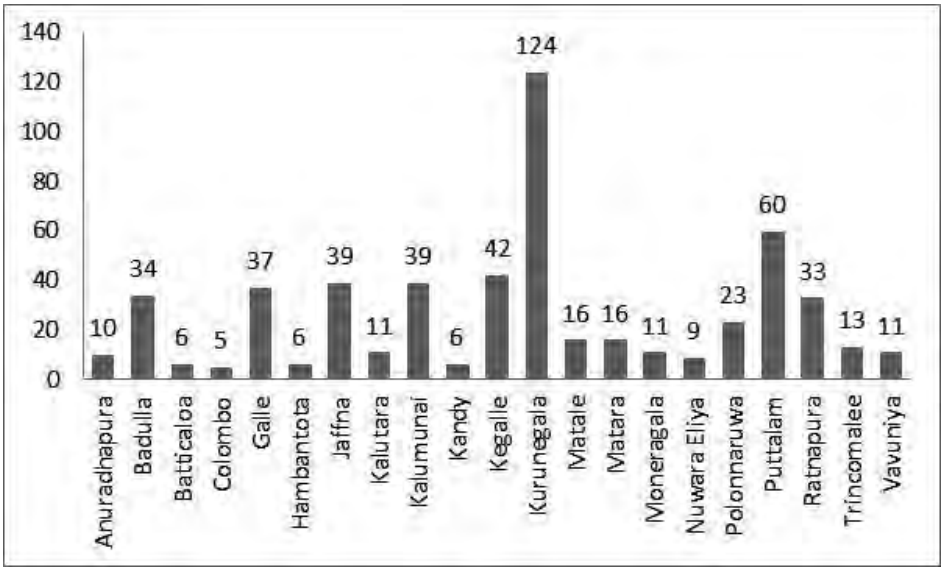
Note: equipment for checking total cholesterol if available.

4.2 Current Situation of HLCs

Although it is recommended to establish HLCs in all primary health care institutions to facilitate access for people to benefit from the screening and health guidance services, the initial target called for the establishment of at least one HLC in a MOH area.

By June 2012, a total number of 551 HLCs established across Sri Lanka as shown in Figure 4-1.

Figure 4-1: HLCs established by June 2012



4.3 Financial Planning for HLCs

In view of assisting MoH and PDHS to calculate the necessary budget for implementing HLCs, NPP developed a financial simulation model by utilising the Kurunegala model.

4.3.1 Hypothesis for cost calculation

This simulation model requires planners to simply input the number of target population to be screened for a specific time period. This model has been developed under the assumption that existing facilities will be utilised effectively, and that equipment and human resources such as doctors and nurses, as well as necessary devices and consumables as specified below, are available.

1) Facilities and equipment: Based on the assumption that existing facilities and equipment can be utilised for rooms, and furniture such as tables and chairs can be used for the implementation of check-ups, and no further costs occur.

2) Check-up equipment: Weighing scales (batteries for a scale must be replaced after 2,000 times of use), stadiometer, blood pressure apparatus (renewed after 10,000 check-ups), and simple glucometer (renewed after 5,000 times of use).

3) Consumables: Strips, needles, disposable gloves (one pair of gloves is used per person and the daily average of people receiving a check-up is 20), invitation letters, registration and other formats.

4) Initial cost: Training costs for personnel engaged in HLCs (holding a 2-day course twice, with approximately 50 participants in each course), IEC materials (guidelines, screening manuals, flip chart, flip chart guidebook, BMI chart, HLC posters, CVD posters, DVDs, health promotion resources, physical exercise instructions, etc.).

5) Personnel cost: The cost per person is calculated based on the hourly wages of health personnel (job category-based monthly salaries, assuming that the working hours are 8 hours a day, 22 days per month), and the number of persons receiving a check-up.

4.3.2 Simulation model

Based on the above concept, a simulation model was developed to calculate total and annual costs to cover the entire eligible population in one MOH area. For example, if a MOH plans to screen 13,230 eligible populations within 5 years, this MOH needs to conduct 132 screening sessions per year with 20 participants per session. The 132 screening sessions can be implemented by several institutions existing within the MOH but it is assumed that each session will be conducted by one doctor and 3 nurses. The total cost for 5 years would be Rs.1,117,350 (Rs.163,470 per year with 300.000 initial cost). Human resources required in 5 years would be a total of 880 hours for each doctor and 2,640 hours for nurses, which are converted to Rs.474,412 (Rs.94,882 per year) in salaries (Table 4-2).

Table 4-2: A simulation result for a sample MOH

Type of cost \ Year	1st	2nd	3rd	4th	5th	Total
Initial cost (rupees)	300,000					300,000
Number of participants	2,646	2,646	2,646	2,646	2,646	13,230
Number of screening sessions	132	132	132	132	132	660
Screening cost (rupees)	163,470	163,470	163,470	163,470	163,470	817,350
Total cost (rupees)	463,470	163,470	163,470	163,470	163,470	1,117,350

Currently, the Ministry intends to establish one HLC per MOH that will conduct at least one screening session per week for 20 participants. By using the above data, one HLC will screen 1,040 persons (20 x 52 weeks) per year with an annual cost of 64,251 rupees without initial and personnel costs.

In order to allow anyone to simulate the implementation cost, NPP developed an easy-to-use programme with Microsoft Excel, and prepared an instruction manual. This programme only requires the target population and the latest consumables cost for calculating the screening budget and necessary personnel.

4.4 Human Resource Implications

As described in the previous chapter, NPP tested two screening models: a one-step model (Kurunegala model) and two-step model (Polonnaruwa model). Although NPP still believes that the Polonnaruwa model would be well suited for a resource poor environment, this section discusses only the Kurunegala model according to MoH decision.

In the Kurunegala model, medical personnel such as Medical Officers and Nursing Officers implement the screening process (lifestyle questions, BMI calculation, BP measurement, fasting blood glucose measurement, CVD risk assessment and data recording) as well as health guidance. During the pilot period, two MOHs in Kurunegala also conducted screening and health guidance, mainly in the community. Table 4-3 below shows the details of the screening and health guidance process. In this table, other personnel such as dispensers and unqualified health staff working at primary health institutions are also included. Broadly speaking,

conducting one screening session with health guidance takes 2.6 hours (156 min.) and requires 4 people including one MO. The other 3 people required are nursing officers, dispensers, medical laboratory technologists (MLTs) and other professionals in hospitals, and PHMs, PHIs and programme planning assistants (PPA) from MOH.

Table 4-3: Details of the screening and health guidance processes in Kurunegala District from November 2009 to October 2010

	Item			Break down of allocated personnel
screening	Number of screening sessions	111	times	
	Average number of participants	27.3	people	
	Average time taken for screening	1.7	hours	
	Average number of allocated personnel	4.1	people	MO: 1.1, NO: 2.5, PHI: 0.1, PHM: 0.5
Health Guidance	Number of health guidance (HG) sessions	109	times	
	Average number of HG participants	24.5	people	
	Average time taken for HG	0.9	hours	
	Average number of allocated personnel	1.2	people	MO: 0.3, NO: 0.8, PHI: 0.1

Source: Cost Analysis Report Table 1 and Table 2

In addition, it is necessary to consider the manpower and time taken for the following processes; (a) recruitment, (b) follow-up screening and health guidance, (c) data management, and (d) transport to communities for human resource planning.

4.5 NPP Contributions to Expansion of HLCs

4.5.1 Production of guidelines, manuals and tools

After the launching of the National NCD Programme in 2011, NPP finalised the NPP models and consolidated them into the "Guidelines for NCD Prevention" in July 2012. Along with these guidelines, all the manuals and tools were finalised and distributed to all districts from the Director General of MoH in February 2013 with the goal of enhancing HLCs and the prevention of NCDs.

Table 4-4: Final production list and quantity

Material Name	Language and Quantity			
	Sinhala	Tamil	Sin/Tam	English
Guidelines for NCD Prevention				500
Screening Manual	4000	1500		4200
Flip Chart	1000	400		
Flip Chart Guidebook	2000	800		
Health Promotion Resource Book				500
Exercise Book (1) & (2)	2000			
Exercise DVD (Hari Hari Uyayama)			700	
Exercise DVD (Exercise for a Healthy Future)			500	
BMI calculation poster			2000	
BMI calculation wheel				1000
CVD poster (Blue and pink version)	800	400		
HLC poster	900	500		
PHM reference card*	2000	1000		

*Developed with Policy Analysis Unit

4.5.2 DVD production for HLCs

In September 2012, the MO/NCDs from all the districts gathered in Kurunegala to observe how Kurunegala RDHS established over 100 HLCs, how the activities and data were monitored, and how the stakeholders were trained. Based on this occasion, the NCD Unit requested NPP to jointly produce two DVDs to facilitate HLC expansion. These final products were handed over to MoH at the final seminar for island-wide distribution.

- DVD (1): Effective Healthy Lifestyle Centres for NCD Prevention

This 120-minute DVD was produced mainly to train health personnel who will be engaged in HLC activities. Various experts contributed to the production as indicated in Table 4-5.

Table 4-5: Contents of DVD (1)

Section	Topic	Contributor
Introduction	What is a Healthy Lifestyle Centre?	Dr. Thalatha Liyanage, Director NCD Unit
Screening	Height, weight, BMI, blood pressure measurement, fasting blood glucose	Staff at BH Dambadeniya & Dr. Shamali Amarasinghe, MO/NCD, RDHS Kurunegala
	CVD risk calculation	Dr. Asanka Rathnayaka, former VP, BH Dambadeniya
	Total risk management	
Health Guidance	Purpose and tips for health guidance	Dr. D. R. D. F. C, Kanthi, deputy director, HEB
	Better nutrition and diet	Dr. U. M. M. Samaranayake, Director, Nutrition Section and 2 doctors, one

		nutritionist, and a food technologist
	Physical exercise for health	Mr. Sanjeewa Tunpattu, physiotherapist, NHSL
	Brief intervention for tobacco and alcohol	Dr. Mehesh Rajasuriya, Senior Lecturer, Department of Psychiatry, University of Colombo
Data Management	Data management, monitoring and evaluation	Dr. Thalatha Liyanage, Director NCD Unit

- DVD (2): What you and your community can do for better health

This 70-minute DVD is designed for the general public who are waiting for CVD screening as well as people who are in the OPD waiting room. It contains a health guidance demonstration with the flip chart followed by a health promotion video. The former part can be used as a substitute for general health guidance after CVD screening if there is not enough manpower. The latter part shows several health promotion settings in the community to inspire people to start healthy activities.

Table 4-6: Contents of DVD (2)

Section	Topic	Contributor
General Health Guidance	Contents of flip chart: CVD risks, healthy diet, exercise, stop smoking and alcohol use.	Dr. Thalatha Liyanage, Director NCD Unit Dr. Shamali Amarasinghe, MO/NCD
Health Promotion	Introduction Healthy villages Healthy schools Healthy workplaces Healthy hospitals Healthy cities Conclusion: for a healthy future	Dr. Neelamani Rajapaksa, Director, HEB Dr. D. R. D. F. C, Kanthi, Deputy Director, HEB, Dr. Sharmila Thoveswaran, Medical Officer, HEB; People's Bank (High Branch); Narammala Divisional Hospital; PMCU Digampitiya, PHMs from RDHS Kurunegala; Kiwulgalla Village; Pothupitiya Village; Boyawalana Maha Vidyalaya, and people at Waters Edge

CHAPTER 5 : Lessons Learnt and Ways Forward

5.1 Lessons learnt from NPP

The NCD Prevention Project was implemented from May 2008 to March 2013 to develop NCD prevention models for Sri Lanka with cooperation from the Japan International Cooperation Agency. The following are some of the lessons learnt during the implementation of the project

(1) Impact of check-up models on the short-term goal for NCD check-ups

The check-up activities in Narammala, Alawwa and Medirigiriya MOH areas demonstrated that both the two-step and one-step models can achieve their short term goals: the detection of risk factors for CVDs and reduction of CVD risk.

Less than 3 % of check-up participants in Kurunegala and 2% in Polonnaruwa were diagnosed as being in the CVD high risk group, based on national drug-treatment criteria. In the follow-up survey[25], 78% of the CVD high risk group in Kurunegala[26] and 75% in Polonnaruwa were confirmed to have commenced treatment and controlled their blood pressure level and/or blood glucose levels. The behaviour survey in Polonnaruwa[27] suggested that favourable behavioural changes were observed after screening, especially when people clearly understood the message of the general health guidance.

(2) Impact of check-up model on the long-term goal of NCD check-ups

As mentioned above, the proportion of those in the CVD high risk group in the target population is less than 3%, Therefore it is necessary to screen a large population in order to detect many other people at high risk who are not currently receiving treatment. The check-up activities in Narammala, Alawwa and Medirigiriya MOH areas demonstrated that approximately 20% of the eligible population can be screened per annum. This figure supports the strong possibility of achieving a high level of coverage of the target population within a few years by continuing the screening interventions. At the same time, however, it is necessary to establish a system to avoid duplication in the check-up registry. Also in order to reduce the number of premature deaths due to CVD, the long term goal of NCD check-ups, it is important to ensure that the regular check-up system is based on participants' CVD event risk status function, so that they can improve or maintain a lower CVD event risk over subsequent years.

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[25] The "follow-up survey for CVD high risk people" conducted by NPP in 2012. Please see section 3.3 for detail.
[26] The data is from NCD Cell in Kurunegala RDHS
[27] Koyama, op.cit

(3) Lack of awareness of ideal levels of weight, blood pressure and blood glucose

The follow-up and Koyama surveys identified the importance of health guidance, though most of the people in the CVD high risk group still did not know their ideal level of weight, blood pressure or blood glucose, even after they received general health guidance. Therefore, during the follow-up health guidance sessions, the participants should be reminded of their ideal levels. In addition, since weight and blood pressure levels are relatively easily monitored by the people themselves, creation of an environment in the community where the public can measure weight and blood pressure in conjunction with health promotion activities is recommended.

(4) Importance of the Total Risk Approach

Among the check-up participants, a high prevalence of hypertension was observed in both Kurunegala (26% in males and 25% in females) and Polonnaruwa (29% in males and 32% in females). Prevalence of diabetes mellitus was 18% of males and 16% of females in Kurunegala. In contrast, prevalence of members of the CVD high risk group (>=20%) was 3.0% of males and 3.4% of females in Kurunegala and 1.6% of males and 1.9% of females in Polonnaruwa.

If hypertension is managed according to a single risk approach, mass treatment, which will not only be costly to the government but also inadequate for CVD risk prevention, will be required. Although the total risk management approach is relatively new to medical officers, the pilot implementations demonstrated its necessity and feasibility. The NCD Unit should extend trainings on this subject until the total risk approach is fixed around the country.

(5) Screening model for male working population

Lower participation rates in males were observed in both pilot districts. Although several actions were taken to improve the male participation rate during the project period, effectiveness was observed only when the MOH office conducted mass screenings in villages and in workplaces. Since hospitals cannot organise such screenings during their routine work schedules, coordination by MO/NCD at RDHS level or by the MOH office is necessary to organise screenings at communities and workplaces.

(6) Introduction of systematic recruiting

Involvement of PHMs in NCD prevention is still controversial in the health sector. This is the main reason why the Polonnaruwa model (two-step model) was not selected despite its cost effectiveness and high coverage. In Polonnaruwa, high coverage was attained since systematic recruitment was implemented by PHMs who knew the population composition of the area. In a less populated area with limited health facilities and resources, introduction of a systematic recruitment model with utilisation of MCH centres may be necessary to increase screening

coverage as well as equity of access to screening programmes.

(7) Extension of continuous support to health promotion setting leaders

In 2009, six consecutive sessions for health promotion setting leaders were conducted and 38 settings in total were established. In September 2010, 24 settings were still active with 574 members and were meeting once a month on average for health promotion activities. The original settings retained high motivation and interest in health promotion due to regular follow-up by the members of the Foundation for Health Promotion. However, other settings without regular follow-up have had a higher tendency to stop activities. This result indicates that continuous support is necessary to maintain health promotion settings; however, NPP could not present a durable model in view of shortage of manpower in the current health system.

5.2 Review of Recommendations Made During the Terminal Evaluation

Under the JICA technical cooperation scheme, the terminal evaluation is conducted six months before the actual termination and provides recommendations to follow. This section reviews the recommendations made in the joint evaluation report between the government of Sri Lanka and JICA, and their current status.

(1) Recommendation 1: Implementation of follow-up guidance for high risk group members

As stated in the joint evaluation report, the Project has already achieved all planned activities and almost all indicators for the Project purpose reached the targets. However, the 2nd indicator for the Project purpose (coverage of follow-up guidance for high risk people) has not been measured because the criteria for the high-risk group had not been fully defined until May 2012. Thus, it is recommended to collect as much data as possible for this indicator in the remaining period.

Status: During the project period, NPP was unable to collect sufficient data. The NCD unit, however, introduced a follow-up registry format and instructed all MO/NCDs to implement and report on annual basis. Once data is accumulated in the follow-up registry, the NCD unit should be able to retrieve the necessary information, although some people may instead opt for private clinics.

(2) Recommendation 2: Continuation of the Ragama Health Study

The Ragama Health Study has provided valuable information and is the first reliable cohort

study implemented in a developing country. Thus, the University of Kelaniya is recommended to seek a funding source to continue this cohort study for as long as possible. Also, to enhance quality of the survey, the University of Kelaniya is recommended to analyse following points:

- To investigate the relevance of the target population as representative of the general population in the country, the demographic data of the population should be compared to those of other studies in the country.
- To analyse the relationship between risk factors and health status outcomes of participants (incidence of CVD etc.), all necessary data should be collected.

Status: University of Kelaniya is still seeking funding to continue the cohort survey. Meanwhile, University of Kelaniya is continuing its follow-up of the RHS population by phone to confirm any CVD events. The background data of the population was compared with the Census Data of Population and Housing 2001 and the Sri Lanka Diabetes and Cardiovascular Study (SLDCS)[28], a cross sectional survey in seven out of nine provinces from 2005 to 2006. The proportion of Christians (36.7%) is higher while Buddhists (61.0%), Hindus (0.5%), and Muslims (1.1%) are lower in the RHS population in comparison with the national census (Christians 6.9%, Buddhists 76.7%, Hindus 7.9%, and Muslims 8.5%). The proportion of those with Sinhalese ethnicity (95.4%) is higher in the RHS population than the national census (81.9%), while other ethnicities are much less proportionate – especially the proportion of Tamils (1.6% in the RHS population; 9.5% in the national census) and Muslims (1.1% in the RHS population; 8.0% in the national census). Compared with SLDCS, the proportion of tertiary and higher educated in the RHS population is relatively large (19.2% in the RHS population; 2.9% in SLDCS), while the proportion of those with no formal schooling and until primary education is lower (8.2% in the RHS population; 24.0% in SLDCS). The proportion of education to secondary level is almost the same in both studies (72.1% in the RHS population; 73.1% in SLDCS).

The proportion of the RHS population with high monthly family income is also higher in the population compared with SLDCS (Rs. 25,000 and above is 15.7% in the RHS population; 5.8% in SLDCS). The demographic differences may be because the study targets an urban population while SLDCS targets both urban and rural populations. The Project suggested further analysis is necessary on the relationship between risk factors and CVD events to University of Kelaniya, especially on the impact of comorbidity of hypertension, diabetes, and dyslipidaemia on CVD events and any characteristics among those in younger age groups who had incidence of dyslipidaemia.

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[28] Katulanda *et al*. Metabolic syndrome among Sri Lankan adults: prevalence, patterns and correlates. *Diabetology & Metabolic Syndrome.* 2012

(3) Recommendation 3: Evidence collection for NCD prevention

The Ministry of Health has realised the importance of surveys to obtain evidence-based information for implementing strategies for NCD prevention and has already initiated certain important measures in this regard. Thus, the MoH is recommended to enhance activities to conduct significant surveys based on its strategic directions.

Status: As stated in Chapter 1, the NCD unit is planning to implement NCD risk factor surveillance in the near future. In addition to this survey, the NCD unit should be able to obtain necessary data and key information through a newly introduced data collection and management system as stated in Chapter 3.

(4) Recommendation 4: Reduce treatment default cases

The Project successfully implemented the activities in the pilot areas to develop models of the health check-ups, but there are still cases where people are missing out on receiving proper treatment. It is crucial for the preventive strategy of NCDs to treat all cases of those who are found to have diseases by health check-up and MoH is recommended to develop mechanisms to reduce missing cases. The Project is recommended to provide technical assistance in the remaining period.

Status: Results of the follow-up survey for people in the CVD high risk group were shared among the relevant stakeholders to reduce treatment defaulters. The Project assisted RDHS Kurunegala and Polonnaruwa to conduct training for medical officers on management of NCDs in order to ensure follow-up on those people with high risk of CVDs. Several training sessions for supportive staff were also held in both Kurunegala and Polonnaruwa to enhance the keeping of proper records in the registry as well as to improve the monitoring system of people at high risk. Supportive staff have started to evaluate BMI for all follow-up patients as well as people who are interested in monitoring their BMI to encourage continuous lifestyle modification.

(5) Recommendation 5: Human resource development for island-wide expansion

For island-wide expansion of NCD prevention measures by utilizing HLCs, it is crucial to develop a sustainable structure for developing human resources. Thus, the MoH is recommended to develop a plan for the establishment of a training structure for human resources in HLCs, including management of health check-ups and health education. The Project is recommended to provide technical assistance in the remaining period.

Status: The NCD Unit has conducted several trainings for MO/NCDs on major topics for NCD prevention. For establishing HLCs, the NCD Unit organised a study tour for MO/NCDs to see how RDHS Kurunegala established and maintained HLCs in the district. In addition to the

training conducted by the NCD Unit, the Education, Training and Research (ET&R) Department conducted health promotion training for MO/NCDs in November 2012. However, since there was not enough time to develop a training structure for human resources for all HLCs in the country, NPP decided to produce DVDs for health personnel who are involving screening and health guidance activities at HLCs, as well as for the general public, as reported in Chapter 4.

(6) Recommendation 6: Health promotion strategies

For health promotion activities, although there are a certain number of bottlenecks in expanding settings and activities nationwide, the MoH is recommended to carefully design a long-term strategy to enhance health promotion activities nationwide, while considering the importance of community ownership of the process. The Project is recommended to provide technical assistance in the remaining period.

Status: Based on the Resource Book for Setting Leaders that was produced by NPP, a long-term strategy to enhance health promotion activities was discussed among relevant stakeholders within the Ministry. During the meeting, the necessity of TOT module was discussed and NPP subsequently developed a draft module to train the MO/NCDs, other medical officers and nurses, as well as health education officers, to become trainers of setting leaders. However, due to time constraints, the module is still at the draft stage waiting for pilot testing.

5.3 Ways Forward

Considering the lessons learnt from NPP, the current status of the Ministry's effort, and the international environment, the following recommendations are made from the Project for further promotion of NCD prevention in Sri Lanka.

(1) Increase the number of para-medical personnel

Non-communicable disease management requires more medical professionals than communicable diseases. Various professions such as public health workers, socio-medical workers, physiotherapists, occupational therapists and nutritionists will be required in larger numbers. A strong demand for health guidance is stressed in the project, and demand for house visits for NCD-related healthcare as well as physiotherapy for post-stroke rehabilitation will increase in the very near future. In consideration of the duration of training of new staff in these areas, planning for an increase in the number of para-medical personnel is essential.

