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Non-communicable disease burden in the Western Province, Sri Lanka

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Non-communicable Disease Burden in the Western Province, Sri Lanka

Health Nutrition and Population Global Practice

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Acronyms

BMI	Body Mass Index
CVD	Cardiovascular Diseases
DALY	Disability-Adjusted Life Years
GDP	Gross Domestic Product.
GHNDR	Health, Nutrition and Population Global Practice
GND	*Grama Niladhari Divisions*
HIES	Household Income and Expenditure Survey
IFD	International Federation of Diabetes
IHD	Ischemic Heart Disease
LKR	Sri Lankan Rupee
MCH	Maternal and Child Health Care
NCD	Non-Communicable Diseases
OOP	Out-Of-Pocket
STEPS	Stepwise Approach to Surveillance
SWIFT	Survey of Wellbeing Via Instant and Frequent Tracking
UHC	Universal Health Coverage
UN	United Nations
USA	United States of America
WC	Waist Circumference
WDI	World Development Indicator
WHO	World Health Organization
WHR	Waist-Hip Ratio

Executive Summary

Why this study?

Having achieved impressive maternal and child health outcomes, Sri Lanka's main health sector challenge is increasingly becoming the need to address non-communicable diseases (NCDs). Its population is aging at a faster rate than the average for lower-middle-income countries and the average for South Asia. According to the latest Global Burden of Disease estimates (IHME, 2017), NCDs account for 81 percent of total deaths in the country. The increasing importance of NCDs is also evident from the major causes of disability-adjusted life years (DALYs), a summary measure of years of life lost to death and disease. The trend in DALYs between 1990 and 2016 shows that DALYs resulting from ischemic heart disease, chronic obstructive pulmonary disease, and particularly diabetes mellitus are on the rise. The share of DALYs attributable to diabetes mellitus and chronic obstructive pulmonary disease increased by 51 and 25 percent, respectively between 2005 and 2016 (IHME, 2017). Monitoring the prevalence and distribution of these NCDs and their risk factors is key to detecting vulnerable groups and providing early treatment.

The primary objectives of this study are: i) to examine the prevalence and distribution of NCDs and risk factors across socioeconomic and demographic groups, and ii) to assess the performance of the health system with regards to NCDs. The focus is on adults in the Western province of Sri Lanka. The Western province is selected because it is the most urbanized and increasingly urbanizing province that is likely to be home to a growing share of Sri Lanka's aging population.

Data and Methods

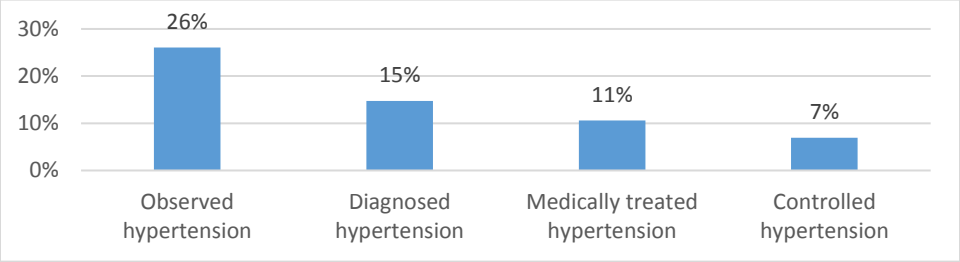
The study mainly draws on household survey data collected specifically for the purposes of this study in 2015. In addition, we examine qualitative data on health seeking behavior and data on indoor air quality from