(2) Re-consider the terms of reference for public health workers

In Sri Lanka, no professional category has yet been officially assigned to promote healthy lifestyles or general knowledge of NCDs, or to provide care for vulnerable residents such as the elderly and the disabled. During the project period, utilisation of PHMs for NCD prevention has often been discussed without reaching a consensus. NPP recognised the need for either increasing the number of PHMs and revising their TOR to extend their services to all generations or establishing other new categories of public health workers for NCDs.

(3) Introduce the total risk assessment approach into the medical faculty curriculum.

Concepts such as "total risk assessment approach" and "population-based approach" only work when all physicians working for primary, secondary and tertiary level health institutions follow the same guidelines and play their separate roles, respectively. That is why all medical students as well as graduates should learn about them as part of the national health policy.

(4) Enhance communication skills

In NCD management, behaviour change is the key to controlling diseases. Therefore, not only medical officers but also nursing officers and other health staff including public health staff need to obtain the skills for mobilising and encouraging people for better compliance. The concepts of "life skills" as well as health promotion need to be introduced and emphasised in all curriculums.

(5) Monitor impact of screening

The effects of screening on those who had lower CVD risk were not surveyed in this programme. Since a shift of mean blood pressure, blood glucose level, and other risk factors in the population distribution is one of the best ways to reduce the overall CVD burden[29], it is recommended to monitor the impact of screening through these shifts of mean value of the main risk factors in the population.

(6) Strengthen NCD surveillance system

Considering the time gap between screening and mortality data, it is recommended to establish alternative methods of monitoring trends, such as by establishing sentinel surveillance sites to track CVD risk factor levels in populations so that the NCD Unit can ensure the effectiveness of the intervention strategy. By introducing the sentinel surveillance system, the burden of data

[29] MacMahon S, Neal B, Rodgers A. Hypertension- time to move on. Lancet 2005; 365:1108-09
Comment. Measuring progress on NCDs: one goal and five targets. www.thelancet.com Vol. 380. October 13, 2012

collection at the screening site (which often tends to increase due to the professional curiosity of the district/central level) can be significantly reduced to ensure the quality of limited data that is collected, such as addresses and telephones number to trace participants.

5.4 Acknowledgements

During the 5 years' implementation of NPP, so many ideas, approaches, and methodologies have been tested with great contributions of medical officers of health, PHIs, PHMs and other staff of MOH Narammala, MOH Alawwa, and MOH Medirigiriya; visiting physicians, medical superintendents, medical officers in charge, doctors, nursing officers, and supportive staff of Base Hospital Dambadeniya, Base Hospital Medirigiriya, divisional hospitals of Narammala, Alawwa, Nawathalwatta, and PMCU Boyawalana, Welikare, Udumulla, Ambagaswewa, Wijayapura and Diwulankadawala. The pilot implementations would not have been so successful without the active involvement of Dr. Nihal Edirisinghe, Dr. Shamali Amarasinghe, Dr. Ranga Chandrasena, and Dr. Indika Udaya Kumara, and RDHS of Kurunegala and Polonnaruwa, as well as PDHS of North West and North Central provinces.

In addition to the above, NPP extends sincere gratitude to the Director General of Health Services, all Deputy Director Generals, Directors, Deputy Directors of the Ministry of Health; Universities of Colombo, Kelaniya, Rajaratha, and Wayamba; Ceylon College of Physicians, College of community Physicians, College of General Practitioners, Health Promotion Foundation, Sri Lanka Medical Association, Nilogi Lanka, the World Health Organization and the World Bank for their support in the Joint Coordinating Meetings.

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ANNEXS

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Annex 1: PDM Version 4

Project Design Matrix (PDM): Project on Health Promotion and Preventive Care Measures of Chronic NCDs (NPP)

Target Areas: Polonnaruwa District, Kurunegala District & Ragama MOH area **Target Group**: Around 200,000 people in the target area **Duration: May 2008-March 2013**

Version 4. 24th September 2010

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS (OVI)	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
OVERALL GOAL			
Effective and efficient implementation models to prevent and control NCDs (DM, Hypertension and Hypercholesterolemia) are implemented in Sri lanka.	(1) One hundred (100) % of districts have implemented the check-up/guidance and health promotion activities. (2) The annual incidence of cardiovascular diseases starts to decline in the project area by 2018.	1. Annual Report of NCD Directorate 2. Regional/district & provincial records	
PROJECT PURPOSE (PRIORITY OUTCOME)			
Effective and efficient implementation models to prevent and control NCDs (DM, Hypertension, and Hypercholesterolemia) are developed.	(1) Twenty (20)% of target population is screened annually. (2) Seventy (70)% of people identified as high risk receive regular follow up guidance. (3) Ninety (90) % of newly identified patients have received necessary treatment.	1. Monthly check-up reports 2. Project report 3. Project report	Priority of the NCD prevention and control is maintained in health policies of Sri Lanka.
OUTPUTS			
(1) Risk factors of cardiovascular diseases are identified by the Ragama Health Study based on the evidence.	- (1)-1: At least one scientific paper with regard to risk factors identified in the Ragama Health Study is accepted by an authorized peer-reviewed journal.	1. Project report 2. Scientific paper	
(2) Intervention guidelines and manuals are formulated based on available evidences and related literatures.	(2)-1 The consolidated intervention guideline (for health check-up/ guidance and health promotion) is approved by JCC by 09/2012. (2)-2 The consolidated intervention guideline is adopted by MoH by 03/2013. (2)-3 Cost analysis results of interventions assessed and disseminated among provincial and national decision makers by 12/2011.	1. Project Report 2. Consolidated intervention guideline 3. Cost analysis report	Current demographic and epidemiological trends continue. Administrative setup remains the same.
(3) Institutional and technical feasibilities of the consolidated intervention guideline are assessed for development of the NCD prevention models in pilot areas.	(3)-1 Health check-up activities are regularly conducted in 90% of target health institutions by 06/2012. (3)-2 Standard registries and formats for health check-up/ guidance are utilized by 12/2011. (3)-3 A model of training mechanism for health promotion activities is developed by 06/2012.	Project Report	
(4) Expansion plan for health check-up/ guidance and health promotion for prevention of cardiovascular diseases is finalized for island wide implementation.	(4)-1 Steps for expansion, stakeholders and their roles, and necessary resources are identified by 09/2011. (4)-2 The cost for island wide expansion is estimated by June 2012.	Project Report	
ACTIVITIES	**INPUTS**		
1-1 Perform periodical risk factor surveys of the participants in Ragama. 1-2 Construct stroke and IHD registries at the Colombo North Teaching Hospital. 1-3 Establish the database for utilization of data collected from the registries and risk factor surveys in Ragama. 1-4 Analyse data from periodical risk factor surveys and the registries in Ragama. 2-1 Collect and evaluate available evidence for prevention of cardiovascular diseases. 2-2 Develop intervention guidelines for health check-up/guidance and health promotion for prevention of cardiovascular diseases. 2-3 Develop manuals and tools to support implementation of activities for health check-up/guidance and health promotion for prevention of cardiovascular diseases. 2-4 Conduct cost analysis of health check-up/ guidance and health promotion for prevention of cardiovascular diseases. 2-5 Finalize consolidated intervention guideline, manuals and tools based on the operational feasibilities and cost analysis obtained from the pilot areas. 3-1 Identify necessary resources for implementation of health check-up/guidance. 3-2 Develop an implementation plan for health check-up/guidance at the district level. 3-3 Conduct training for relevant health staff on health check-up/guidance. 3-4 Conduct health check-up/ guidance in target MOH areas. 3-5 Ensure referral & back-referral system for diagnosed patients. 3-6 Implement follow up guidance for high-risk people identified at health check-ups. 3-7 Develop a training mechanism for health promotion activities. 3-8 Provide trainings to nurture resource groups for health promotion activities. 3-9 Assist health promoters to establish health promotion settings. 3-10 Monitor and evaluate the activity status of health check-up/ guidance and health promotion. 3-11 Conduct awareness programmes for NCD prevention and control. 4-1 Review the achievement of the project activities for health check-up/ guidance and health promotion for cardiovascular diseases prevention. 4-2 Review and analyse the various approaches and activities for NCD prevention and control by different agencies. 4-3 Estimate financial and human resource requirements based on the results. 4-4 Develop capacity building methods for health check-up/ guidance and health promotion for prevention of cardiovascular diseases. 4-5 Identify appropriate level and allocation of necessary resources such as equipment and drugs for island wide expansion.	**Japanese Side** 1) Experts: Team Leader, NCD Control, Health Promotion, Health Information System Management, Cost Analysis 2) Community based risk factor profiling surveys 3) Diagnostic equipment 4) Computers 5) Equipment for primary care level institutions 6) Health promotion materials 7) Local consultants 8) Vehicles 9) Workshops, trainings, meetings 10) Counterpart training in Japan **Sri Lankan Side** 1) Counterparts 2) Office space and necessary office facilities 3) Project office running expenses 4) Custom Duties and Value Added Tax(CD-VAT), cost for custom clearance, storage and domestic transportation for any equipment provided by the Japanese side for the project implementation 5) Necessary expenses for implementation of the project activities		Additional tasks for NCD prevention are accepted by health personnel. **PRECONDITIONS** Therapeutic drugs are available for treatment.

Annex 2: Sri Lankan Counterparts

Title	Name	NPP 1 (2008/05-2009/3)	NPP 2 (2009/4-2010/3)	NPP 3 (2010/04-2011/03)	NPP 4 (2011/05-2012/03)	NPP 5 (2012/04-2013/03)
Project Director (Secretary, Health)	Dr. Athula Kahandaliyanage	2008/04 - 2010/01				
(Acting)	Dr. Y. D. Nihal Jayathilaka					
	Dr. T. R. C. Ruberu			2010/04 - 2012/07		
	Dr. Y. D. Nihal Jayathilaka					2012/07 -
Project Manager (DDG/Planning)	Dr. Sarath Samarage	2008/04 - 2010/01				
	Dr. Wimal Jayantha			2010/01 -		
Director NCD	Dr. L. Somathunga	2008/04 - 2009/01				
	Dr. L. Panapitiya		2009/01 - 2010/05			
	Dr. Champa Aluthweera			2010/05 - 2011/05		
	Dr. Thalatha Liyanage				2011/05 -	
Director HEB	Dr. Sarath Amunugama	2008/04 - 2011/11				
(Acting)	Dr. r. D. F. C. Kanthi				2011/11 - 2012/07	
	Dr. Neelamani Rajapaksa					2012/07 -
MO/NCD Kurunegala	Dr. Nihal Edirisinghe	2008/04 - 2009/08				
	Dr. Shamalee Amarasinghe		2009/08 -			
MO/NCD Polonnaruwa	Dr. Ranga Chandrasena	2008/04 - 2011/11				
	Dr. Indika Udaya Kumara				2011/11 -	

Annex 3: Dispatch of Japanese Experts

Annex 3

Dispatch of Japanese Experts

	Name	Position/Expertise	2008	2009	2010	2011	2012	Total
1	K. Nishino	Team leader/NCD prevention/Health promotion	3.7	3.5	4.0	5.5	6.6	23.3
2	F. Flores	Deputy team leader/NCD prevention	4.4	4.4	0.0	0.0	0.0	8.8
3	Y. Ogawa	Deputy team leader/Health promotion	0.0	0.5	3.7	0.3	0.0	4.5
4	T. Murayama	Deputy team leader/Clinical epidemiology	3.0	4.7	4.4	4.4	6.5	23.0
5	R. Sata	Health information system management/Health guidance	0.0	0.0	3.2	5.6	6.4	15.2
6	Y. Kamiya	Clinical epidemiology/NCD prevention	1.6	0.7	1.0	1.3	0.6	5.2
7	T. Sugimoto	Cost Analysis	0.7	1.3	1.4	1.5	0.8	5.7
8	K. Watanabe	Health promotion/Health information system management	3.5	1.7	0.0	0.0	0.0	5.2
9	Y. Uchida	Health finance	0.0	0.3	0.0	0.3	0.0	0.6
10	A. Tatera	Counterpart training coordination	1.0	1.0	0.0	0.0	0.0	2.0
11	A. Iwata	Counterpart training coordination	0.0	0.0	0.5	0.5	0.0	1.0
		Total	17.9	18.1	18.2	19.4	20.9	94.5

Annex 4: List of Equipment

INVENTORY LIST

Annex 4

List of Equipment Procured

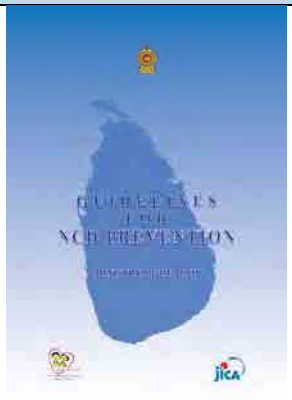
	Item	Price (SLRS)	Date Procured	Used at	Quantity	Condition
	1st year (2008.5 - 2009.3)					
1	Desktop Computer(HP Pavillion A63181)	132,000	11/09/2008	University of Kelaniya	1	good
2	Printer(HP D 2460)	17,000	12/09/2008	University of Kelaniya	1	good
3	Laptop Computer(HP Compaq V6901-TU)	155,000	11/09/2008	NPP Kurunegala/NPP Polonnaruwa	2	good
4	Photo Copy Machine(Panasonic DP 8020E)	215,000	24/09/2008	NPP Colombo	1	good
5	Photo Copy Machine(Panasonic DP 8016)	125,000	24/09/2008	NPP Kurunegala/NPP Polonnaruwa	2	good
6	Digital Blood Pressure Monitor(OMRON IA2)	11,000	23/01/2009	Screening centers in Kurunegala,Polonnaruwa	13	good
7	Glucometer(EZ Smart Standard)	5,980	24/01/2009	Screening centers in Kurunegala,Polonnaruwa	13	good
8	Pointe 180 II Analyzer	456,521	23/01/2009	BH Dambadeniya	1	good
9	Pointe 180 II Analyzer	456,521	26/01/2009	BH Medirigiriya	1	good
	2nd year (2009.4 - 2010.3)					
10	Desktop Computer(The Technology Ld)	102,203	20/10/2009	RDHS Kurunegala/RDHS Polonnaruwa	2	good
11	Printer(HP D 1660)	11,450	15/12/2009	RDHS Kurunegala/RDHS Polonnaruwa	2	good
12	Sony Cybershot Digital Camera	35,943	21/12/2009	NPP Kurunegala, Polonnaruwa	2	good
13	Sony Handycam DCR-SR67C	69,653	21/12/2009	NPP Colombo	1	good
	3rd year (2010.4 - 2011.3)					
14	Laptop Computer(Dell Inspiron N4010)	112,260	09/03/2011	Dambadeniya Base Hospital/Narammala District Hospital/Alawwa District Hospital/Medirigiriya Base Hospital	4	good
15	Projector(HITACHI CP-RX79)	112,000	09/03/2011	Dambadeniya Base Hospital/Narammala District Hospital/Alawwa District Hospital/Medirigiriya Base Hospital	4	good
16	Sony Digital Video Camera SR68	53,000	15/11/2011	NPP Polonnaruwa	1	good
	4th year (2011.5-2012.3)					
17	Desktop Computer	95,000	27/10/2011	NCD Unit, MoH	1	good
18	SPSS	846,496	27/10/2011	NCD Unit, MoH	1	good
19	TV (Sharp LC32AF20)	47,633	06/03/2012	HLCs in Kurunegala	27 sets	good
20	DVD (LG DV652)	6,308	06/03/2012	HLCs Polonnaruwa	7 sets	good
21	Blood Pressure Monitor (Omron HBP-9020)	217,750	03/02/2012	Institutions in Colombo	5 sets	good
22	Desk	5,834	06/03/2012	Institutions in Kurunegala	10 sets	good
23	Chair	9,584	06/03/2012	Institutions in Polonnaruwa	10 sets	good

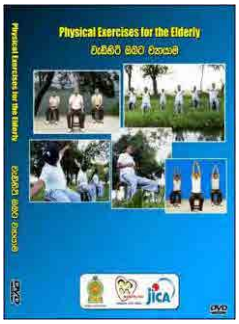
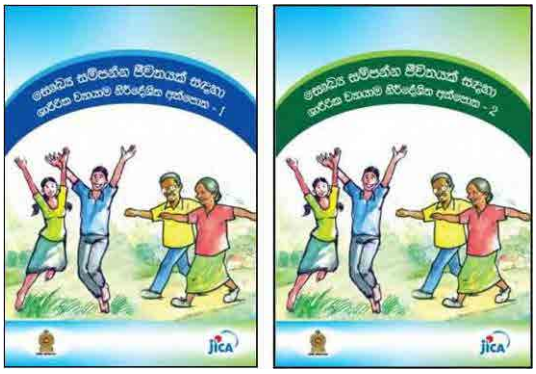
Annex 5: Counterpart Trainings in Japan

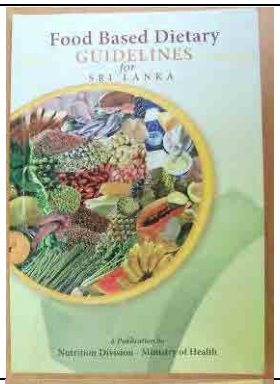
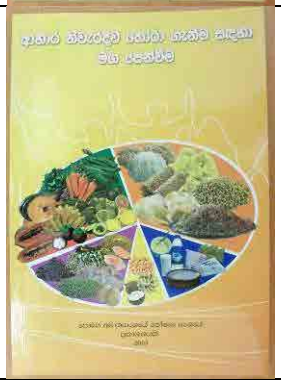
Record of Counterpart Training

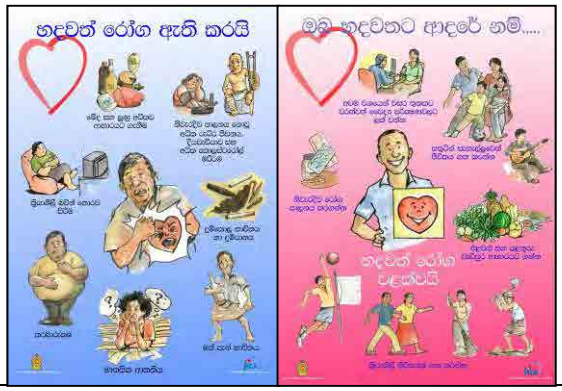
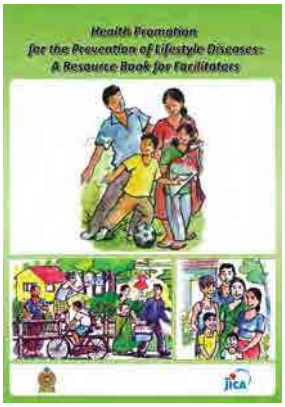
	2nd Year (2009)		3rd Year (2010)		4th Year (2011)	
Name of trainee/ Designation	Dr. L. Panapitiya Director Non Communicable Disease (NCD) Unit, Ministry of Healthcare & Nutrition		Dr. R. Wimal Jayantha Deputy Director General, Planning, Ministry of Health		Dr. Thalatha Liyanage Director, NCD Unit, Ministry of Health	
	Dr. P. Yapa Regional Director of Health Service, Kurunegala District		Dr. Champa Aluthweera Director NCD unit, Ministry of Health		Dr. Virginie Mallawarachchi Consultant Community Physician, NCD Unit, Ministry of Health	
	Dr. J.M.T.B Balalla Medical Officer of Health, Narammala MOH, Kurunegala District		Dr. Shamalee Amarasinghe Medical Officer NCD, RDHS, Kurunegala District		Dr. S. Noel Udugama Regional Director of Health Service, Polonnaruwa District	
	Dr. P.L Atapattu Regional Director of Health Service, Polonnaruwa District		Dr. Indika Udaya Kumara Medical Officer NCD, RDHS, Polonnaruwa District		Dr. Deegayo. Nayakarathna AMOH Alawwa, Kurunegala District	
	Dr. W.A.A.U Kumara Medical Officer of Health, Medirigiriya MOH, Polonnaruwa District					
Sector	Health		Health		Health	
Period	20 July to 4 August 2009		6 to 19 June 2010		19 February to 1 March 2012	
Training facilities and programmes	Kawasaki city governmental office, Kawasaki city hospital	Lecture: "Healthy Kawasaki 21" and programmes of Kawasaki city, Observation: Maternity Clinic	Ministry of Health, Labor and Welfare	Presentation: NCD prevention control programme in Japan and Sri Lanka	Ministry of Health, Labor and Welfare	Presentation and Discussion: NCD prevention programme in Japan
	St. Mary's Hospital	Observation: Health promotion activities at St. Mary's Hospital	Kumamoto Prefectural Government Office	Lecture: Monitor and evaluate "Healthy Kumamoto 21"	St. Mary's Hospital	Lecture: Universal health insurance system in Japan Observation: Health check up Observation: Health promotion activities Lecture: Healthy Japan 21
	Fukuoka Foundation for Sound Health	Lecture and observation: Data management system on health check up	Kyokai Kenpo, Kumaoto Branch	Lecture: Role of insurer for small and medium sized company employees, Data management system		
	Chlorella Industry Co., Ltd, Kyushu Factory	Observation : Mobile health checkup system	KSPA, Kumamoto Sports Jigyodan	Observation: Health promotion activities for obese people	Fukuoka Foundation for Sound Health	Observation: Data management process Observation: Health promotion activities for community Observation: Mobile health check up system Lecture: Roles and responsibilities of checkup center
	Kurume City Hall	Lecture: Healthy Japan 21 at City level, Health check up at MOH Kurume	St. Mary's Hospital	Observation: Health check up programme at St. Mary's Hospital		
	Municipal health promotion centre "ASUTERASU"	Observation: Health checkup in different settings	Fukuoka Foundation for Sound Health	Lecture and observation: Data management system on health check up		
	Nagasaki University Hibakusha centre	Lecture and observation: Special checkup programme for atomic bomb affected population in Nagasaki	Health Welfare department, Ohmuta city	Lecture: Healthy Japan 21, Role of health centers(MOH)	The Board of Education of Kurume City	Lecture & Observation: School health and safety act, school lunch
	Saza Town	Observation: NCD prevention programme for community at rural area in Nagasaki	Municipal health promotion centre "ASUTERASU"	Observation: Health promotion activities at Ogori City	Municipal health promotion centre "ASUTERASU"	Observation: Health promotion activities at Ogori City
	Omura City	Walking activity in Omura City (Health Promotion Activity by health promoter)	Nagasaki University	Lecture and workshop: Evidence based formulation of the NCD strategies	Health Welfare department, Ohmuta city	Lecture: Healthy Japan 21(municipal level), role of health center, dietary education program in Omuta city

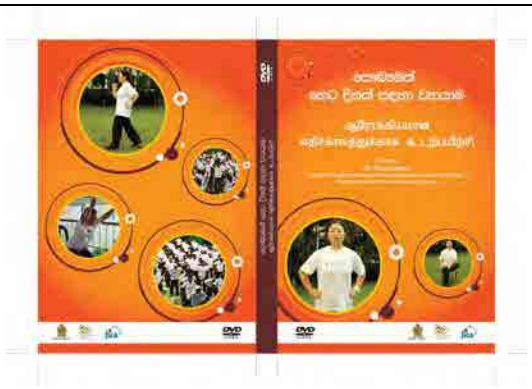
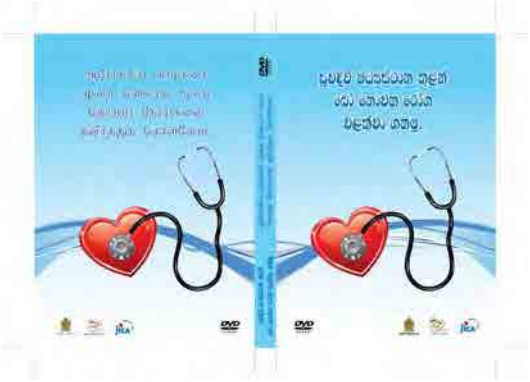
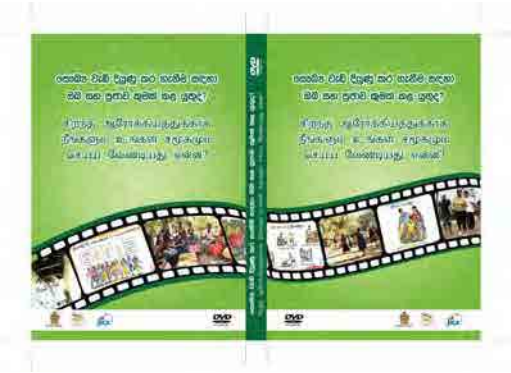
Annex 6: NPP guidelines, manuals and tools

	Name	Image	Contents/Usage/Language
1	Guidelines for NCD Prevention		➢ Principles and guidelines for NCD prevention ➢ English
2	Screening manual		➢ For conducting screening ➢ Basic steps for screening ➢ A4 size booklet ➢ English, Sinhala, Tamil
3	Flip chart		➢ For general health guidance ➢ Basic information on NCDs, risk factors and causes, prevention methods ➢ A3 size ring binding ➢ Sinhala, Tamil
4	Flip chart guide-book		➢ Supplementary guidebook on how to use flip chart ➢ More information on NCDs, risk factors and causes, prevention methods ➢ A4 size booklet ➢ Sinhala, Tamil

5	Self-check calendar		➢ For individual monitoring of physical exercise, diet and smoking cessation (2012 calendar) ➢ For follow up and health promotion ➢ 18 x 23 inches
6	Stickers for health record (or exercise book)		➢ For monitoring individual improvements on physical exercise, diet, smoking cessation and alcohol intake. ➢ For follow up and health promotion ➢ Seven varieties
7	Exercise DVD		➢ Easy physical exercise with instruction ➢ Suitable for elderly people ➢ For showing at HLCs, OPD waiting rooms and special events ➢ DVD
8	Exercise instruction book		➢ Stretching and light exercises for health ➢ Suitable for exercise workshop with instructor ➢ Original booklet was developed by Kumamoto Sports Promotion Association and Asuterasu (Ogori city) in Japan ➢ A4size

9	BMI poster		➢ For easy calculation of BMI ➢ Suitable for the wall of health institutions, MOHs and workplaces ➢ 36 x 48 inches
10	BMI wheel		➢ For easy calculation of BMI ➢ Suitable for community screening ➢ Not as accurate as BMI chart ➢ 6 x 6 inches
11	Food based dietary guidelines for Sri Lanka		➢ For medical officers to understand nutrition and diet (published by the Nutrition Division, Ministry of Health, 2011) ➢ Including key messages for improving diet ➢ A5 size booklet
12	Food guide for general public		➢ Suitable for field workers to use in a nutrition session ➢ Easy reference on nutrition and diet (published by the Nutrition Division, 2010) ➢ A5 size booklet
13	PHM reference card	 	➢ Suitable for PHMs to provide nutrition guidance for general public ➢ Recommended daily nutrition intake for each generation, function of each nutrient, BMI calculation formula,

			health guidance messages. ➢ A4 size leaflet (4 faces)
14	Nutrition flash card		➢ Food photograph cards with explanation of nutrients ➢ Suitable for PHMs to discuss about menu planning ➢ 82 cards
15	NCD posters		➢ General message on NCD risk factors (blue) and healthy lifestyle to prevent these risks (pink) ➢ Suitable for health institutions, MOH and workplaces ➢ Sinhala, Tamil
16	Poster for healthy lifestyle		➢ Health is the best wealth ➢ Health information for general public ➢ Encourage public to visit Healthy Lifestyle Centres ➢ Suitable to be posted in health institutions and MOH offices ➢ Sinhala, Tamil
17	Health promotion resource book for setting facilitators		➢ General information on health promotion with specific emphasis on NCDs ➢ Suitable for health professionals, school teachers and setting leaders ➢ A4 size booklet ➢ English

18	Exercise for healthy future		➢ Stretching and general movement for exercise ➢ Instructor: Ms. Rinko Sataka ➢ Sinhala & Tamil
19	Training DVD for Healthy Lifestyle Centres		➢ Screening, health guidance, data management, monitoring and evaluation. ➢ Sinhala & Tamil
20	Training DVD for general public		➢ General health guidance and health promotion ➢ Sinhala & Tamil

Annex 7: Cost Analysis Report

Project on Health Promotion and
Preventive Care Measures of Chronic NCDs
NCD Prevention Project

Cost Analysis Report

NCD Prevention Project

December 2011

Ministry of Health

Japan International Cooperation Agency

Cost Analysis Report

NCD Prevention Project

December 2011

Dr. Anuradhani Kasturiratne
Dr. Lasantha Ranwala
Mr. Takao Sugimoto

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Introduction

Background

The Ministry of Health (MoH) of Sri Lanka initiated the “Project on Health Promotion and Preventive Measures of Chronic NCDs” (or NCD Prevention Project or NPP) as one of its major undertakings to address the growing health and economic burden of chronic non-communicable diseases. The NPP is one of the Health Master Plan priorities and a follow up to the “Evidence-Based Management (EBM) Study” that was supported by the Japan International Cooperation Agency (JICA). Based on a request from the government of Sri Lanka, JICA dispatched the preparatory mission in December 2007, and the Record of Discussion (R/D) was signed on the 27th of February 2008 between Mrs. Noriko Suzuki, Resident Representative of JICA Sri Lanka Office and Dr. Athula Kahandaliyanage, Secretary of the Ministry of Health. The five-year Technical Assistant Project officially commenced on May 12' 2008 with the arrival of Japanese experts.

Project Purpose & Overall Goals

The Purpose of this five-year project (2008 – 2013) is to develop “effective and efficient implementation models to prevent and control NCDs (DM, Hypertension, and hypercholesterolemia)”. The models developed by NPP are designed to initiate appropriate deployment of human resources and health infrastructure and thereby contribute to island-wide implementation in the future.

Outputs

With the following four outputs, the NPP is expected to achieve the Project Purpose:

Output 1: Risk factors of cardiovascular diseases are identified in the Ragama Health Study based on the evidence.

Output 2: Intervention guidelines and manuals are formulated based on available evidence and related literatures.

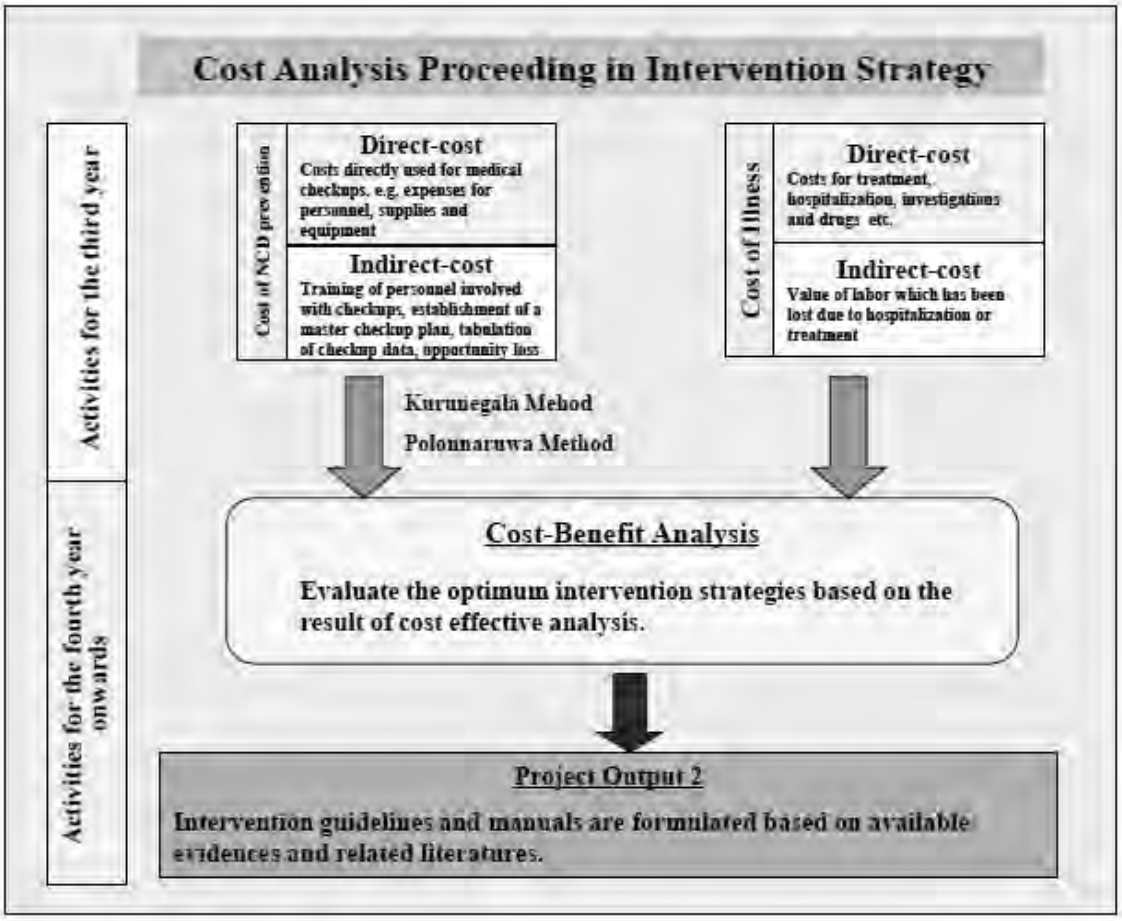
Output 3: Institutional and technical feasibilities of the consolidated intervention guidelines are assessed for development of the NCD prevention models in pilot areas.

Output 4: Expansion plan for health check-up/ guidance and health promotion for prevention of cardiovascular diseases is finalized for island wide implementation.

Cost Analysis of Third Year Activities

The cost analysis is a designated activity to achieve Output 2 of the project.

The costs required for the implementation of medical check-ups, the number of health and medical personnel required to carry out these check-ups and the costs involved in training the personnel, were calculated for the third year, based on the past results of the project. The check-ups were conducted in two districts of the project's target area: the North Central Province and North Western Province over the last two years. The objective of these activities was to enable us to tentatively calculate the financial and human resources necessary for broader scaled-up implementation



Systemic and household Cost analysis

Following the advice of Prof. Amala de Silva (Department of Economics, University of Colombo), we requested Dr. Lasantha Ranwala (a student at the Postgraduate Institute of Medicine) to determine the costs required for check-ups, and Dr. Anuradhani Kasturiratne (a lecturer in the Department of Public Health, University of Kelaniya) to determine the costs of illness and indirect costs related to check-ups, as the components of costing NCD prevention. Both doctors were qualified to carry out this study, as they had previously been involved in hospital

department-based and illness-based cost accounting during the Development Study Phase Ⅱ - on Evidence-based Management for Health System Development in Sri Lanka “Category 2: Improvement of Hospital Finance with Cost Accounting and Development of Information System” - implemented from October 2005 to October 2007.

I would like to thank Dr. R.W.Jayantha, DDG/Planning, and Dr.Thalatha Liyanage, Director/NCD for supporting our study. And special thanks to all authors and research assistants for their serious manner to research work.

Takao Sugimoto
Person in Charge of Cost Analysis for NPP

Report 1

Cost Analysis

Third Year of the NCD Prevention Project

Lasantha Ranwala
Takao Sugimoto

A study conducted for Japan International Cooperation Agency

2010

1 An outline of the cost analysis process

The cost analysis process can generally be divided into two categories of costs: costs required for the check-ups, and costs of illness.

We carried out the study of costing the check-ups separately for the two pilot districts (Kurunegala and Polonnaruwa Districts), as they had introduced different check-up systems. Two different types of cost were collated: direct costs, such as costs of personnel, supplies and equipment required for the actual implementation of check-ups, and indirect costs, borne in training the human resources involved in the check-ups, and for the establishment of a check-up program.

Also, assuming that the costs of illness will be used for a cost-benefit analysis at a later stage, we tabulated the costs, dividing them into direct costs (hospitalization, medical personnel, nursing personnel, treatment, tests and drugs) and indirect costs (cost of travelling to the hospital, medication costs borne by patients, cost of meals, and loss of income).
Calculating costs of illness is important in this study because if patients are not screened and early intervention undertaken patients will end up with episodes of hospitalization that are expensive to both the health system and households.

Such cost accounting exercises, incorporating costing studies of specific diseases, could contribute to quantitative, evidence based decision making. As these special cost studies will be based on speculative accounting, the results will never be completely accurate. The data and background information available for the calculation of costs or for utilization in the accounting process are however fundamental. At a practical level, the key to correct decision-making depends on how precisely appropriate information regarding activities can be gathered.

2 Study of check-up costs (provisional calculation based on cost accounting)

2.1 Study method

【Check-ups】
The pilot implementation of check-ups started in July 2009. For this analysis, we utilized data from the most recent time period after the activity went on line: November 2009 to October 2010. For the analysis, we were able to obtain key data regarding the check-ups and health guidance, including how long they took and who implemented them, using the “NCD Check-up Observation Report (Annex 1) prepared by a Project Officer (PO) attending the check-up session. Based on this data, check-up costs were calculated which reflected the actual purchase prices of equipment

and supplies. As POs either did not attend or prepare reports for some check-up sessions, we could only analyse the reports of around half the check-up sessions implemented during the relevant period (111 sessions in Kurunegala and 46 sessions in Polonnaruwa).

【Training】
We calculated the costs incurred in the five training sessions targeted at check-up staff held prior to the check-up activity.

【Other costs】
We surveyed past records to obtain stationery costs and the costs borne in printing the check-up manual and the assessment table.

【Indirect costs】
We estimated the costs incurred by check-up participants (travel cost to and from the check-up site, eating-out cost, income lost by participating in a check-up, and other costs incurred due to the check-up). As these data can only be obtained by interviewing the check-up participants, we employed research assistants and proceeded with a survey of 400 people in each district; a total of 800 people.

2.2 Analysis of check-up costs

There are two methods of cost analysis: one is to divide costs into direct costs and indirect costs; the other is to divide costs into fixed costs and variable costs. In this survey, we tried to calculate not only the costs directly related to check-ups, but also the costs indirectly borne as a result of conducting the check-ups. Moreover, as it was necessary to perform an analysis to determine both the budget and manpower necessary to expand this project to the national level, we decided to separate the costs into two types: fixed costs used for the implementation of check-ups irrespective of participant numbers, and variable costs that are directly linked to individual check-up participants. Fixed costs included costs such as the expenditure on the building, furnishings and personnel, Variable costs estimated per participant coverage expenditure on medical materials, consumables and stationary. However, while we consider personnel costs to be a fixed cost, they may also be considered a variable cost. The study involves simulations formulated through recalculating costs based on the study findings regarding the actual time spent on screening individual participants.

2.3 Details of the check-up process in practice

Details relating to the screening process, as observed at the two sites, are given in Table 1. The

study focuses on 111 check-up sessions in the Kurunegala District, where the average number of participants per check-up session was 27.3 people, the average time taken was 1.7 hours, and the average number of allocated personnel was 4.1; and on the 46 sessions held in the Polonnaruwa District, where the average number of participants per check-up session was 26.5 people, the average time taken was 1.5 hours, and the average number of allocated personnel was 4.2. Although it seems that there were hardly any differences between the districts when comparing the average data per check-up session, it is necessary to take the differences in the check-up process into account. These differences are described later in section 4.4. We also carried out a similar study on health guidance held after each check-up session. In Kurunegala District, the average number of participants per health guidance session was 24.5, the average time taken was 0.9 hours, and the average number of allocated personnel was 1.2. In Polonnaruwa District, the average number of participants per health guidance session was 22.8, the average time taken was 0.5 hours, and the average number of allocated personnel was 1. Hereinafter, for the purposes of this analysis, we jointly consider the check-up and the following health guidance session as one check-up session.

Table 1 Details of the check-up processes

	Item / District	Kurunegala		Polonnaruwa	
Check-up	No. of check-up sessions	111	times	46	times
	Total No. of participants	3,035	people	1,218	people
	Total time taken for check-ups	194.04	hours	70.25	hours
	Total No. of allocated personnel	454	people	194	people
Health guidance	No. of health guidance (HG) sessions	109	times	46	times
	Total of HG participants	2,666	people	1,049	people
	Total time taken for HG	99.3	hours	23.6	hours
	Total No. of allocated personnel	128	people	46	people
Average per session	No. of check-up participants	27.3	people	26.5	people
	Time taken for check-up	1.7	hours	1.5	hours
	No. of allocated check-up personnel	4.1	people	4.2	people
	Total No. of HG participants	24.5	people	22.8	people
	Total time taken for HG	0.9	hours	0.5	hours
	Total No. of allocated personnel for HG	1.2	people	1.0	people

2.4 Differences in check-up systems in the 2 pilot areas (Kurunegala and Polonnaruwa Districts)

The check-up systems used in the current pilot implementation areas were the One-Step System in Kurunegala District and the Two-Step System in Polonnaruwa District (hereinafter, referred to as the Kurunegala System and the Polonnaruwa System. See the flowcharts given as Annex 2 and 3.

In both systems, check-up participants were aged between 40 and 75, with no previous history of Diabetes, hypertension, Ischemic heart disease or stroke. However, the screening processes adopted in the Kurunegala System and Polonnaruwa System were different in some ways. Firstly, in the Kurunegala System, medical personnel such as doctors and nurses implemented the check-ups mainly at medical facilities such as Base Hospitals and Divisional Hospitals. In the Polonnaruwa System, Public Health Inspectors (PHIs) and Public Health Midwives (PHMs) implemented the check-ups mainly at primary care facilities such as Health Centers and Central Dispensaries. In other words, in the Kurunegala System the check-up participants had to travel to the facilities to receive the check-up, whereas in the Polonnaruwa System the check-up implementers visited the areas where the check-up participants lived.

Both check-up implementation systems were established by effectively utilizing the existing facilities, equipment, and personnel. As these new NCD prevention measures effectively utilize the existing resources, it is highly feasible that a similar strategy can be promoted at national-level on the completion of this pilot project. In cost analysis, the method of calculating fixed costs such as the costs of the facility, equipment and personnel have a great bearing on the outcomes. Use of existing facilities, equipment and personnel would minimize the fixed costs incurred by the check-up process.

Secondly, there were 5 check-up items implemented in both systems: ① Blood pressure measurement, ② BMI measurement, ③ Smoking history, ④ Lifestyle-related disease history, and ⑤ Blood glucose measurement using a Glucometer. In the Kurunegala System, all the items were examined in a single event. However, in the Polonnaruwa System, Items ①～④ were examined locally at a primary care facility in each area, and only the participants who were determined to be in need of further testing had blood pressure measurement, a blood glucose measurement and a family history interview at a clinic where such tests are conducted on a regular basis. This is the reason the Kurunegala System is referred to as a “One-Step System” and the Polonnaruwa System the “Two-Step System”.

This cost analysis only covers group check-ups in the study, not the clinic tests in the case of the Polonnaruwa System (i.e., the second step of the Two-Step System), as it is difficult to calculate the cost of just a few check-up participants seeking regular services in existing operating clinics. However as the direct cost of the blood glucose test using a glucometer can be calculated per participant, we included this cost in the analysis.

Table 2 Personnel in charge of different activities at the two study sites

Item		District	Kurunegala District (111 times)			Polonnaruwa District (46 times)		
			Total No.	Total hours	No. of staff per session	Total No.	Total hours	No. of staff per session
Check-up	Doctor		119	209.8	1.1	0	0	0
	Nurse		274	497.0	2.5	0	0	0
	PHI		6	11.0	0.1	45	68.3	1.0
	PHM		55	92.4	0.5	149	225.8	3.2
	Total		454	810.2	4.1	194	294.0	4.2
Health guidance	Doctor		33	30.8	0.3	0	0	0
	Nurse		83	74.0	0.8	0	0	0
	PHI		9	8.5	0.1	40	20.4	0.9
	PHM		3	3.3	0.0	6	3.3	0.1
	Total		128	116.5	1.2	46	23.6	1.0
Total (Check-up+HG)			582	926.7	5.25	240	317.6	5.22

2.5 Review of the personnel costs incurred in the check-up process

There are three factors to be considered when calculating the personnel costs' in implementing the check-ups:

1) Determine the cost per check-up participant, by calculating the hourly salary of personnel engaged in check-ups, and the number of hours spent per check-up participant;
2) Consider that the personnel cost need not be included as the personnel engaged in the check-ups already receive a salary for working in the healthcare system, and these check-ups are a part of their duties;
3) Determine how the check-up process resulted in an increase of duties that needed extra effort of the personnel in charge, and if that increase of duties might decrease the quality of their duty implementation, since having check-ups means that the personnel engaged in these activities have additional duties on top of their existing duties. In other words, to calculate the total number of hours that personnel were engaged in check-ups and consider measures that could be taken to recompense for these extra hours of work, such as the employment of new staff or providing incentive payments for existing staff.

We will carry out the cost analysis using these different approaches to personnel cost.

As shown in Tables 2 and 3, in Kurunegala District, the personnel costs per check-up participant and that per health guidance participant were rupees (Rs) 30.6 and Rs. 5.0, respectively, a total of Rs. 35.6; in Polonnaruwa District, the personnel costs per check-up participant and that per health guidance participant were Rs. 21.3 and Rs. 1.9, respectively, a total of Rs. 23.2. The difference in cost results from differences in the personnel used and the time spent on each activity,

In the next section, we will estimate the time that personnel were engaged in the check-ups, and review the allocation of tasks between personnel.

Table 3 Personnel cost per check-up/health guidance participant

Item	District	Monthly salary	Hourly rate	Kurunegala District		Polonnaruwa District	
				Total hours	Cost per participant (Rs)	Total hours	Cost per participant (Rs)
Check-up	Doctor (grade ii)	28,095	159.6	209.8	11.0	0	0.0
	Nurse (grade i A)	17,810	101.2	497.0	16.6	0	0.0
	PHI	15,080	85.7	11.0	0.3	68.3	4.8
	PHM (grade ii)	15,620	88.8	92.4	2.7	225.8	16.4
	Total	―	―	810.2	30.6	294.0	21.3
Health guidance	Doctor (grade ii)	28,095	159.6	30.8	1.8	0	0.0
	Nurse (grade i A)	17,810	101.2	74.0	2.8	0	0.0
	PHI	15,080	85.7	8.5	0.3	20.4	1.7
	PHM (grade ii)	15,620	88.8	3.3	0.1	3.3	0.3
	Total	―	―	116.5	5.0	23.6	1.9
Total (Check-up+HG)		―	―	926.7	35.6	317.6	23.2

※The hourly rate was calculated under the working conditions of 8 hours a day, 22 days a month.

2.6 Estimation of the check-up system based on the study

The details relating to the check-ups undertaken within the study and the allocation of work between the personnel engaged in the check-ups are shown in Tables 1 and 2. Based on these data, the averages relating to the implementation of one check-up are shown in Table 4. The Table presents the time required per check-up session, based on the type of activity, which in turn is related to specific personnel.

Table 4 An average check-up system

	No. of check-up sessions	No. of participants	Required hours	Doctor		Nurse		PHI		PHM	
				No.	Hours	No.	Hours	No.	Hours	No.	Hours
Kurunegala System	111	3,035	194.04	119	209.8	274	497.0	6	11.0	55	92.4
	1	27.3	1.7	1.1	1.9	2.5	4.5	0.1	0.1	0.5	0.8
Polonnaruwa System	46	1,218	70.25	0	0	0	0	45	68.3	149	225.8
	1	26.5	1.5	0	0	0	0	1.0	1.5	3.2	4.9

Next, the check-up plan and past results of its implementation are examined for both districts in Table 5.

Table 5 Check-up plan and annual results

		Kurunegala District	Polonnaruwa District
Plan	Population aged 40-75	35,983	16,849
	Check-up target population	24,173	11,596
	Estimated No. of annual check-up participants	4,835	2,319
Results	No. of annual check-ups	227	91
	No. of annual check-up participants	6,674	2,351

This pilot project was established as a 5-year check-up implementation plan, targeting the population aged between 40 and 75 with no past history of NCDs.

The plan was implemented in July 2009. Table 5 shows the records for one year from October 2009 to September 2010. As can be seen, the project has been implemented according to plan in Polonnaruwa District, while in Kurunegala District the project has been implemented much faster than planned. If check-ups are continuously conducted in Kurunegala District at the present pace, the target population will all be covered approximately within 3 and a half years instead of the planned 5 years. We estimate the costs for the check-up system based on the average check-up system. The check-up plan as implemented in both pilot districts and the implementation situation are shown in Tables 4 and 5.

Table 6 Simulation of annual check-up results based on the averages determined by the study

		No.of check-ups	No. of participants	Required hours	Doctor		Nurse	
					No.	Hours	No.	Hours
Kurunegala System	Average of study	1	27.3	1.7	1.1	1.9	3.0	5.4
	Annual results	227	6,674	385.9	250	429	681	1,226
		No.of check-ups	No. of participants	Required hours	PHI		PHM	
					No.	Hours	No.	Hours
Polonnaruwa System	Average of study	1	26.5	1.5	1.0	1.5	3.2	4.9
	Annual results	91	2,351	136.5	91	135	291	447

In the Kurunegala System, PHIs and PHMs were included as check-up implementers, but only accounted for 0.6 personnel (see Table 4) so they were grouped with the nurses in this simulation exercise.

In the Kurunegala System, a total of 429 hours by doctors and 1,226 hours by nurses were spent implementing a total of 227 check-up sessions in one year. In the Polonnaruwa System, a total of 135 hours by PHIs and 447 hours by PHMs were spent implementing a total of 91 check-up sessions in one year. Furthermore, the time spent on Health Guidance implemented after the check-up is shown in Table 7. As described previously, one of the key points in cost analysis is how we take this time spent into account in the form of personnel costs.

Table 7 Annual total No. of hours spent on check-ups and Health Guidance by personnel (estimate)

District	Type of job	Check-up	HG	Total
Kurunegala	Doctor	429	64	493
	Nurse	1,226	175	1,401
Polonnaruwa	PHI	135	40	175
	PHM	447	6	453

2.7 Cost analysis for check-ups

As we utilized the existing buildings and furnishings for check-ups, and did not purchase anything new, we do not need to consider their costs. The same approach as applied in this pilot project, will be adopted in other areas of the country in the future.

All the devices utilized during the project were considered to be variable costs, and the costs per check-up participant were calculated on the basis of estimated service life (times used). In the Kurunegala System, blood pressure was often measured using a mercury manometer which the doctor was already using at the medical facility, but the cost was calculated as that of a digital sphygmomanometer in this analysis (as this was the chosen method for this project).

We considered that the blood glucose test was conducted on all participants in the Kurunegala System and 20% of the number of first step participants in the Polonnaruwa System. This too was calculated as a variable cost.

The initial costs listed in Table 8 are the implementation costs incurred in starting up the project. As the materials produced for this project can be utilized in other areas and over time, only printing cost will have to be borne in implementing the check-up nationally in the future. The number of training sessions for check-up implementers was 3 sessions in Polonnaruwa and twice in Kurunegala. The extra session in Polonnaruwa was due holding a training session for Step 2.

Table 8 Costs necessary for the implementation of check-ups (the value unit is Sri Lanka rupee)

Item	Summary	Cost	Per participant	Remarks
Building	Rooms used for check-ups	No costs as the existing facilities were effectively utilized.		
Furnishings	Waiting room chairs, reception desks and chairs Desks and chairs per check-up item	No costs as the existing facilities were effectively utilized.		
Devices	Scale	5,244	0.54	Replaced every 10,000 times of use
	Height chart	2,500	0.25	Replaced every 10,000 times of use
	Digital sphygmomanometer	8,500	1.19	Replaced every 10,000 times of use
	Glucometer	4,890	1.08	Replaced every 5,000 times of use
	Calculator	250	0.03	Replaced every year
Materials	Blood glucose test tapes	-	44.00	Materials directly used for individual participants
	Needles	-	5.50	
	Disposable gloves	4.5	0.17	1 set used for each check-up participant?
	Hand-outs	-	9.00	Given to check-up participants, eg check-up forms
Initial costs	Check-up manual production	333,000	When introducing check-ups in a new area, only the printing cost for the necessary copies will be incurred. Rs. 900、000 was spent as initial costs of designing te material, including the printing cost of Rs. 200,000.	
	BMI chart production	66,000		
	Health promotion poster production	229,000		
	Flip chart production	271,000		
	Check-up implementer training	114,000	Twice in Kurunegara	
	〃	205,000	3 times in Polonnaruwa	

Based on the analysis so far, we will suggest three different costing scenarios are necessary for considering check-ups given the three different approaches to personnel costs.

In cost analysis, it is necessary to consider not only the actual time the check-up takes, but also the time taken and cost required for traveling to the check-up site, and the time required by PHM for recruitment of participants. However, we did not include the time taken by the PHM for recruitment, as it was considered to be a part of this person's present Primary Health Care (PHC) duties.

We also did not think it necessary to include traveling time to the check-up site. In the Kurunegala system the check-ups were implemented in the relevant personnel's workplace. Although PHMs involved in the check-up project had to visit the subject area under the Polonnaruwa System, we did not consider the traveling time for them either as they also came from the relevant areas. In the case of the exceptions: 1 support PHI and 2 PHMs who came from other areas, we took the distance from the MOH office to the Health Centre where the check-up was implemented (an average 22 Km round-trip), and calculated travel costs. However, we did not look into travel time; in the future however it will be necessary to make sure that travel costs also include the time required for travel, as time lost in travel also has an economic cost.

Simulation 1) Calculation of staff salaries per check-up participant

Although all this money was not actually spent during the pilot implementation, we calculated the allocated cost per check-up participant by converting the personnel cost into an hourly rate. Also, the travel cost by Polonnaruwa personnel was calculated just for this exercise. In the case of Kurunegala District, Rs. 2,667,000 is necessary for check-ups for the target population of 24,173 people. In the case of Polonnaruwa District, Rs. 1,208,000 is necessary for the target population of 11,596 people. Based on these results, when simulating the check-up costs for other districts, initial costs need to be added to variable costs per participant and multiplied by the target population. For instance, the cost necessary to implement check-ups for a target population of 20,000 people using the Kurunegala System is Rs. 97.4 × 20,000 people + Rs. 314,000 = Rs.2,262,000

Table 9 Simulation 1) (Unit: Sri Lanka rupee)

Item		Kurunegala District	Polonnaruwa District
Variable costs	Total material cost (C×A)	1,492,924	127,672
	Total personnel cost (D×A)	860,559	269,027
	Step 2 (E×B)	-	117,759
	Traveling cost	-	289,080
	Total	2,353,483	803,538
	Average per participant	98	70
Initial costs	Training cost	114,000	205,000
	Cost for preparation of material	200,000	200,000
	Total	314,000	405,000
Total cost for check-up implementation		2,667,483	1,208,538

Simulation 2) Exclusion of costs which do not actually increase spending, such as staff salaries, from the total

With the assumption that check-ups can be implemented as a new project utilizing the existing manpower, only the costs that were actually spent on the pilot implementation of check-ups need to be estimated.

In Kurunegala District, Rs. 1,807,000 is necessary for check-ups for the target population of 24,173 people, and in Polonnaruwa District, Rs. 940,000 is necessary for the target population of 11,596 people.

Table 10 Simulation 2) (Unit: Sri Lanka rupee)

Item		Kurunegala District	Polonnaruwa District
Variable costs	Total variable cost (C×A)	1,492,924	127,672
	Step 2 (E×B)	-	117,759
	Traveling cost	-	289,080
	Total	1,492,924	534,511
	An average per participant	62	47
Initial costs	Training cost	114,000	205,000
	Fabrication cost	200,000	200,000
	Total	314,000	405,000
Total cost for check-up implementation		1,806,986	939,511

In this case, the cost necessary to implement check-ups of a target population of 20,000 people using the Kurunegala System is Rs. 61.8 × 20,000 people + Rs. 314,000, for a total of

Rs. 1,555,000. This is the figure that needs to be included in the budget for the check-up project, if it can be implemented without increasing the number of personnel.

Simulation 3) Review of the costs actually spent and the time spent by personnel

The material and equipment costs directly necessary for the implementation of check-ups and the training cost for personnel engaged in check-ups are calculated as in Simulation 2. However, in this case it is necessary to clarify how we view the time spent by personnel for the implementation of the check-ups.

If check-ups for a target population can be implemented by part-timers, the simplest way is to calculate the “hourly rate × No. of hours engaged in check-ups” as shown in Simulation 1. However, the check-up project has been actually promoted based on the idea of utilizing existing manpower. How much impact the implementation of these pilot check-ups had on existing workload, and if it increased the burden of people involved unduly is unknown, as this cost analysis survey did not look into such details. However given that there could have been such impacts, it is necessary to examine how to recompense for the hours spent on check-ups in some form or other.

Table 11 Time spent on the implementation of check-ups

District	Type of job	Annually	Target population
Kurunegala 227 times a year	Doctor	493 hours	1,785
	Nurse	1,401 hours	5,074
Polonnaruwa 91 times a year	PHI	175 hours	863
	PHM	453 hours	2,234

The total time spent on check-ups, based on the type of personnel, is shown in Table 11. A lot of personnel are involved in these check-ups. For instance, personnel at 9 facilities carry out the check-up sessions about twice a month in Kurunegala. In Polonnaruwa, check-up sessions are conducted once or twice a month in 23 PHM areas. In this system, personnel share the duties and so individuals are not overly burdened. In both systems, in general, efficient approaches have been introduced to carry out the check-ups without increasing manpower.

However, in order to keep the motivation of the existing personnel high and continue the project, it is necessary to examine alternative ways to cover the extra work involved in providing the check-up sessions. One way would be to calculate the workload involved and allocate new personnel: this would involve including in the budget, personnel costs using the hourly rate of personnel as calculated using simulation 1. The alternative would be to add this cost to simulation 2 in the form of incentive payments to existing personnel. In addition, in the

case of the PHMs in Polonnaruwa the travel costs would also need to be included in the budget.

Table 12 Disaggregated cost information relating to implementation of check-ups

	Item	Kurunegala District		Polonnaruwa District	
A	Check-up target population	24,173	People	11,596	People
B	Step 2 subjects	-		2,319	People
C	Variable costs per participant	61.76	Rs	11.01	Rs
D	Personnel cost per participant	35.6	Rs	23.2	Rs
E	Blood glucose (Step 2)	-		50.78	Rs
F	Traveling cost per session	-		660	Rs.
G	Training cost	114,000	Rs	205,000	Rs
H	Fabrication cost	200,000	Rs	200,000	Rs
I	No. of doctors	1,785	Hours		
J	No. of hours spent by nurses	5,698	Hours		
K	PHI hours			863	Hours
L	PHM hours			2,234	Hours

Table 12 provides disaggregated costing data relating to the check-ups as determined in this study as such information could be utilized for various simulations and cost-benefit exercises in the future.

2.8 Costs incurred by participants in having the check-up

【Survey method】

In order to figure out the costs incurred by check-up participants, a survey was conducted for 400 participants each, a total of 800 participants in both districts. The surveyed areas were Narammala and Alawwa in Kurunegala District and Medirigiriya in the Polonnaruwa District and the numbers of subjects surveyed in each area are shown in Table 13.

Table 13 No. of survey subjects

MOH area	No. of survey subjects	Ratio
Narammala	250 people	31.2%
Alawwa	150 people	18.8%
Medirigiriya	400 people	50.0%
Total	800 people	100.0%

The questionnaire included issues such as age, gender, occupation, highest level of education achieved, family income, the number of family members living together, the method and cost of traveling to and from the check-up site, the cost of lunch incurred by attending the check-up, and any income lost by the participant or the family due to the check-up.

【Preliminary survey results】

We are presently carrying out a detailed analysis of these survey results. Therefore, in this report

we will provide only the preliminary results here, such as the types and amounts of costs incurred by check-up participants.

Table 14 Costs incurred by participants to have a check-up (Rs.)

District	Median	Interquartile range
Kurunegala (n=329)	84.00	30.00-130.00
Polonnaruwa (n=92)	40.00	23.75-50.00

The costs directly incurred by participants in having a check-up are shown in Table 14. The main cost was the travel cost between home and the check-up implementation facility. The costs also included the cost of lunch as they usually eat lunch at home but had to eat out in order to participate in the check-up. There were sizeable differences in the findings between the districts, such as the number of people who had to pay such costs (Kurunegala 329 people (329/400; 82%), Polonnaruwa 92 people (92/400; 23%), and the amount of costs incurred (Polonnaruwa Rs. 40 and double that in Kurunegala (Rs. 84). The reason for this difference in costs is the difference in systems: Check-up participants had to travel to major health facilities in the Kurunegala System, but check-up implementers visited and conducted check-ups in the area where participants lived in the Polonnaruwa System.

Table 15 Income loss for participants as a result of having a check-up (Rs.)

District	Median	Interquartile range
Kurunegala (n=65)	325.00	150.0-450.0
Polonnaruwa (n=15)	250.00	200.0-825.0

Table 15 shows costs relating to participants who had to take a day off for the check-up. In most cases, the loss of income was for participants themselves, but the data also includes income losses in the case of accompanying family members – if this occurred. As the target areas in both districts have a high ratio of farmers, and approx. 70% of the study subjects were women, the relevant number was only 65 people (65/400;16%) in Kurunegara and 15 people (15/400;4%) in the Polonnaruwa District.

The data relating to the costs incurred by the health system in implementing the check-up systems and the costs borne by the participants in the check-ups in accessing such a service in the two districts are presented above. This cost information will be utilized in carrying out more detailed analyses below.

3 Costs of Illness study

Calculating costs of illness is important in this study because if patients are not screened and early intervention undertaken patients will end up with episodes of hospitalization that are

expensive to both health system and households.

3.1 Study method

【Target diseases within the study】

As originally stated, the NCD Prevention Project Goal is “To establish an effective and efficient implementation strategy for the prevention of Non-Communicable Diseases (Diabetes, hypertension, Ischemic heart disease, stroke and dyslipidemia). The study targeted 4 types of illness: ① Cerebro-vascular accident ② Myocardial infarction ③ Ischemic heart disease and ④ Diabetes mellitus. Hospitalization costs resulting from these types of illness were calculated in this study.

【Direct costs】

The target hospitals were Kurunegala Teaching Hospital (TH Kurunegala) (1535 beds) and the Dambadeniya Base Hospital B (BH Dambadeniya) (169 beds) in the Kurunegala District and the Polonnaruwa General Hospital (GH Polonnaruwa) (603 beds) and the Medirigiliya Base Hospital B (BH Medirigiliya) (191 beds) in the Polonnaruwa District. We analysed 30 Bed Head Tickets (BHT - patient medical records) from each district and 60 for each illness to calculate the hospitalization cost. As step-down cost accounting (see Annex 4) had already been introduced in two hospitals in the Northwestern Province, TH Kurunegala and BH Marawila and monthly data were available in tabulated form for these hospitals, we decided to utilize this cost information as proxies in calculating basic hospitalization costs (accommodation costs) and for cost of diagnostic testing, for the four hospitals in our sample.

【Direct and Indirect costs to patients】

We estimated the direct costs to patients such as travel cost and the indirect cost due to loss of earnings due to hospitalization. These costs were calculated based on the distance between home and the medical facility, unofficial hours spent on nursing care, and the duration of days-off work. As such data can only be obtained by interviewing patients, the 243 interviews (TH Kurunegala 85, BH Dambadeniya 37, GH Polonnaruwa 96, BH Mwedirigiriya 25) were carried out by research assistants. See Table 20

3.2 Costs of Illness incurred by hospitalization

【BHT analysis】

The number of BHTs studied at the four target hospitals is shown in Table 16. Initially, we planned to analyse 20 BHTs from each of the tertiary care institutions (the Teaching Hospital and the General Hospital) and 10 BHTs from each of the secondary care institutions (the Base Hospitals).

However, as we could not obtain a sufficient number of BHTs for stroke and Myocardial infarction from the secondary care institutions, we decided to increase the data from the tertiary care institutions. Thus, we analysed 60 cases for each type of illness, ending with a total of 245 BHTs.

Table 16 No. of BHTs in the target illness-based and hospital-based study

Diagnosis	TH, Kurunegala	BH, Dambadeniya	GH, Polonnaruwa	BH, Medirigiriya	Total
Cerebro-vascular accident	23	07	28	02	**60**
Myocardial infarction	20	10	27	04	**61**
Ischemic heart disease	21	12	20	10	**63**
Diabetes mellitus	20	10	20	11	**61**
Total	**84**	**39**	**95**	**27**	**245**

We started the BHT analysis by extracting the information on medical treatment and drugs as listed in the BHTs. We then categorized the data as tests, medical materials, injections, drugs and the duration of hospital stay. By applying the step-down cost accounting data and other data specifically collected for this study, we calculated the costs required for hospitalization per BHT, or in other words per patient.

【Cost data used in the analysis】

We applied the costs from the Central Medical Supply in costing the drugs and medical materials actually utilized by patients for this analysis. Other costs, such as inpatient accommodation costs and diagnostic testing costs were calculated based on records from step-down cost accounting at TH Kurunegala and BH Marawila for the relevant period. Table 17, for instance, shows the accommodation cost per day per patient who was admitted to an internal medicine ward at Marawila Hospital. This cost includes personnel costs, utilities, overhead costs and costs for hospital management. This is considered the cost of hospitalization, excluding treatment costs.

The cost of hospitalization for the entire illness episode is calculated by multiplying the per- day cost (Rs. 854.72) by the duration of hospital stay as reported in the BHT from the secondary care institutions. We used the data from TH Kurunegala for calculating the cost of hospitalization for General Hospital Polonnaruwa (tertiary care hospital) as well.

Table 17 Basic cost of hospitalization per internal medicine patient per day at BH Marawila (for 2009)

y 2009	Personnel cost (Rs)	Material cost (Rs)	Recurrent cost (Rs)	Absorbed cost (Rs)	Total cost per month (Rs)	No of Admissions (person)	Cost per patient (Rs)	No. of the days in the hospital (days)	Cost Per Patient Per day (Rs)
January	977,867	351,929	119,726	203,792	1,653,314	735	2,249.4	1,672	988.8
February	1,017,180	60,384	61,442	151,160	1,290,167	627	2,057.7	1,385	931.5
March	1,017,680	90,566	66,983	176,902	1,352,132	754	1,793.3	1,585	853.1
April	856,170	83,124	51,457	130,471	1,121,221	718	1,561.6	1,422	788.5
May	1,108,636	81,047	43,243	149,078	1,382,003	810	1,706.2	1,682	821.6
June	940,909	60,932	42,528	149,171	1,193,540	841	1,419.2	1,769	674.7
July	844,259	71,495	40,457	149,307	1,105,518	839	1,317.7	1,670	662.0
August	1,019,764	77,685	44,293	186,903	1,328,645	629	2,112.3	1,424	933.0
September	1,179,839	77,146	65,802	191,525	1,514,312	618	2,450.3	1,495	1,012.9
October	1,063,201	77,660	41,917	166,700	1,349,478	752	1,794.5	1,651	817.4
November	1,041,264	101,102	40,772	163,243	1,346,382	675	1,994.6	1,349	998.1
December	858,337	89,469	42,864	150,756	1,141,427	758	1,505.8	1,356	841.8
Total	11,925,106	1,222,540	661,484	1,969,007	15,778,138	8,756	1,802.0	18,460	854.7

Investigation	Cost (Rs)
X-ray	142.62
ECG	130.97
Laboratory	365.14
Blood Bank	25.20

As a result of the step-down cost accounting conducted at BH Marawila, the cost per diagnostic test can also be calculated as shown in the Table on the left. This calculation includes the salaries of personnel working in each department, material costs such as chemicals and X-ray films, electricity cost, and the costs incurred in hospital management. However, these costs were only limited to running costs, and the depreciation of the building, equipment and medical devices were not taken into account. In calculating the basic cost of hospitalization as well the depreciation of buildings and equipment were not included.

【Hospitalization costs】

Using the procedure explained in the previous pages, the cost per inpatient was calculated by type of illness. We tabulated the individual BHTs based on type of illness, and the results are presented as the median instead of the mean, as this measure is less influenced by outliers and the interquartile ranges of the distributions.

With regard to Cerebro-vascular accidents and Myocardial infarction, the costs at TH Kurunegala were relatively high. This is because special wards have been established at TH Kurunegala for these illnesses so more serious patients might have been hospitalized in this location, or more advanced care might have been provided to inpatients here, compared to the other hospitals.

The median treatment cost per inpatient and the median duration of hospital stay by type of illness are as follows:

Cerebro-vascular accident: Rs. 5,800 (3 days), Myocardial infarction: Rs. 9,100 (4 days), Ischemic heart disease: Rs. 6,000 (4 days), Diabetes mellitus: Rs. 5,500 (4 days).

Please refer to Tables 18 to 21 for the cost per type of illness by hospital.

Table 18 Hospitalization cost per Cerebro-vascular accident patient

Hospital	Median cost	Interquartile range	Median duration of stay
TH, Kurunegala	11,317.74	8564.10-17042.41	6
BH, Dambadeniya	3,071.76	1488.67-3344.74	3
GH, Polonnaruwa	4,259.85	3534.02-5532.18	2
BH, Medirigiriya	8,456.65	8456.65-8456.65	5.5
Total	**5,836.56**	**3674.12-10192.55**	**3**

Table 19 Hospitalization cost per Myocardial infarction patient

Hospital	Median cost	Interquartile range	Median duration of stay
TH, Kurunegala	11,695.44	10225.90-16116.43	4.5
BH, Dambadeniya	8,424.51	7744.07-11207.62	5.5
GH, Polonnaruwa	9,065.51	8165.12-9805.77	4
BH, Medirigiriya	4,182.27	3446.63-5525.86	3
Total	**9,065.51**	**7915.84-11006.33**	**4**

Table 20 Hospitalization cost per Ischemic heart disease patient

Hospital	Median cost	Interquartile range	Median duration of stay
TH, Kurunegala	3,967.13	3242.67-8770.08	3
BH, Dambadeniya	6,189.69	3233.45-7250.27	4
GH, Polonnaruwa	6,721.17	5829.48-7987.18	3.5
BH, Medirigiriya	4,879.93	4232.06-5710.18	4
Total	**5,967.58**	**3922.86-7669.58**	**4**

Table 21 Hospitalization cost per Diabetes mellitus patient

Hospital	Median cost	Interquartile range	Median duration of stay
TH, Kurunegala	6,631.46	2750.24-8705.12	4.5
BH, Dambadeniya	5,242.30	2864.02-7518.12	4.5
GH, Polonnaruwa	5,670.02	5228.54-8282.96	3
BH, Medirigiriya	4,829.28	2371.42-6795.99	4
Total	**5,462.44**	**4227.22-7860.67**	**4**

3.3 Analysis of household costs of hospitalization

【Survey method】

We conducted a survey on costs incurred due to hospitalization and the opportunity loss from such an event. The survey involved 243 inpatients who had been admitted to the selected hospitals due to lifestyle-related diseases.

Table 22 No. of surveyed patients per hospital

District	Hospital	No. of subjects	Ratio
Kurunegala	TH, Kurunegala	85 people	35.0%
	BH, Dambadeniya	37 people	15.2%
Polonnaruwa	GH, Polonnaruwa	96 people	39.5%
	BH, Medirigiriya	25 people	10.3%
Total		**243 people**	**100.0 %**

Data was collected on age, gender, occupation, the highest level of education, family income, the number of family members living together, the method and cost of traveling to and from the medical facility, any loss of income for the participant or the family due to the hospitalization, the cost of meals, the cost of diagnostic testing conducted at private medical institutions, and other costs incurred due to hospitalization.

【A summary of the survey results】

Here we will provide a summary of the costs incurred by an inpatient and their family as a result of hospitalization.

Table 23 Travel cost incurred due to hospitalization (Rs.)

District	Median	Interquartile range
Kurunegala (n=122)	400.0	60.0-1000.0
Polonnaruwa (n=121)	362.0	180.0-750.0
Total	390.0	100.0-800.0

The main cost incurred due to hospitalization is the travel cost to visit the hospital. Travel costs can be divided into that spent by the patient and the family. Table 23 shows the total traveling costs incurred by patients.

Table 24 Travel cost incurred by the patient's family for hospital visits (Rs.)

District	Median	Interquartile range
Kurunegala (n=122)	506.0	200.0-1112.5
Polonnaruwa (n=121)	525.0	300.0-885.0
Total	510.0	264.0-950.0

Table 24 shows the total traveling cost spent by the patient's family to visit the patient in hospital.

We can add the costs spent by inpatients and their families in the course of hospitalization. In addition, we can also add the potential income loss which occurs due to the hospital stay. Table 25 shows the total of the direct and indirect costs incurred by patients and their families as a result of hospitalization: Rs. 3,036 in the Kurunegala District and Rs.2,165 in the Polonnaruwa District.

Table 25 Impact of hospitalization on household finances (Rs.)

District	Median	Interquartile range
Kurunegala (n=122)	3,036.5	1722.0-5725.2
Polonnaruwa (n=121)	2,165.0	1285.0-3460.0
Total	2,640.0	1450.0-4520.0

4 Future Activities

These cost analysis-related activities were carried out based on the contents of the First Conference conducted by the Cost Analysis Sub-working Group of the NCD prevention project (held on 18th December 2008 at the NCD Conference Room of the Ministry of Health). An outline of the discussions is as follows:

① This sub-working group will analyse the intervention strategy, focusing not only the costs directly incurred by the implementation of check-ups, but also from the viewpoint of the costs

for treatment for NCDs (costs that can be averted with screening) and the socio-economic factors that affect households, in order to examine the effectiveness and efficiency of the NCD intervention strategy.

② High costs are incurred in the treatment of NCDs and it is important to calculate these costs. The data obtained through routine step-down cost accounting in some hospitals in the North Western Province will be utilized in costing treatment in the pilot area.

③ As the discussion proceeds, the fields to be reviewed need to be narrowed (treatment cost, check-up cost and opportunity loss) and more in-depth discussions need to be held on these fields.

④ The Ministry of Health and Provincial Health Authority need to take the lead on the matter of budget allocations in order to promote cost accounting in the healthcare field.

⑤ A project to promote step-down cost accounting will be carried out in hospitals in the North Western province, with the support of JICA, from July 2008 to March 2009. We can expect a synergy effect by mutually collaborating with NPP.

The next step will be discussions based on Health Economics involving a Cost Benefit Analysis (CBA), which will be conducted after proceeding with the analytical work listed above.

The objective of CBA is to compare various social costs and benefits from various interventions, or alternatively the option of “not doing anything”. When reviewing the costs and benefits, although the cost spent on check-ups can be easily calculated, it is necessary to determine the number of cases prevented (prevention rate) as a result of having a check-up. This enables the comparison of costs and benefits, and the calculation of socio-economic costs to health system and households. These costs are likely to increase significantly if NCD prevention measures are not implemented.

Annex 1

CU_05

NCD Checkup Observational Report <Ver.3>

Date of Checkup (YY/MM/DD): 2011/01/18

Name of Health Facility: DH Narammala

Name of reporter: Dr. W.R.G.K.Bandara.

1. Screening

Recruitment	Method (by area PHM, by community volunteer, by poster at OPD, without recruitment etc)	PHM (10) & WITHOUT RECRUITMENT(02)
Time	Starting Time	8.00A.M.
	End Time	9.45A.M.
Implementer	No. of health staff who conducted screening	Health staff : 02(02-Nurses) Doctor : 01
	No. of volunteers who helped screening	00
Result	**Serial No.**	**From 1136 to 1147**
	Total No. of eligible* participants (age 40-75 without any past history of lifestyle related disease)	Participants recruited: 10(M:03/F:07) Participants without recruitment: 01(M:00/F:01)
	Total No. of participants under 40 years old or over 75years old	01
	Total No. of participants with past history (any age)	00
	No. of people who had BMI>=23*	M:00 / F:01
	No. of people who had BP>=140/90 mmHg*	M:01 / F:00
	No. of people who had BP>= 220/120mmHg* (Kindly write down the action which was taken by doctor on the checkup day)	00
	No. of people who had FCBG>= 110mg/dl*	M:02 / F:02
	No. of people who had FCBG >= 350mmHg* (Kindly write down the action which was taken by doctor on the checkup day)	00
Referred cases	No. of people referred within the institution on the checkup day*	00
	Reason for refer*	

	No. of cases admitted into the health institution*	00
	Reason for admission*	
Equipment, Consumables, Paper material	Kindly write down (1) Any trouble happened, (2) Action taken on the day, and (3) Suggestion for future	NO

*: Count only result of target (eligible) participants.

2. Health Guidance

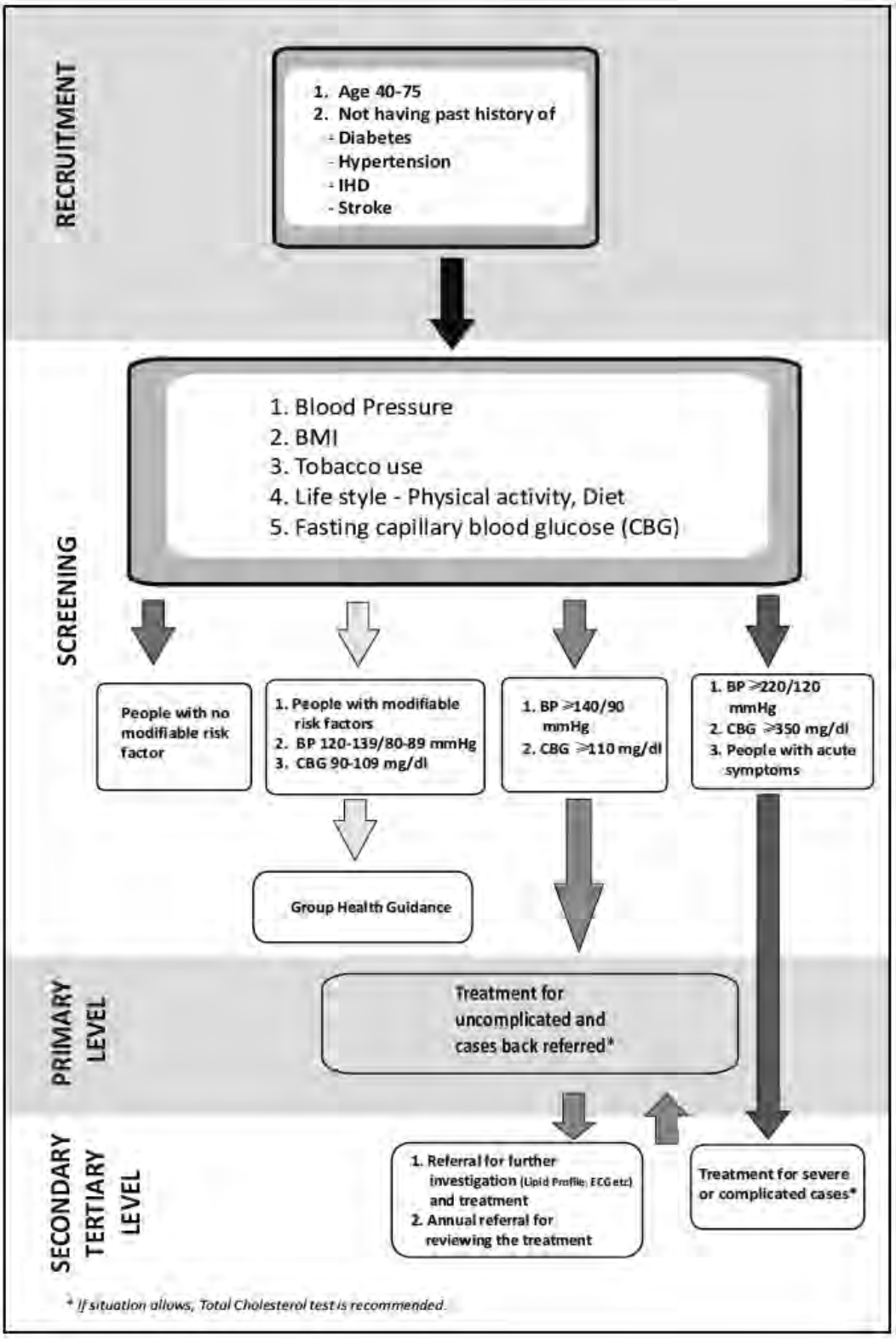
Starting Time		9.45A.M.
End Time		10.45A.M.
Designation of Implementer		TWO NURSING OFFICERS
No. of participants		12
If other material was used in addition to or instead of flip chart, kindly write down (ex: Video tape prepared by nursing sister etc)		NO
Topics Covered (Tick the topics covered, Keep blank if the topic was not covered))	Result of screening (How to read the results)	YES
	Physical Activity	YES
	Diet	YES
	Tobacco	YES
	Others (Specify it)	MENTAL HEALTH AND ALCOHOL.
Questions and comments raised by participants (Kindly write down at least three in case there are many questions and comments)		ABOUT GASTRITIS.

3. Other Observation

- **ABOUT THE TREATMENT FOR DM AND THE COMPLICATIONS OF DM.**
- **ARYURVEDIC MEDICINE FOR DM.**

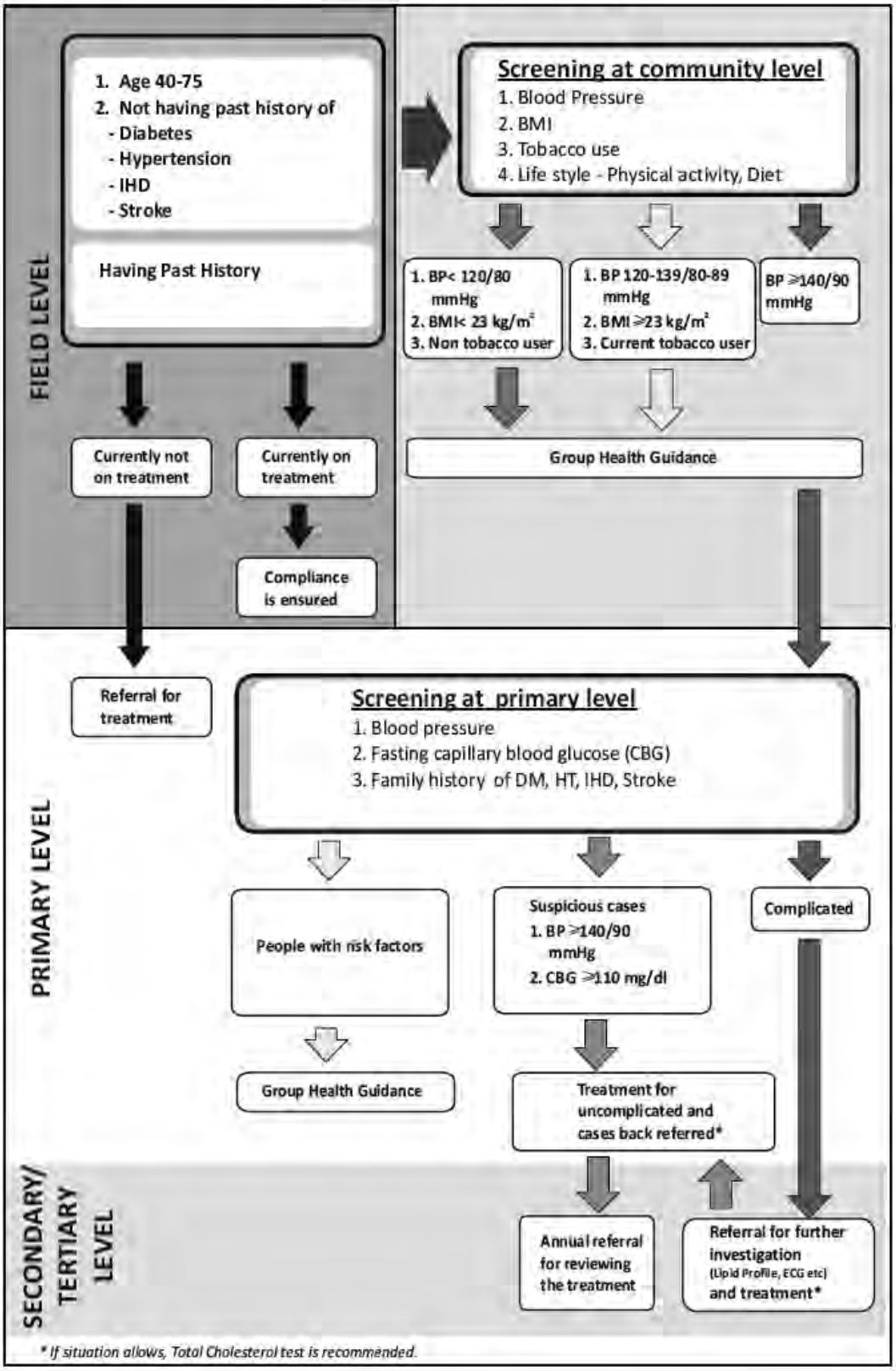
Annex 2

One Step Checkup



Annex 3

Two Step Checkup



Annex 4

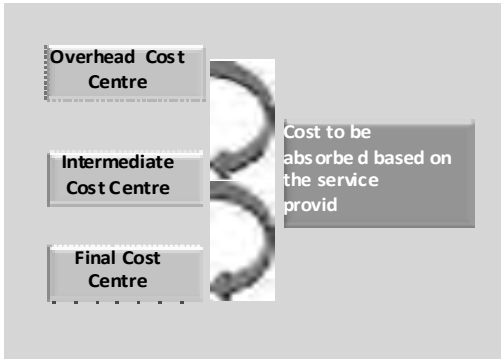
THE STEP-DOWN APPROACH

The step-down cost accounting system here involves three levels of classification: from the more general to the more specific in allocating costs to final Cost Centres.

A Cost Centre can be defined as "a production or service location, function, activity or item of equipment for which costs are accumulated".

The analysis of hospital costs was designed to accumulate costs by department or Cost Centre. The Cost Centres demarcated in this analysis were of *three* types:

overheads (to accumulate overhead costs including administrative costs that are then shared out among the patient-related Cost Centres); ***intermediate*** (those that provide support, e.g., diagnostic services, to the final Cost Centres) and ***final*** (example medical departments that provide" final" services directly to patients, e.g., wards, outpatient clinics).



DIAGRAMMATIC IMAGE OF STEP-DOWN COST ACCOUNTING

The ***'step-down'*** approach is used, whereby costs are allocated to Cost Centres starting with each Cost Centre's direct costs and then apportioning the indirect costs, making sure that each cost is ultimately allocated to the relevant final Cost Centre.

Source: Resource book 1 Cost Accounting, Final report Volume2, The Development Study on Evidence-Based Management for the Health System in Sri Lanka, September 2007, Global Link Management, Inc.

Report 2

Cost of participation in the health check-up component of the NCD Prevention Project (NPP) and Cost of hospitalization for selected NCDs in the Kurunegala and Polonnaruwa districts

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Amala de Silva

A study conducted for Japan International Cooperation Agency
2010

1 Introduction

1.1 Background

Non-Communicable diseases (NCDs) are a priority public health problem in Sri Lanka. Ischaemic heart disease has been the commonest cause of death in hospital over the last three decades (Ministry of Health, 2008). The number of reported cases of Ischaemic heart disease and Myocardial infarction is increasing annually (Constantine et al., 1999). Cerebro-vascular events are among the six leading causes of death (Gunawardena, 1999). Hypertension and Diabetes are the commonest chronic diseases seen in the ambulatory care setting. Rates of hospitalization due to these two conditions are observed to be rapidly increasing (Premaratne et al., 2005). High prevalence of insulin resistance and type 2 Diabetes mellitus in South Asians is well documented and is considered to be an important cause of elevated vascular risk **(**Tziomalos et al., 2008)

Screening is one of the strategies adopted worldwide for prevention of NCDs. Screening can be used in both primary prevention and secondary prevention. Early detection and modification of risk factors is a strategy of primary prevention. The subjects are free of disease at this point in time, but they may have risk factors for development of NCDs. A screening programme will actively look for risk factors and form a basis for appropriate lifestyle modification activities implemented at both population and individual levels to control these risk factors. Screening for early identification of NCDs is a strategy of secondary prevention. In this strategy, subjects are screened for asymptomatic disease using simple and quick screening methods. Those detected to have the disease(s) can be referred for treatment and follow-up, which will control progression of the condition and improve patient outcome through preventing complications. Multiple screening methods incorporated into a single screening programme targeting both risk factors and asymptomatic disease is appropriate for population level screening in Sri Lanka.

1.2 Non-communicable disease Prevention (NPP) Project

The Non-communicable Disease Prevention Project (NPP) currently conducted by the Ministry of Health and funded by the Japan International Cooperation Agency has a component on screening the general population for NCDs and risk factors. This component is currently implemented in the Medirigiriya Medical Officer of Health (MOH) area in the Polonnaruwa district and Alawwa and Narammala MOH areas in the Kurunegala district by regional health authorities. Members of the general population aged between 40-75 years who reside in the three MOH areas, are invited to participate in the screening programme (health check-up). Appointments for the check-up are issued by the public health field staff or health staff of hospitals. Check-ups are conducted at a centre close to the participants' residence. At the check-up, screening for hypertension, obesity

and Diabetes mellitus is conducted. Screened subjects who are positive are referred for medical care and follow up in the referral centres in the district where specialist care is available. Health education on prevention of NCDs is given in-group sessions.

1.3 Justification

The health check-up programme requires considerable resources for its implementation. Cost of in-service training of health staff, maintaining overheads and provision of technical support are important elements of the programme's cost. Continued implementation and expansion of health check-ups should be based on its ability to improve the outcomes of targeted NCDs, contributing to cost containment in curative and rehabilitative care. To evaluate the effectiveness of the health check-up programme, estimates of the household cost of participation in the health check-up as well as the cost of managing important NCDs in hospital and the economic burden of hospitalisation on the household (the outcomes that could result from the alternative scenario of non-screening) are prerequisites. The systemic cost of conducting the health check-ups is presented in the paper by T. Sugimoto in this same compendium.

1.4 Objectives

This study is undertaken with the following objectives

1.5 General Objective:

To determine the household cost of participation in the health check-up component of the NCD Prevention Project (NPP) and

To determine the household and health system cost of hospitalisation for selected NCDs in referral hospitals in the Polonnaruwa and Kurunegala districts

1.6 Specific Objectives:

1 To determine the direct and indirect household costs of participation in health check-ups.

2 To determine the direct and indirect household costs of hospitalisation for selected non-communicable diseases i.e. Diabetes mellitus, Myocardial infarction, Ischaemic heart disease and Cerebor-vascular in selected referral hospitals in the Polonnaruwa and Kurunegala districts.

3 To determine the cost incurred by the hospital/state health sector for treatment of selected non-communicable diseases i.e. Diabetes mellitus, Myocardial infarction, Ischaemic heart disease and Stroke in selected referral hospitals in the Polonnaruwa and Kurunegala districts.

2 Methods

2.1 Study design:

This study is a descriptive cross sectional study with two components.

Component one: This component was conducted prospectively in health check-up centres in the Polonnaruwa and Kurunegala districts. Participants of the health check-up programme were the study subjects. Data were collected by trained pre-intern medical officers using an interviewer-administered questionnaire in Sinhala. Different household cost components were identified. Both direct and indirect costs of participating in the health check-ups were assessed.

Component two: This component was conducted prospectively in four referral hospitals including the main hospitals in the two districts. Patients admitted for treatment of the diseases of interest were followed up during their entire hospital stay. The household cost of hospitalisation was estimated based on data obtained from interviews with patients and/ or relatives/carers. Data on clinical management of the patients were extracted from the Bed Head Ticket as well as from health personnel involved in the treatment of the patient.

2.2 Study setting:

Component one was conducted in health check-up centres in Medirigiriya, Alawwa and Narammala MOH areas. Component two was conducted at the General Hospitals, Kurunegala and Polonnaruwa and Base Hospitals, Dambadeniya and Medirigiriya.

2.3 Study period:

The study was conducted from August to December 2010.

2.4 Study population:

Component one: Participants of the NPP health check-up component in the Medirigiriya, Alawwa and Narammala MOH areas

Component two: Subjects who received in-patient care in the relevant hospitals during the period between August and December 2010, for the following conditions:

1. Cerebro-vascular
2. Acute Myocardial infarction
3. Ischaemic Heart Disease
4. Diabetes mellitus

Stroke/ Cerebrovascular Accident

Inclusion criteria: Patients who presented with weakness or sensory loss of a side of the body and diagnosed to have a stroke during this admission

Exclusion criteria:

1. Patients who developed complications due to unrelated conditions during their hospital stay.
2. Patients who had a prolonged hospital stay due to any other reason (hospital acquired infections etc.)
3. Patients who were transferred to other hospitals/healthcare institutions for further management or patients who left against medical advice
4. Patients who died during hospitalisation

Acute Myocardial Infarction

Inclusion criteria: Patients admitted due to acute Myocardial infarction (MI) and required treatment with thrombolytic therapy (streptokinase/low molecular weight heparin) and completed treatment.

Exclusion criteria:

1. Patients who developed complications of MI such as heart failure/arrythmias during their hospital stay
2. Patients who have a prolonged hospital stay due to any other reasons (hospital acquired infections etc.)
3. Patients who are transferred to other hospitals/healthcare institutions for further management or patients who left against medical advice
4. Patients who died during hospitalisation

Ischaemic Heart Disease

Inclusion criteria: Patients with a past history of ischaemic heart disease who presented at the hospital with chest pain and were diagnosed to have ischaemic heart disease but not an acute Myocardial infarction during this episode of chest pain or during this admission

Exclusion criteria:

1. Patients who developed complications of other unrelated co-morbid conditions during their hospital stay that needed special care (e.g. surgical procedures)

2. Patients who did not complete the entire period of treatment (e.g. patients who left against medical advice)
3. Patients who were transferred to other hospitals/healthcare institutions for further management
4. Patients who died during hospitalisation

Diabetes mellitus

Inclusion criteria: Patients who presented due to a complication of Diabetes mellitus that required hospitalisation

Exclusion criteria:

1. Patients who developed complications due to unrelated conditions during their hospital stay.
2. Patients who had a prolonged hospital stay due to any other reason (hospital acquired infections etc.)
3. Patients who were transferred to other hospitals/healthcare institutions for further management or patients who left against medical advice
4. Patients who died during hospitalisation

2.5 Sample size:

Component one: Indirect (opportunity) cost of participation was assumed to be 50% of the total household cost. For the calculation of the sample size this assumption was used.

Using the formula:

$n = Z^2_{1-\alpha/2}\, p(1-p)/ d^2$

where $Z^2_{1-\alpha/2}$ is 1.96 corresponding to the two sided alpha error of 5%

p is the proportion of indirect cost

d is one half of the confidence interval of the estimated proportion assumed to be 0.05.

Substituting these values, the minimal required sample size n = 384

The sample size was rounded off to 400. Four hundred participants were sampled in each district.

Component two: Considering the feasibility of obtaining patients fulfilling inclusion criteria it was decided to sample 30 patients with each of the four conditions from each district. The proposed sample consisted of minimum of 20 patients from the main hospital of the district and 10 patients from the Base Hospital.

Condition	Polonnaruwa		Kurunegala		Total
	GH Polonnaruwa	BH Medirigiriya	TH Kurunegala	BH Dambadeniya	
MI	20	10	20	10	60
IHD	20	10	20	10	60
DM	20	10	20	10	60
CVA	20	10	20	10	60

2.6 Sampling:

Component one: The participants were sampled consecutively at consecutive check-up sessions. All the check-up centres were visited and efforts were taken to recruit all the participants present on that day.

Component two: The patients were consecutively sampled considering inclusion criteria identified for each type of disease until the required sample size was obtained.

2.7 Data collection instruments:

Component one: This was an interviewer-administered questionnaire developed in Sinhala (Annex 1). This was pre-tested among participants of the Ragama Health Study Clinic at Faculty of Medicine, Ragama, in August 2010. Main variables were: basic information of the participant, cost of travelling, lost income by the participant and the family and the cost of food and other expenses incurred due to screening visit.

Component two: 1. An interviewer-administered questionnaire developed in Sinhala (Annex 2) was used for collecting data on the household cost of hospitalisation. This has been used in a previous study (Kasturiratne et al, 2005). Main variables were cost of travel, lost income by the person(s) accompanying the patient or family companion, cost of keeping a companion, cost of medications and investigations obtained from the private sector, cost of special food and other miscellaneous costs.

2. The data collection instruments were data extraction forms developed for each condition studied (given in Annex 3, 4, 5, 6). All cost components incurred in treating each of the selected conditions in hospital were identified (e.g. length of hospital stay, cost of medication, cost of investigations performed on the patient etc.) through expert opinion surveys. Information required in determining each of these cost components was then identified and included in the data extraction forms. The forms were pre-tested and modified according to the findings of the pre-test conducted in July 2010.

2.8 Data collection:

Component one: Data collection was conducted over a period of three months by pre-intern medical officers. They visited the health check-up centres and conducted sampling of participants and data collection.

Component two: Data collection was conducted over a period of three months by pre-intern medical officers. They visited the medical wards of the hospitals and conducted sampling of participants and data collection. Information needed to estimate the household cost of hospitalisation was collected using the interviewer-administered questionnaire.

The information needed to determine the cost of treatment incurred by the hospital and the health system were extracted from the BHT. Clinical opinions were sought from the clinicians for estimating certain cost items.

2.9 Data analysis:

Questionnaires and data extraction forms were checked for completeness before data entry. Data were entered in Epi Data 3.1b and analysis was done using SPSS version 16. The cost of each item was determined and added up to calculate the cost of each component. Then the total cost incurred was calculated. Costs were usually described using median and interquartile range. In some situations median and range was used to describe the data.

2.10 Administrative considerations:

Permission to conduct the study was obtained from provincial and regional health authorities of the two districts as well as the heads of institutions where the study was conducted. Permission was also obtained from the Consultant Physicians in charge of each ward from which patients were recruited for component 2.

2.11 Ethical considerations:

Component one: Individuals were recruited only after informed written consent (consent form - Annex 7) was obtained and the data collected was used only for the purpose of research. They were informed that their participation was entirely voluntary and that their decision to participate or not would not affect the services provided at the check-up and their subsequent follow-up.

Component two: Patients were recruited only after informed written consent was obtained from the patient (consent form- Annex 8). When the patient was unable to give consent due to being too ill, consent was obtained from a first degree relative. They were informed that their participation was entirely voluntary and that their decision to participate or not would not affect the

management of their condition. As some of the conditions under study could potentially be life threatening, care was taken to avoid disturbing the patient during data collection. In situations where the patient was too ill to answer, an informant was identified to provide information on the household cost of hospitalization. This informant was a family member or a person named by the patient's family. All personal information documented in the BHTs were treated as confidential information.

3 Results

3.1 Cost of participation in the health check-up programme of the NPP Project

This component was conducted on a sample of 800 participants comprising 400 participants from each of the two districts. In Kurunegala district the project was conducted in two MOH areas. Participants were recruited consecutively from screening clinics held during the period of data collection. Fewer participants and clinic sessions were observed in Alawwa, as reflected in the number recruited.

Distribution of participants by MOH area is given in Table 1.

Table 1 Distribution of participants by MOH area

District	MOH area	Number of participants	Percentage
Kurunegala	Narammala	250	31.2
	Alawwa	150	18.8
Polonnaruwa	Medirigiriya	400	50.0
Total		**800**	**100.0**

Participants in Kurunegala district travelled a greater distance to the check-up centre compared to participants in Polonnaruwa district. Distance travelled by participants in each district is shown in Table 2.

Table 2 Distance to the check-up centre by district

District	Distance to check-up centre (km) Median (interquartile range)
Kurunegala	3 (2.0-5.0)
Polonnaruwa	1.5 (0.5-2.0)
Total	2.0 (1.0-3.0)

Majority of the participants were between 50 to 59 years of age. Age distribution of the participants is given in Table 3.

Table 3 Age distribution of the participants

Age category	Number	Percentage
< 40 years	15	1.9
40-49 years	260	32.5
50-59 years	307	38.4
60-69 years	164	20.5
≥ 70 years	54	6.8
Total	**800**	**100.00**

Study participants were predominantly female, comprising 68% of the total sample. In Kurunegala females comprised 79.7% of the sample compared to 62.3% in Polonnaruwa.

Table 4 Sex distribution of the participants

Sex category	Number	Percentage
Male	257	32.1
Female	543	67.9
Total	**800**	**100.00**

Occupations were classified according to International Standard classification of Occupation (ISCO). The largest occupational group participating in the check-up were agricultural workers (22.2%). Few people were engaged in sedentary occupations. The distribution of participants by occupational group is given in Table 5.

Table 5 Distribution of participants by occupational category

Occupation category	Number	Percentage
Legislators, senior officials and managers	0	0
Professionals	9	1.1
Technicians and associate professionals	10	1.3
Clerks	6	0.8
Service and shop and market sales workers	27	3.4
Skilled agricultural and fishery workers	178	22.2
Craft and related workers	20	2.5
Plant and machine operators and assemblers	14	1.7
Elementary occupations	37	4.6
Unemployed	499	62.4
Total	**800**	**100.0**

Approximately 71% of the participants were educated above grade 8 in Kurunegala district as compared to 48% in Polonnaruwa district. Only 0.7% of the participants had received higher education. The group who had not received any formal education comprised 2% in Kurunegala district compared to 7.2% in Polonnaruwa district. The educational level of the participants by district is given in Table 6.

Table 6 Distribution of participants by educational level and district

District	Educational level	Number	Percentage
Kurunegala	No formal education	8	2.0
	< Grade 5	47	11.7
	Passed Grade 5	63	15.7
	Passed Grade 8	130	32.6
	Passed G.C.E Ordinary Level	86	21.6
	Passed G.C.E. Advanced Level	63	15.7
	Higher education	3	0.7
Total		**400**	**100.0**
Polonnaruwa	No formal education	29	7.2
	< Grade 5	102	25.5
	Passed Grade 5	78	19.6
	Passed Grade 8	121	30.2
	Passed G.C.E Ordinary Level	58	14.6
	Passed G.C.E. Advanced Level	9	2.2
	Higher education	3	0.7
Total		**400**	**100.0**

About 21% of the participants reported that their monthly family income was less than Rs. 5,000.00. Only 22% reported a monthly family income above Rs. 20,000.00. The income distribution of respondents is given in Table 7.

Table 7 Distribution of participants by monthly family income

Educational level	Number	Percentage
No formal education	44	5.5
< Grade 5	169	21.1
Passed Grade 5	147	18.4
Passed Grade 8	248	31.0
Passed G.C.E Ordinary Level	135	16.9
Passed G.C.E. Advanced Level	52	6.5
Higher education	5	0.6
Total	**800**	**100.0**

The family size of the participants ranged from 1-11. Median family size was 4 (interquartile range 3-5). Distribution of participants by family size is shown in Table 8.

Table 8 Distribution of participants by family size

Family size	Number	Percentage
1-4 members	442	55.2
5-8 members	354	44.3
≥ 9 members	4	0.5
Total	**800**	**100.0**

Approximately 42% walked to the check-up centre. The most common mode of transport used was the bus. Many participants used bicycles. Distribution of the participants by the mode of transport is given in Table 9.

Table 9 Distribution of participants by mode of transport used to come to the check-up centre

Mode of transport	Number	Percentage
Walking	338	42.3
Bicycle	149	18.7
Motorcycle	125	15.6
Three-wheeler	5	0.6
Automobile	5	0.6
Hired three-wheeler	12	1.5
Hired automobile	2	0.2
Bus	152	19.0
Train	0	0.0
Others	12	1.5
Total	**800**	**100.0**

Travel costs were incurred by 71.2% in the Kurunegala district but only 22.7% in the Polonnaruwa district. The cost of traveling to the check-up centre is given in Table 10.

Table 10 Cost of traveling to the check-up centre

District	Median(Rs.)	Interquartile range(Rs.)
Kurunegala	20.00	0.00-40.00
Polonnaruwa	0.0	0.00-0.00

Costs incurred for meals during the visit and any other costs incurred due to the visit were considered as incidental expenses due to the visit to the check-up centre. In Kurunegala approximately 51% incurred incidental expenses. In Polonnaruwa only 1.5% incurred any incidental expenses (Table 11).

Table 11 Incidental expenses incurred due to participation in the check-up

District	Median(Rs.)	Interquartile range(Rs.)
Kurunegala (n=204)	85.00	60.00-110.00
Polonnaruwa (n=6)	40.0	35.00-60.00

Travel costs and incidental expenses of the visit were considered as direct costs of the visit. In Kurunegala district 329 participants incurred direct costs due to participation in the health check-up. Their costs ranged from Rs. 6.00-450.00. Only 92 participants (23%) in Polonnaruwa incurred any costs due to participation in the check-up. Among them the direct costs ranged from Rs. 5.00-200.00.

Table 12 Total direct cost of participation in the check-up

District	Median(Rs.)	Interquartile range(Rs.)
Kurunegala (n=329)	84.00	30.00-130.00
Polonnaruwa (n=92)	40.00	23.75-50.00

Loss of income due to being off work to participate in the check-up was reported by 16.3% of the participants in Kurunegala. Only 3.5% reported loss on income in Polonnaruwa district. Participants' lost income is summarized in Table 13.

Many are self-employed so there is not an issue of taking leave but being off work.

Table 13 Loss of income due to participation in the check-up

District	Median(Rs.)	Interquartile range(Rs.)
Kurunegala (n=65)	200.00	100.00-400.00
Polonnaruwa (n=14)	300.0	200.00-900.00

Loss of income to a family member due to the check-up was reported by only one participant in Polonnaruwa district. None was reported in Kurunegala district. About 7.6% attended the check-up accompanied by family members.

Total loss of income to the families that incurred a loss is shown in Table 14.

Table 14 Total loss of income to the family due to participation in the check-up

District	Median(Rs.)	Interquartile range(Rs.)
Kurunegala (n=65)	325.00	150.00-450.00
Polonnaruwa (n=15)	250.00	200.00-825.00

3.2 Household costs of hospitalization for four major non-communicable diseases in Sri Lanka

A sample of 243 patients admitted for the four selected diseases was obtained from the four hospitals for this analysis. Table 15 shows the distribution of patients by district and hospital. A larger proportion of patients had to be sampled from the two main hospitals due to insufficient numbers at Base Hospital level.

Table 15 Distribution of patients by district and hospital

District	Hospital	Number	Percentage
Kurunegala	TH, Kurunegala	85	35.0
	BH, Dambadeniya	37	15.2
Polonnaruwa	GH, Polonnaruwa	96	39.5
	BH, Medirigiriya	25	10.3
Total		**243**	**100.00**

A majority of the participants were between 55 to 64 years of age. Age distribution of the participants is given in Table 16. Date of birth was not available for one patient.

Table 16 Age distribution of the participants

Age category	Number	Percentage
< 35 years	7	2.9
35-44 years	17	7.0
45-54 years	40	16.5
55-64 years	103	42.6
65-74 years	47	19.4
≥ 75 years	28	11.6
Total	**242**	**100.00**

A greater proportion of the sample was male (69.1%). In Kurunegala males comprised 62.3% of the sample as compared to 76% in Polonnaruwa.

Table 17 Sex distribution of the participants

Sex category	Number	Percentage
Male	168	69.1
Female	75	30.9
Total	**243**	**100.00**

Occupations were classified according to International Standard Classification of Occupation (ISCO). A large proportion was unemployed (33.3%). The largest occupational group hospitalised was agricultural workers (25.9%). All of the occupational groups were represented in the sample. Distribution of participants by occupational group is given in Table 18.

Table 18 Distribution of participants by occupational category

Occupation category	Number	Percentage
Legislators, senior officials and managers	7	2.9
Professionals	11	4.6
Technicians and associate professionals	2	0.8
Clerks	13	5.4
Service and shop and market sales workers	27	11.1
Skilled agricultural and fishery workers	63	25.9
Craft and related workers	7	2.9
Plant and machine operators and assemblers	13	5.3
Elementary occupations	19	7.8
Unemployed	81	33.3
Total	**243**	**100.0**

Approximately 45.7% of the participants were educated above grade 5. Only 4.1% had received higher education. The group who had not received any formal education was unusually high at 11.5%. The educational level of the participants is given in Table 19.

Table 19 Distribution of participants by educational level

Educational level	Number	Percentage
No formal education	28	11.5
< Grade 5	53	21.8
Passed Grade 5	51	21.0
Passed Grade 8	45	18.5
Passed G.C.E Ordinary Level	43	17.7
Passed G.C.E. Advanced Level	13	5.4
Higher education	10	4.1
Total	**243**	**100.0**

About 8.6% of the participants reported that their monthly family income was less than Rs. 50,000.00. About 35.8% reported a monthly family income above Rs. 20,000.00. Income distribution is shown in Table 20.

Table 20 Distribution of participants by monthly family income

Family income	Number	Percentage
< Rs. 5000	21	8.7
Rs. 5000-9999	64	26.3
Rs. 10000-19999	71	29.2
Rs. 20000-34999	52	21.4
Rs. 35000-49999	17	7.0
≥ Rs. 50000	18	7.4
Total	**243**	**100.0**

The family size of the participants ranged from 1-8. Median family size was 4 (interquartile range 3-5). Distribution of participants by family size is shown in Table 21.

Table 21 Distribution of participants by family size

Family size	Number	Percentage
1-4 members	132	54.3
5-8 members	111	45.7
≥ 9 members	0	0.0
Total	**243**	**100.0**

Over 55% arrived at the screening centre in a hired three-wheeler. About 16.9% used the bus. About 11% of the participants used their own three-wheeler. Distribution of the participants by the mode of transport is given in Table 22.

Table 22 Distribution of participants by mode of transport used to come to hospital

Mode of transport	Number	Percentage
Walking	1	0.4
Bicycle	4	1.6
Motorcycle	9	3.7
Three-wheeler	27	11.1
Automobile	11	4.5
Hired three-wheeler	134	55.1
Hired automobile	11	4.5
Bus	41	16.9
Train	4	1.6
Others	1	0.4
Total	**243**	**100.0**

On discharge, 42.4% hope to go home by hired three-wheeler. A considerable proportion (35%), hope to use the bus. Distribution of the participants by the expected mode of transport to go back on discharge is given in Table 23.

Table 23 Distribution of participants by the expected mode of transport to go back on discharge

Mode of transport	Number	Percentage
Walking	0	0.0
Bicycle	1	0.4
Motorcycle	8	3.3
Three-wheeler	24	9.9
Automobile	9	3.7
Hired three-wheeler	103	42.4
Hired automobile	10	4.1
Bus	85	35.0
Train	2	0.8
Others	1	0.4
Total	**243**	**100.0**

Travel costs were incurred by 95.9% of the hospitalized patients in the Kurunegala district and 100% of the hospitalized patients in the Polonnaruwa district. Travel costs incurred due to the hospitalization are summarized by district in Table 24.

Table 24 Travel cost of hospitalization by district

District	Median(Rs.)	Interquartile range(Rs.)
Kurunegala (n=122)	400.00	60.00-1000.00
Polonnaruwa (n=121)	362.00	180.00-750.00
Total	**390.00**	**100.00-800.00**

Travel costs incurred due to the hospitalization are summarized by hospital in Table 25.

Table 25 Travel cost of hospitalization by hospital

Hospital	Median(Rs.)	Interquartile range(Rs.)
TH, Kurunegala (n=85)	500.00	100.00-1080.00
DH, Dambadeniya (n=37)	200.00	36.00-600.00
GH, Polonnaruwa (n=96)	400.00	200.00-850.00
BH, Medirigiriya (n=25)	260.00	80.00-550.00
Total	**390.00**	**100.00-800.00**

Loss of income and costs incurred by the patient's household due to accompanying the patient to hospital are summarized in Table 26 by district and hospital.

Table 26 Loss of income and costs due to accompanying the patient to hospital by district and hospital

District	Median (Rs.) (interquartile range)	Hospital	Median (Rs.) (interquartile range)
Kurunegala (n=122)	0.00 (0.00-300.00)	TH, Kurunegala (n=85)	0.00 (0.00-0.00)
		DH, Dambadeniya (n=37)	0.00 (0.00-00.00)
Polonnaruwa (n=121)	0.00 (0.00-50.00)	GH, Polonnaruwa (n=96)	0.00 (0.00-50.00)
		BH, Medirigiriya (n=25)	0.00 (0.00-30.00)
Total	**0.00 (0.00-60.00)**	**Total**	**0.00 (0.00-60.00)**

Overall 91.8% of households (90.2% in Kurunegala and 93.4% in Polonnaruwa) incurred a cost for visiting the patient. Costs incurred by the patient's household for visiting the patient in hospital are summarized in Table 27 by district and hospital. Travel costs incurred for bringing food to the patient from home are also included.

Table 27 Costs incurred by the household for visiting the patient in hospital by district and hospital

District	Median(Rs.) (interquartile range)	Hospital	Median(Rs.) (interquartile range)
Kurunegala (n=122)	506.00 (200.00-1112.50)	TH, Kurunegala (n=85)	540.00 (205.00-1300.00)
		DH, Dambadeniya (n=37)	440.00 (190.00-895.00)
Polonnaruwa (n=121)	525.00 (300.00-885.00)	GH, Polonnaruwa (n=96)	550.00 (316.25-937.50)
		BH, Medirigiriya (n=25)	400.00 (215.00-845.00)
Total	**510.00 (264.00-950.00)**	**Total**	**510.00 (264.00-950.00)**

Overall 37.9% of households (23.8% in Kurunegala and 52.1% in Polonnaruwa) incurred a cost for keeping a companion with the patient. Costs incurred by the household for keeping a companion are summarized in Table 28 by district and hospital.

Table 28 Costs incurred by the household for keeping a companion by district and hospital

District	**Median(Rs.) (interquartile range)**	**Hospital**	**Median(Rs.) (interquartile range)**
Kurunegala (n=122)	0.00 (0.00-0.00)	TH, Kurunegala (n=85)	0.00 (0.00-0.00)
		DH, Dambadeniya (n=37)	0.00 (0.00-10.00)
Polonnaruwa (n=121)	100.00 (0.00-400.00)	GH, Polonnaruwa (n=96)	200.00 (0.00-400.00)
		BH, Medirigiriya (n=25)	0.00 (0.00-200.00)
Total	**0.00 (0.00-300.00)**	**Total**	**0.00 (0.00-300.00)**

Overall 67.9% of households (43.4% in Kurunegala and 92.6% in Polonnaruwa) incurred a cost for food bought for consumption of the patient. Costs incurred by the household for food are summarized in Table 29 by district and hospital.

Table 29 Costs incurred by the household for food bought for consumption of the patient by district and hospital

District	**Median(Rs.) (interquartile range)**	**Hospital**	**Median(Rs.) (interquartile range)**
Kurunegala (n=122)	0.00 (0.00-207.50)	TH, Kurunegala (n=85)	0.00 (0.00-245.00)
		DH, Dambadeniya (n=37)	0.00 (0.00-147.00)
Polonnaruwa (n=121)	155.00 (92.50-230.00)	GH, Polonnaruwa (n=96)	155.00 (100.00-228.75)
		BH, Medirigiriya (n=25)	160.00 (67.50-232.50)
Total	**110 (0.00-230.00)**	**Total**	**110 (0.00-230.00)**

Overall 18.1% of households (23.8% in Kurunegala and 12.4 % in Polonnaruwa) incurred a cost for medications (prescription drugs) for the patient during the hospital stay. Costs incurred by the household for medications are summarized in Table 30 by district and hospital.

Table 30 Cost of medications for the patient by district and hospital

District	Median(Rs.) (interquartile range)	Hospital	Median(Rs.) (interquartile range)
Kurunegala (n=122)	0.00 (0.00-0.00)	TH, Kurunegala (n=85)	0.00 (0.00-0.00)
		DH, Dambadeniya (n=37)	0.00 (0.00-135.00)
Polonnaruwa (n=121)	0.00 (0.00-0.00)	GH, Polonnaruwa (n=96)	0.00 (0.00-0.00)
		BH, Medirigiriya (n=25)	0.00 (0.00-0.00)
Total	**0.00 (0.00-0.00)**	**Total**	**0.00 (0.00-0.00)**

None of the patients had to buy surgical consumables for use during hospitalization.

Overall 25.9% of households (40.2% in Kurunegala and 11.6% in Polonnaruwa) incurred a cost for laboratory investigations conducted in the private sector. Costs incurred by the household for laboratory investigations are summarized in Table 31 by district and hospital.

Table 31 Cost of laboratory investigation of the patient by district and hospital

District	Median(Rs.) (interquartile range)	Hospital	Median(Rs.) (interquartile range)
Kurunegala (n=122)	0.00 (0.00-1000.00)	TH, Kurunegala (n=85)	0.00 (0.00-125.00)
		DH, Dambadeniya (n=37)	970.00 (250.00-1000.00)
Polonnaruwa (n=121)	0.00 (0.00-0.00)	GH, Polonnaruwa (n=96)	0.00 (0.00-0.00)
		BH, Medirigiriya (n=25)	0.00 (0.00-0.00)
Total	**0.00 (0.00-300.00)**	**Total**	**0.00 (0.00-300.00)**

Overall 38.3 % of households (48.4% in Kurunegala and 28.1% in Polonnaruwa) incurred a loss of income due to this hospitalization. This loss of income was either by the patient or members of his family.

Loss of income incurred by households is summarized in Table 32 by district and hospital.

Table 32 Loss of income by the patient's household by district and hospital

District	Median(Rs.) (interquartile range)	Hospital	Median(Rs.) (interquartile range)
Kurunegala (n=122)	0.00 (0.00-3000.00)	TH, Kurunegala (n=85)	0.00 (0.00-3375.00)
		DH, Dambadeniya (n=37)	800.00 (0.00-2750.00)
Polonnaruwa (n=121)	0.00 (0.00-550.00)	GH, Polonnaruwa (n=96)	0.00 (0.00-720.00)
		BH, Medirigiriya (n=25)	0.00 (0.00-0.00)
Total	**0.00 (0.00-1800.00)**	**Total**	**0.00 (0.00-1800.00)**

All sampled patients incurred a direct household cost due to this hospitalization. Direct cost comprised travel costs, expenses incurred by accompanying persons, cost of keeping a companion, cost of food bought, cost of visits by family members, cost of medications bought from the private sector, cost of investigations conducted in the private sector, cost of other material required by the patient during hospitalization and any other incidental expenses incurred due to the hospital stay. The total direct cost incurred by the household is summarized in Table 33 by district and hospital.

Table 33 Total direct household cost of hospitalization by district and hospital

District	Median(Rs.) (interquartile range)	Hospital	Median(Rs.) (interquartile range)
Kurunegala (n=122)	2000.00 (1009.50-3295.00)	TH, Kurunegala (n=85)	1940.00 (925.00-3575.00)
		DH, Dambadeniya (n=37)	2150.00 (1036.50-3080.00)
Polonnaruwa (n=121)	1775.00 (1102.50-2857.50)	GH, Polonnaruwa (n=96)	1957.50 (1235.00-3007.50)
		BH, Medirigiriya (n=25)	1040.00 (547.50-1860.00)
Total	**1875.00 (1053.00-3010.00)**	**Total**	**1875.00 (1053.00-3010.00)**

Total cost of the hospital stay including direct household cost and indirect household cost (loss of income by patient and other household members) is summarized in Table 34.

Table 34 Total household cost (direct and indirect) of hospitalization by district and hospital

District	Median(Rs.) (interquartile range)	Hospital	Median(Rs.) (interquartile range)
Kurunegala (n=122)	3036.50 (1722.00-5725.25)	TH, Kurunegala (n=85)	3020.00 (1671.00-5792.50)
		DH, Dambadeniya (n=37)	3053.00 (1984.00-5500.50)
Polonnaruwa (n=121)	2165.00 (1285.00-3460.00)	GH, Polonnaruwa (n=96)	2460.00 (1390.00-3608.75)
		BH, Medirigiriya (n=25)	1535.00 (582.50-2513.50)
Total	**2640.00 (1450.00-4520.00)**	**Total**	**2640.00 (1450.00-4520.00)**

3.3 Cost of in-patient care for four major non-communicable diseases in Sri Lanka

Data on a minimum of 30 patients admitted due to each of the selected diseases were obtained from each district for this analysis. Table 35 shows the distribution of patients by hospital and disease. A minimum of twenty (20) patients with the disease were obtained from the district's main referral hospital. The number sampled from the main referral centre had to be increased for Cerebro-vascular accidents and Myocardial infarction because sufficient numbers were not available at Base Hospital level.

Table 35 Distribution of patients by hospital and disease

Diagnosis	TH, Kurunegala	BH, Dambadeniya	GH, Polonnaruwa	BH, Medirigiriya	Total
Cerebro-vascular accident	23	07	28	02	**60**
Myocardial infarction	20	10	27	04	**61**
Ischaemic heart disease	21	12	20	10	**63**
Diabetes mellitus	20	10	20	11	**61**
Total	**84**	**39**	**95**	**27**	**245**

Table 36 shows the median duration of stay by hospital and disease. The longest duration of 6 days was observed for stroke patients at TH, Kurunegala. Shortest duration of stay (2 days) was observed for stroke patients at GH, Polonnaruwa.

Table 36 Median duration of stay (interquartile range) by hospital and disease

Diagnosis	TH, Kurunegala	BH, Dambadeniya	GH, Polonnaruwa	BH, Medirigiriya	Total
Cerebro-vascular accident	6 (5-11)	3 (1-3)	2 (2-3)	5.5 (3-8)	**3 (2-6)**
Myocardial infarction	4.5 (3.75-5.25)	5.5 (4.75-6.25)	4 (4-4)	3 (3-3.75)	**4 (4-5)**
Ischaemic heart disease	3 (2-4)	4 (2.25-4.75)	3.5 (3-4)	4 (3-4)	**4 (2-4)**
Diabetes mellitus	4.5 (1.25-5.75)	4.5 (2.75-6.75)	3 (2.25-4.75)	4 (2-7)	**4 (2-5)**

1) Cerebro-vascular accidents (CVA)

Out of the patient-specific costs incurred in hospital, the cost of investigations was the highest. The cost of intravenous fluids was the lowest. The cost of surgical consumable items was higher than the cost of drugs.

Table 37 Median cost of different elements of in-patient care for Cerebro-vascular accident

Hospital	Investigations	Surgical consumables	IV fluids	Medications
TH, Kurunegala	3704.07 (3379.70-4206.33)	161.20 (130.66-329.87)	48.64 (0-97.28)	216.14 (120.84-622.67)
BH, Dambadeniya	632.96 (501.99-644.61)	0 (0-127.70)	0 (0-0)	4.73 (0.99-8.27)
GH, Polonnaruwa	1576.29 (1066.41-2736.00)	209.81 (127.70-419.61)	0 (0-48.64)	68.68 (34.05-152.69)
BH, Medirigiriya	130.97 (130.97-130.97)	339.74 (127.70-551.77)	0 (0-0)	698.29 (460.44-936.15)
Total	**2398.59 (1066.41-3565.21)**	**159.72 (127.70-419.61)**	**0 (0-83.82)**	**101.12 (33.22-274.90)**

Accommodation cost of patients was highest in Teaching Hospital, Kurunegala which has a specialized unit for the management of strokes.

Table 38 Accommodation cost of Cerebro-vascular accident by hospital

Hospital	Accommodation cost (per day)	Median duration of stay	Total accommodation cost
TH, Kurunegala	1039.09	6	6234.54 (5195.45-11429.99)
BH, Dambadeniya	854.72	3	2564.16 (854.72-2564.16)
GH, Polonnaruwa	1039.09	2	2078.18 (2078.18-3117.27)
BH, Medirigiriya	854.72	5.5	4700.96 (2564.16-6837.76)
Total	**-**	**3**	**3117.27 (2078.18-6234.54)**

Table 39 Total cost of in-patient care for Cerebro-vascular accident by hospital

Hospital	Total cost (Median)	Interquartile range
TH, Kurunegala	11317.74	8564.10-17042.41
BH, Dambadeniya	3071.76	1488.67-3344.74
GH, Polonnaruwa	4259.85	3534.02-5532.18
BH, Medirigiriya	8456.65	8456.65-8456.65
Total	**5836.56**	**3674.12-10192.55**

2) Myocardial infarction

In the management of Myocardial infarction, out of the patient-specific costs incurred in hospital, the cost of investigations was the highest, followed by the cost of drugs. The cost of intravenous fluids was the lowest.

Table 40 Median cost of different elements of in-patient care for Myocardial infarction

Hospital	Investigations	Surgical consumables	IV fluids	Medications
TH, Kurunegala	3026.70 (1990.15-4304.18)	161.20 (151.35-330.96)	121.60 (36.48-210.91)	3971.64 (3561.47-4102.92)
BH, Dambadeniya	1244.61 (1012.14-1983.47)	130.66 (127.70-254.53)	0 (0-48.64)	2287.14 (2230.60-2806.50)
GH, Polonnaruwa	2178.38 (1946.22-3012.63)	547.31 (547.31-547.31)	97.28 (48.64-145.92)	1800.19 (1702.57-1897.53)
BH, Medirigiriya	856.69 (439.29-1233.18)	206.82 (127.70-386.19)	24.32 (0-48.64)	119.70 (37.22-1341.50)
Total	**2130.64 (1529.64-2958.29)**	**419.61 (158.24-547.31)**	**97.28 (25.36-145.92)**	**1847.86 (1715.00-2496.46)**

Table 41 Accommodation cost of Myocardial infarction by hospital

Hospital	Accommodation cost (per day)	Median duration of stay	Total accommodation cost
TH, Kurunegala	1039.09	4.5	4675.91 (3896.59-5455.22)
BH, Dambadeniya	854.72	5.5	4700.96 (4059.92-5342.00)
GH, Polonnaruwa	1039.09	4	4156.36 (4156.36-4156.36)
BH, Medirigiriya	854.72	3	2564.16 (2564.16-3205.20)
Total	**-**	**4**	**4156.36 (4156.36-5195.45)**

Table 42 Total cost of in-patient care for Myocardial infarction by hospital

Hospital	Median cost	Interquartile range
TH, Kurunegala	11695.44	10225.90-16116.43
BH, Dambadeniya	8424.51	7744.07-11207.62
GH, Polonnaruwa	9065.51	8165.12-9805.77
BH, Medirigiriya	4182.27	3446.63-5525.86
Total	**9065.51**	**7915.84-11006.33**

3) Ischaemic Heart Disease

Out of the patient-specific costs incurred in hospital, the cost of investigations was the highest. The cost of intravenous fluids was the lowest. The cost of surgical consumable items was higher than the cost of drugs.

Table 43 Median cost of different elements of in-patient care for ischaemic heart disease

Hospital	Investigations	Surgical consumables	IV fluids	Medications
TH, Kurunegala	1018.67 (764.82-1647.40)	133.62 (127.70-161.20)	0 (0-48.64)	371.42 (13.33-2310.52)
BH, Dambadeniya	922.17 (728.50-1443.84)	127.70 (127.70-127.70)	0 (0-0)	1492.21 (284.77-2082.35)
GH, Polonnaruwa	2038.98 (1818.75-2502.75)	419.61 (223.58-419.61)	194.56 (158.08-194.56)	285.67 (177.61-363.62)
BH, Medirigiriya	643.91 (392.91-1028.78)	158.24 (158.24-158.24)	194.56 (85.12-194.56)	308.49 (274.32-1706.73)
Total	**1217.33 (785.82-1992.87)**	**158.24 (127.70-419.61)**	**48.64 (0-194.56)**	**328.84 (49.00-1489.37)**

Table 44 Accommodation cost of ischaemic heart disease by hospital

Hospital	Accommodation cost (per day)	Median duration of stay	Total accommodation cost
TH, Kurunegala	1039.09	3	3117.27 (2078.18-4156.36)
BH, Dambadeniya	854.72	4	3418.88 (1923.12-4059.92)
GH, Polonnaruwa	1039.09	3.5	3636.81 (3117.27-4156.36)
BH, Medirigiriya	854.72	4	3418.88 (2564.16-3418.88)
Total	**-**	**4**	**3418.88 (2078.18-4156.36)**

Table 45 Total cost of in-patient care for ischaemic heart disease by hospital

Hospital	Median cost	Interquartile range
TH, Kurunegala	3967.13	3242.67-8770.08
BH, Dambadeniya	6189.69	3233.45-7250.27
GH, Polonnaruwa	6721.17	5829.48-7987.18
BH, Medirigiriya	4879.93	4232.06-5710.18
Total	**5967.58**	**3922.86-7669.58**

4) Diabetes mellitus

In the management of Diabetes mellitus, out of the patient-specific costs incurred in hospital, the cost of investigation was the highest. The cost of intravenous fluids was the lowest. The cost of surgical consumable items was higher than the cost of drugs.

Table 46 Median cost of different elements of in-patient care for Diabetes mellitus

Hospital	Investigations	Surgical consumables	IV fluids	Medications
TH, Kurunegala	1294.22 (765.09-2343.04)	161.20 (79.99-290.28)	48.64 (0-133.76)	106.30 (25.33-1124.98)
BH, Dambadeniya	900.28 (469.25-1718.82)	14.80 (2.96-172.30)	0 (0-12.16)	51.49 (17.41-103.35)
GH, Polonnaruwa	2411.09 (1953.26-3267.30)	158.24 (127.70-158.24)	97.28 (0-145.92)	118.95 (51.66-146.88)
BH, Medirigiriya	687.50 (447.45-927.55)	127.70 (0-158.24)	0 (0-0)	142.72 (23.30-443.94)
Total	**1505.97 (742.04-2457.74)**	**158.24 (32.56-163.69)**	**0 (0-121.60)**	**94.68 (25.79-239.05)**

Table 47 Accommodation cost of Diabetes mellitus by hospital

Hospital	Accommodation cost (per day)	Median duration of stay	Total accommodation cost
TH, Kurunegala	1039.09	4.5	4675.91 (1298.86-5974.77)
BH, Dambadeniya	854.72	4.5	3846.24 (2350.48-5769.36)
GH, Polonnaruwa	1039.09	3	3117.27 (2337.95-4935.68)
BH, Medirigiriya	854.72	4	3418.88 (1709.44-5983.04)
Total	**-**	**4**	**3418.88 (2078.18-5195.45)**

Table 48 Total cost of in-patient care for Diabetes mellitus by hospital

Hospital	Median cost	Interquartile range
TH, Kurunegala	6631.46	2750.24-8705.12
BH, Dambadeniya	5242.30	2864.02-7518.12
GH, Polonnaruwa	5670.02	5228.54-8282.96
BH, Medirigiriya	4829.28	2371.42-6795.99
Total	**5462.44**	**4227.22-7860.67**

4 Discussion

This descriptive cross-sectional study was conducted with two objectives. Firstly to determine the household cost of participating in the health check-up programme conducted in the Kurunegala and Polonnaruwa districts under the NPP project; and secondly, to determine the household and health system cost of hospitalization for the four most important non-communicable diseases in the same districts: Cerebro-vascular accident (stroke), Myocardial infarction, Ischaemic heart disease and Diabetes mellitus.

4.1 Cost of participation in the health check-up programme of the NPP Project

The health check-up programme was conducted in the Alawwa and Narammala MOH areas of the Kurunegala district and the Medirigiriya MOH area in Polonnaruwa district. Sampling of subjects was done consecutively in the health check-up centres of the two districts during August-December 2010. In Kurunegala district, the number of participants in the Alawwa MOH area was relatively lower than the number of participants in Narammala MOH area. This was due to the lower number of check-up sessions conducted in Alawwa MOH area during the study period. This is reflected in the number sampled from each location for the study.

The target group for the check-up programme is the general population between 40-75 years of age living in the respective MOH areas. A majority of the attendees at the check-ups were between 50-59 years of age. There were a few participants under 40 years of age in the sample indicating problems in recruitment. The differences in the pattern of health seeking-behaviour between people of different age groups may be an underlying reason for unequal representation of age groups. Recruitment strategies used by the health workers could have been responsible, as the invitation to participate may have been confined to specific population groups.

A large majority of the participants (70%) were female. Female preponderance in health seeking is well documented. Invitations for participating in health check-ups are done through the health system. In Polonnaruwa, a public health midwives are responsible for this task whereas in Kurunegala, participants are invited through the health institutions. A large proportion of the sample being female reflects better health seeking behaviour, higher contact with the health system, especially the public health midwives and higher acceptance of services by females. Relatively few women in rural communities engage in formal occupations making it possible for them to attend the check-ups during weekdays. In contrast, men employed in both the formal and informal sector could have been severely under-represented due to unwillingness to participate and difficulties in taking time off from work. The majority of those affected by NCDs, as reflected in the statistics of the selected hospitals, were male, raising a concern about this pattern.

A majority of the participants were unemployed. Of those employed, a large proportion were employed in the informal sector. People involved in agriculture comprised the majority of the sample. Check-up sessions were mostly held on weekdays and many people employed in the formal sector may not have had the opportunity to attend due to the need to apply for leave. Others may have been reluctant to lose a day's wages. People in occupational groups that can be classified as sedentary (e.g. professionals, technicians as well as associate professionals and clerks) comprised less than 5% of the sample.

Only a few participants from both districts had received higher education. Over 86% had received secondary education in Kurunegala district as compared to only 66% in Polonnaruwa district. Overall, participants in Kurunegala district had a higher level of educational attainment compared to participants from Polonnaruwa district. This may reflect the differences in the educational level of the general population in the two districts.

More than half the sample reported having a monthly family income of less than Rs. 10,000. Ninety-five percent of the sample reported drawing an income less than Rs. 50,000. Reported

income by research subjects is usually considered to be an underestimate. In these two districts many households own agricultural land and fixed assets that generate non-monetary income, which may have been under-estimated in reported income.

Median family size was 4, comparable to results of other demographic studies conducted in Sri Lanka in the same period.

Approximately 42% walked to the check-up centre indicating close proximity to their residences. Over 60% walked or cycled - thereby not incurring any travel costs. The commonest mode of transport used was the bus. The other common mode was the motorcycle. In Kurunegala a majority incurred travel costs, while in Polonnaruwa a majority did not incur any travel costs. This may be explained by the longer distance the participants had to travel to reach the clinic in Kurunegala district. The differences in the social structure, rural-urban characteristics, accessibility and common modes of travelling in the two areas could have contributed to this difference to a lesser degree.

The other main cost item was incidental expenses incurred during the visit, which mainly included the cost of snacks, tea and any other food bought during the visit. In Kurunegala this was substantial. In Polonnaruwa, this was minimal. Travel costs and incidental expenses of the visit were considered as direct costs of the visit. Total direct costs were higher in Kurunegala than in Polonnaruwa. Median direct costs were also considerably higher in Kurunegala. This may be due to the longer distance and relatively more urban features in Kurunegala when compared to Polonnaruwa, resulting in greater expense.

In Kurunegala a larger proportion reported loss of income to the family due to the visit. The amount of lost income was comparable in the two districts. Although a relatively larger proportion of daily wage earners are living in these two districts, the informal nature of their occupations may have limited them from identifying the amount lost due to this visit.

4.2 Household cost of hospitalization for four major non-communicable diseases in Sri Lanka

For this component, a larger proportion of patients had to be sampled from the two main hospitals due to insufficient numbers at base hospital level. Considering the importance and life-threatening nature of some of the selected conditions, patients with some types of NCDs are rarely admitted to Base Hospitals, especially in Polonnaruwa district where the facilities available at Base Hospital level are limited.

More than 90% of the patients were above 45 years of age reflecting the fact that NCDs become commoner with advancing age.

Nearly 70% of the total sample was male and the proportion of males was higher in the Polonnaruwa district. This reflects the higher risk for NCDs in males.

In contrast to the participant profile of the check-ups, all occupational groups were represented in this sample of patients. One third of patients were unemployed. The largest occupational group hospitalized were agricultural workers comprising over one fourth of the total sample. Despite agricultural work (farming) being an occupation that involves high levels of physical activity, many farmers seem to experience NCDs. Presence of many other risk factors that predispose to development of NCDs seem to have outweighed the advantages of an active lifestyle. The risk of NCDs that affect every level of social class was reflected in all the occupational groups being represented in the sample.

Nearly half of the participants were educated above grade 5, but less than 5% had received higher education. The group who had not received any formal education was about 12%. This appears higher than the national rates and could be due to the limitations in infrastructure in some parts of these two districts even in the latter half of the 20th century.

About 9% of patients reported a monthly family income of less than Rs. 5,000.00 and only about 36% reported a monthly family income above Rs. 20,000.00. These reports may reflect the economic conditions of the patients seeking in-patient care at state sector hospitals in these districts.

Median family size was similar to that reported in the demographic surveys in Sri Lanka.

A majority of patients arrived in hospital by hired three-wheeler while a considerable proportion used the bus. On discharge, many patients hoped to go home by hired three-wheeler while the number hoping to use the bus was greater than the number that arrived by bus. These represent the commonest modes of transport available for emergency and non-emergency situations in these districts. About 11% of the participants used their own three-wheeler, reflecting the availability of user-owned transport facilities.

Travel costs were incurred by about 96% of the hospitalized patients in the Kurunegala district and all the patients in Polonnaruwa district. On average Rs. 400 was spent on travel. The travel

costs of those who had been admitted in referral centres were higher, with an average of Rs. 400-500. The lower cost of travel to Base Hospitals indicates the shorter distances involved.

Loss of patient income and costs incurred by the patient's household due to accompanying the patient to hospital were not substantial. This may be due to many family members being involved in non-formal occupations and problems of estimating and quantifying the loss of income in these occupations.

A large majority of families incurred a cost for visiting the patient in hospital or transporting food from home. On average, visits by family members amounted to Rs. 400-500 during the entire stay at all levels of hospitals.

The costs of keeping a companion were not substantial in these settings. 25-50% of patients had to keep a companion. These companions were non-professional carers and could be relatives or friends of the patient, and may not charge a fee. In these situations the cost incurred for a companion will mainly involve the cost of travel and subsistence. This finding reflects the informal nature of patient care practices at the institutional level.

Another important element is the food bought for consumption of the patient. Over 2/3 of families spent money on food. The limited variation and the poor quality of the hospital diet as well as accessibility problems in providing home cooked food would have led to food being bought from vendors in and around the hospital premises.

Overall 12-24% of households incurred a cost for medications (prescription drugs) for the patient during the hospital stay and about 26% of households incurred a cost for laboratory investigations of the patient conducted in the private sector. The percentage that had to get an investigation done from the private sector was as high as 40% in Kurunegala. These indicate a growing problem in Sri Lankan health sector. Non-availability of necessary and important drugs for treatment of NCDs within the hospital is a serious shortcoming at present. Lack of infrastructure and resources to meet the demand for laboratory investigations and non-availability of modern investigation facilities in the hospitals leads to requests for private investigations. In settings like Kurunegala where private pharmacies and laboratories are widely available and more families can afford these services, accessing services from the private sector is likely to be more common in contrast to Polonnaruwa.

None of the patients had to buy consumable items such as intravenous cannula or injection syringes for use during hospitalization. This is an encouraging finding in this study.

Loss of income experienced by the entire family due to hospitalization for this episode of illness affected about 38.3 % of households. This percentage was close to 50% in the Kurunegala district. In both these districts it can be expected that the proportion occupied in the informal sector is greater than the proportion occupied in the formal sector. The loss of income associated with being away from work is generally greater in the informal sector. Therefore the percentage reporting a loss of income in this study could be an under-estimate as many patients may find it difficult to quantify the loss of income in the informal sector, especially in the self-employed agricultural sector.

All sampled patients incurred a direct household cost due to this hospitalization. The direct cost comprised travel costs, expenses incurred by accompanying persons, the cost of keeping a companion, cost of food bought, cost of visits by family members, cost of medications bought from the private sector, cost of investigations conducted in the private sector, cost of other material required by the patient during hospitalization and any other incidental expenses incurred due to the hospital stay. The total direct cost of a hospitalization is around Rs. 2,000. The total cost of the hospital stay including direct household cost and indirect household cost (loss of income by patient and other household members) ranges from Rs. 2,000-3,000. This is a substantial proportion of the monthly family income specially in settings where more than 60% of families report a monthly income less than Rs. 20,000.

4.3 Cost of in-patient care for four major non-communicable diseases in Sri Lanka

The number of patients admitted due to MI and CVA was markedly small in Base Hospitals. Due to the severity and the life-threatening nature of these conditions and improved health seeking behaviour, patients are more likely to get admitted to a larger hospital with these conditions.

The median duration of stay was 3 days for CVA and 4 days for Myocardial infarction, ischaemic heart disease and Diabetes mellitus. In general, after initiating treatment, management of CVA is largely conservative and patients are discharged early. In the specialized neurology unit in Kurunegala, hospital stay for CVA was markedly longer (6 days). Due to being one of the few specialized neurology units in the country, this unit may get severe cases who need prolonged care leading to a longer stay in hospital.

The accommodation cost of a patient in a medical ward estimated in Teaching Hospital, Kurunegala was applied as a means of estimating costs in both Teaching Hospital, Kurunegala and General Hospital, Polonnaruwa. The accommodation cost of a patient in a medical ward estimated in Base Hospital, Marawila was applied for both Base Hospitals, Dambadeniya and Medirigiriya.

The cost of intravenous fluids used in the management of the four conditions was low. There was a wide variation in the pattern of use across hospitals even for managing the same condition. This may have been due to differences in individual patient requirements as well as differences in management protocols adopted across settings.

1) Cerebro-vascular accident (CVA)

Out of the patient-specific costs incurred in hospital, the highest cost was the cost of investigations. This was higher in referral centres where advanced facilities are available. The cost of intravenous fluids was the lowest. The cost of surgical consumable items was higher than the cost of drugs.

The requirement to conduct CT scans in CVA patients can be considered the main reason for the higher cost of investigations. The cost of drugs and intravenous fluids is minimal due to relatively low cost of these items and their limited use in CVA management. The need to use many types of surgical consumables such as urinary catheters and urine bags, intravenous cannulae and infusion sets contribute to a relatively higher cost for surgical consumables.

The accommodation cost of patients was highest in Teaching Hospital, Kurunegala which has a specialized neurology unit. This was due to longer duration of stay.

The total cost of a hospitalization episode for a stroke ranged from approximately Rs. 3,100 at Base Hospital, Dambadeniya to Rs. 11,300 at the neurology unit of Teaching Hospital, Kurunegala. The median cost across all units was approximately Rs. 5,800. The total median cost was relatively high in Medirigiriya. In Dambadeniya, at least 25% of stroke patients were discharged 24 hours after admission resulting in a lower median cost. Higher total cost in Kurunegala can be attributed to advanced investigation facilities used and longer duration of stay. The relatively higher cost observed in Medirigiriya may not be representative as only 2 patients were included from Medirigiriya.

2) Myocardial infarction

In the management of Myocardial infarction, out of the patient-specific costs incurred in hospital, the cost of investigations was the highest, followed by the cost of drugs. The cost of medication was higher than cost of investigations in both hospitals in the Kurunegala district. The cost of intravenous fluids was the lowest cost, overall. The number of investigations conducted on a patient with Myocardial infarction is high. These include a number of ECGs repeated over the hospital stay as well as many biochemical investigations. The cost of medication includes the cost of relatively expensive thrombolytic drugs like streptokinase or low molecular weight heparins and injectable sedatives for pain relief. Due to these reasons cost of investigations and medications are generally high with only a slight difference depending on the setting.

The average duration of stay was over 4 days except in BH, Medirigiriya where the average stay was 3 days. Being a life threatening condition that needs optimum care in hospital, patients with MI would need at least 3 days in hospital.

Except for BH, Medirigiriya, the total cost of managing an MI was over Rs. 8,000 with an average of Rs. 9,000. The lower cost in Medirigiriya may be due to the shorter duration of stay in hospital and is limited by having only 4 patients in the sample.

3) Ischaemic Heart Disease

Out of the patient-specific costs incurred in hospital, the cost of investigations was markedly higher. The cost of intravenous fluids was the lowest. The cost of surgical consumable items was less than the cost of drugs.
All Ischaemic heart disease patients require investigations for the exclusion of an MI. This investigation process will include a number of ECG repetitions and biochemical investigations contributing to a higher cost. As the disease severity is relatively lower than CVA and MI, use of surgical consumable items is limited in its management. Drugs used in the management of ischaemic heart disease are mostly oral medications. Although the number of different drugs ordered for a patient is high, their cost is relatively low.

The average total cost was around Rs. 6,000 per hospitalization across hospitals. The average total cost was lowest in Kurunegala Teaching Hospital due to the relatively shorter duration of stay.

4) Diabetes mellitus

The cost of investigation was the highest among all patient specific costs in the management of Diabetes mellitus. The cost of surgical consumable items was higher than the cost of drugs. Despite many patients being treated with insulin, the cost of drugs was low. This could be due to the relatively low cost of most oral Diabetes medications.

The average total cost of a hospitalization for Diabetes was around Rs. 5,500. This cost was more at referral centres than at base hospitals. This may be largely due to the relatively expensive investigations and medications ordered at referral centres. In Base Hospitals, due to limited resources these investigations and medications would be obtained from the private sector at the expense of the patient leading to a lower cost of patient care to the state.

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Annex 1

බෝ නොවන රෝග වැළැක්වීමේ ව්‍යාපෘතිය

සෞඛ්‍ය පරීක්ෂා වැඩසටහනෙහි ආර්ථික විශ්ලේෂණය

සහභාගී වන්නන්ගේ ගෘහස්ථ ව්‍යදම පිළිබඳ සම්මුඛ සාකච්ඡාව

ක්ෂේත්‍ර අංකය		සෞඛ්‍ය සේවා නිලධාරී ප්‍රදේශය	
පරීක්ෂා කෙරුණු ස්ථානය			
1	මූලික තොරතුරු		
1-1	ඔබගේ නම කුමක්ද		
1-2	ඔබගේ ලිපිනය කුමක්ද		
1-3	ඔබගේ පදිංචි ප්‍රදේශ සෞඛ්‍ය නිලධාරිනී කොට්ඨාශය කුමක්ද		
1-4	ඔබගේ උපන් දිනය කුමක්ද	අවු	මා
1-5	ඔබගේ රැකියාව කුමක්ද		
1-6	ඔබ දකා ඇති ඉහළම අධ්‍යාපන මට්ටම කුමක්ද		
	විධිමත් අධ්‍යාපනයක් ලබා නැත		
	5 ශ්‍රේණියට අඩු අධ්‍යාපනයක්		
	5 ශ්‍රේණිය සමත්		
	8 ශ්‍රේණිය සමත්		
	අ පො ස සා/පෙළ සමත්		
	අ පො ස උ/පෙළ සමත්		
	උසස් අධ්‍යාපනය ලැබූ		
1-7	ඔබගේ පවුලේ මාසික ආදායම කුමක්ද		
	රු 5000ට අඩු		
	රු 5000-9999 දක්වා		
	රු 10000-19999 දක්වා		
	රු 20000-34999 දක්වා		
	රු 35000-49999 දක්වා		
	රු 50000 හෝ ඊට වැඩි		
1-8	ඔබගේ පවුලේ සාමාජිකයන් ගණන කොපමණද		
	අවු 15 ට අඩු		
	අවු 15 -59 අතර		
	අවු 60 හෝ ඊට වැඩි		

Annex 1.1

බෝ නොවන රෝග වැලැක්වීමේ ව්‍යාපෘතිය

සෞඛ්‍ය පරීක්ෂා වැඩසටහනෙහි ආර්ථික විශ්ලේෂණය

සහභාගී වන්නන්ගේ ගෘහස්ථ වියදම් පිළිබඳ සම්මුඛ සාකච්ඡාව

සම්මුඛ සාකච්ඡාව පිළිබඳ විස්තරය

මහත්මයාණෙනි/ මහත්මියනි

ඔබගේ සෞඛ්‍ය සේවා නිලධාරී ප්‍රදේශය තුළ ක්‍රියාත්මක වන බෝ නොවන රෝග වැලැක්වීමේ ව්‍යාපෘතියේ සෞඛ්‍ය පරීක්ෂා වැඩ සටහනට අද දින සහභාගී වන ඔබට සම්මුඛ සාකච්ඡාවක් සඳහා සහභාගී වීමට ආරාධනා කරමු මෙම සම්මුඛ සාකච්ඡාවේ අරමුණ මෙම වැඩ සටහනට සහභාගී වීමට ඔබට දැරීමට සිදුවන වියදම් සහ අද දින ඒ සඳහා කාලය මිසංගු කිරීම නිසා ඔබ අත් විඳින ආර්ථිකමය පාඩුව තීරණය කිරීමයි

ඔබ මෙම සම්මුඛ සාකච්ඡාවට සහභාගී වීමට තීරණය කරන්නේ නම් සේවයවරයකු ඔබගෙන් සරල ප්‍රශ්න කිපයක් අසනු ඇත ඒවාට පිළිතුරු දීමට ඔබට ගත වන කාලය දළ වශයෙන් විනාඩි 15ක් පමණ වනු ඇත එහිදී ඔබගෙන් ලබා ගන්නා තොරතුරු වල රහස්‍ය භාවය සුරකින අතර එම තොරතුරු මෙම සම්මුඛ සාකච්ඡාව සඳහා පමණක්ම යොදා ගැනෙනු ඇත

ඔබ මෙම සම්මුඛ සාකච්ඡාවට සහභාගී නොවීමට තීරණය කරන්නේ නම් මුලදී ඔබට සෞඛ්‍ය පරීක්ෂා වැඩ සටහනට සාමාන්‍ය පරිදි සහභාගී විය හැක සම්මුඛ සාකච්ඡාවට සහභාගී නොවීමෙ ඔබ ගන්නා තීරණය ඔබගේ පරීක්ෂාවට හෝ ඉන් පසු ඔබට ලබා දෙන සේවය උපදෙස් සහ සේවය පහසුකම් වලට කිසිම බලපෑමක් නොකරනු ඇත

මෙම සම්මුඛ සාකච්ඡාවට සහභාගී වීමට පෙර ඔබට තවත් තොරතුරු අවශ්‍ය නම් මෙම පත්‍රිකාව ඔබට ලබා දුන් සම්මුඛ සේවයවරයාගෙන් විමසන්න එසේ නැතිනම් පහත දුරකථන අංකය ඔස්සේ සම්මුඛ සාකච්ඡාවේ ප්‍රධාන විමර්ශක සේවය .... අමතන්න (දුරකථන අංකය 077.....)

(අත්සන)

සේවය .....

කටිකාචාරිණි

සේවය පීඨය තැ පෙ 06 රාගම

Annex 2

කෝ නොවන රෝග වැලැක්වීමේ ව්‍යාපෘතිය

සෞඛ්‍ය පරීක්ෂා වැඩපටහනෙහි ආර්ථික විශ්ලේෂණය

කෝ නොවන රෝග නිසා රෝහල් ගත වූවන්ගේ ගෘහස්ථ වියදම පිළිබඳ සමීක්ෂණය

පේළි අංකය		පරීක්ෂණ	
නාවිටු අංකය			

1	මූලික තොරතුරු			
1-1	ඔබගේ නම කුමක්ද			
1-2	ඔබගේ ලිපිනය කුමක්ද			
1-3	ඔබ පදිංචි සෞඛ්‍ය සේවය නිලධාරී කොට්ඨාශය/ ප්‍රාදේශීය ලේකම් කොට්ඨාශය කුමක්ද			
1-4	ඔබගේ උපන් දිනය කුමක්ද	අවු	මා	දි
1-5	ඔබගේ රැකියාව කුමක්ද			
1-6	ඔබ දක්වා ඇති ඉහළම අධ්‍යාපන මට්ටම කුමක්ද			
	විධිමත් අධ්‍යාපනයක් ලබා නැත			
	5 ශ්‍රේණියට අඩු අධ්‍යාපනයක්			
	5 ශ්‍රේණිය සමත්			
	8 ශ්‍රේණිය සමත්			
	අ පො ස සා/පෙළ සමත්			
	අ පො ස උ/පෙළ සමත්			
	උසස් අධ්‍යාපනය ලැබූ			
1-7	ඔබගේ පවුලේ මාසික ආදායම කුමක්ද			
	රු 5000ට අඩු			
	රු 5000-9999 දක්වා			
	රු 10000-19999 දක්වා			
	රු 20000-34999 දක්වා			
	රු 35000-49999 දක්වා			
	රු 50000 හෝ ඊට වැඩි			
1-8	ඔබගේ පවුලේ සාමාජිකයන් ගණන කොපමණද			
	අවු 15 ට අඩු			
	අවු 15 -59 අතර			
	අවු 60 හෝ ඊට වැඩි			

Annex 2.1

බෝ නොවන රෝග වැලැක්වීමේ ව්‍යාපෘතිය

සෞඛ්‍ය පරීක්ෂා වැඩසටහනෙහි ආර්ථික විශ්ලේෂණය

බෝ නොවන රෝග සඳහා රෝහල් ගතවන්නන්ගේ ගෘහස්ථ වියදම් පිළිබඳ සමීක්ෂණය

සමීක්ෂණය පිළිබඳ විස්තරය

ගෞරවනීය/ ගෞරවනීයයි

බෝ නොවන රෝගයකට ප්‍රතිකාර ගැනීමට රෝහල් ගත වූ වූ ඔබට සමීක්ෂණයක් සඳහා සහභාගී වීමට ආරාධනා කරමු **මෙම** සමීක්ෂණයේ අරමුණ **මෙම** රෝහල් ගත වීම නිසා ඔබට සහ ඔබගේ පවුලේ සාමාජිකයන්ට දැරීමට සිදුවන වියදම් සහ අත් විඳීමට සිදුවන ආර්ථිකමය පාඩුව නිර්ණය කිරීම සහ ඔබට ප්‍රතිකාර කිරීමේ/ සෞඛ්‍ය පහසුකම් සැපයීමේ රෝහල සහ සෞඛ්‍ය පද්ධතිය දරන වියදම ගණනය කිරීමයි

ඔබ මෙම සමීක්ෂණයට සහභාගී වීමේ තීරණය කරන්නේ නම් ඔබ රෝහලේ සිටින කාලය තුළ දිනූ දෙකකට වරක් සෞඛ්‍යවේදියකු ඔබගෙන් හෝ ඔබ හෝ ඔබේ පවුලේ සාමාජිකයන් විසින් නම් කරන ලද තොරතුරු සපයන්නෙකුගෙන් සරල ප්‍රශ්න කිපයක් අසනු ඇත ඒනාව පිළිතුරු ලබා දීමට වරකට ගත වන කාලය දළ වශයෙන් විනාඩි 5-10 ක් පමණ වනු ඇත එහිදී ඔබගෙන් ලබා ගන්නා තොරතුරු වල රහස්‍ය භාවය සුරක්ෂිත අතර එම තොරතුරු **මෙම** සමීක්ෂණය සඳහා පමණක්ම යොදා ගැනෙනු ඇත

තවද ඔබට රෝහලේදී ලබා දෙන පියවර ප්‍රතිකාර සහ සෞඛ්‍ය සේවා පිළිබඳ විස්තර ද ඔබගේ ඇඳ ඉහපතෙන් ලබාගනු ලැබේ අවශ්‍ය අමතර විස්තර නාවිටු තාර්ය මණ්ඩලයෙන් ලබා ගනු ඇත

ඔබ මෙම සමීක්ෂණයට සහභාගී නොවීමට තීරණය කරන්නේ නම් ඔබට සාමාන්‍ය පරිදි සෞඛ්‍ය ප්‍රතිකාර ලැබෙනු ඇත සමීක්ෂණයට සහභාගී නොවීමට ඔබ ගන්නා තීරණය ඔබගේ ඔබට ලබා දෙන සෞඛ්‍ය පහසුකම් සහ සේවා වලට කිසිම බලපෑමක් නොකරනු ඇත

මෙම සමීක්ෂණයට සහභාගී වීමට පෙර ඔබට තවත් තොරතුරු අවශ්‍ය නම් **මෙම** පත්‍රිකාව ඔබට ලබා දුන් සමීක්ෂණ සෞඛ්‍යවේදයාගෙන් විමසන්න එසේ නැතිනම් පහත ළිපිනය අංකය ඔස්සේ සමීක්ෂණයේ ප්‍රධාන විමර්ශක සෞඛ්‍ය .... අමතන්න (ළිපිනය අංකය 077.....)

(අත්සන)

සෞඛ්‍ය ....

කථිකාචාර්ණි

සෞඛ්‍ය පීඨය තැ පෙ 06 රාගම

Annex 3

NCD Prevention Project (NPP)
Cost Accounting of selected diseases - Data Extraction Form **Code:**
CerebroVascular Accident (Stroke)

Part 1. Please complete this check-list before proceeding to Part 2.
Cross (X) the relevant cage.

1.1 Has this patient experienced sudden weakness or sensory loss during the last 7 days?	Y	N
1.2 Is this weakness/ sensory loss, the reason for this admission?	Y	N
1.5 Is it documented on the Bed Head Ticket that the patient had a CVA/ Stroke?	Y	N
1.6 Has the patient developed any complications of other diseases needing ICU admission or surgery during this admission?	Y	N
1.7 Has the patient left against medical advice or reported missing?	Y	N
1.8 Was the patient transferred for further management?	Y	N

Part 2. Write the relevant information in the space provided or mark the relevant cage with a √

2.1 Code

2.2 Hospital Code

2.3 Ward

2.4 BHT No.

2.5 Date and time of Admission	DD	MM	YY	Admission Time a.m./ p.m.

2.6 Nebulisation done:	Yes		No	

2.7 Details of nebulisation:

	Drug combination used	Dose	Frequency	Total No. of doses	Total units
1					
2					
3					
4					
5					
6					

Annex 4

NCD Prevention Project (NPP)
Cost Accounting of selected diseases - Data Extraction Form **Code:**
Myocardial Infarction (MI)

Part 1. Please complete this check-list before proceeding to Part 2.
Cross (X) the relevant cage.

1.1 Was the reason for admission chest pain ± other symptoms?	Y	N
1.2 Is this his/ her first admission for this episode of chest pain?	Y	N
1.3 Is it documented on the BHT that the patient had a MI during this admission?	Y	N
1.6 Has the patient developed any complications of diseases other than the MI needing ICU admission or surgery during this admission?	Y	N
1.7 Has the patient left against medical advice or reported missing?	Y	N
1.8 Was the patient transferred for further management?	Y	N

Part 2. Write the relevant information in the space provided or mark the relevant cage with a √

2.1 Code 2.2 Hospital Code

2.3 Ward 2.4 BHT No.

2.5 Date and time of Admission | DD | MM | YY | Admission Time a.m./ p.m.

2.6 Nebulisation done: Yes No

2.7 Details of nebulisation:

	Drug combination used	Dose	Frequency	Total No. of doses	Total units
1					
2					
3					
4					
5					
6					

Annex 5

NCD Prevention Project (NPP)
Cost Accounting of selected diseases - Data Extraction Form **Code:**
Ischaemic Heart Disease (IHD)

Part 1. Please complete this check-list before proceeding to Part 2.
Cross (X) the relevant cage.

1.1 Was the reason for admission chest pain ± other symptoms?	Y	N
1.2 Is this his/ her first admission for this episode of chest pain?	Y	N
1.3 Does the patient have a past history of IHD?	Y	N
1.4 Is it documented that the patient had a MI during this admission?	Y	N
1.5 Has the patient developed any complications of diseases other than IHD needing ICU admission or surgery during this admission?	Y	N
1.6 Has the patient left against medical advice or reported missing?	Y	N
1.7 Was the patient transferred for further management?	Y	N

Part 2. Write the relevant information in the space provided or mark the relevant cage with a √

2.1 Code | 2.2 Hospital Code

2.3 Ward | 2.4 BHT No.

2.5 Date and time of Admission | DD | MM | YY | Admission Time a.m./ p.m.

2.6 Nebulisation done: | Yes | | No | |

2.7 Details of nebulisation:

	Drug combination used	Dose	Frequency	Total No. of doses	Total units
1					
2					
3					
4					
5					
6					

Annex 6

NCD Prevention Project (NPP)
Cost Accounting of selected diseases - Data Extraction Form **DC:**
Diabetes Mellitus

Part 1. Please complete this check-list before proceeding to Part 2.
Cross (X) the relevant cage.

1.1 Does this patient have documents to support a diagnosis of diabetes mellitus?	Y	N
1.2 Is he/ she admitted due to a complication of diabetes mellitus?	Y	N
1.5 Is it documented that the patient had a CVA/ Stroke during this admission?	Y	N
1.6 Is it documented that the patient had a Myocardial Infarction (MI) during this admission?	Y	N
1.7 Is there evidence that the patient has been admitted due to an acute coronary event ?	Y	N
1.6 Has the patient developed any complications of diseases **other than diabetes** needing ICU admission or surgery during this admission?	Y	N
1.7 Has the patient left against medical advice or reported missing?	Y	N
1.8 Was the patient transferred for further management?	Y	N

Part 2. Write the relevant information in the space provided or mark the relevant cage with a √

2.1 Code | | 2.2 Hospital Code | |

2.3 Ward | | 2.4 BHT No. | |

2.5 Date and time of Admission

DD	MM	YY	Admission Time
			a.m./ p.m.

2.6 Nebulisation done:

Yes		No	

2.7 Details of nebulisation:

	Drug combination used	Dose	Frequency	Total No. of doses	Total units
1					
2					
3					
4					
5					
6					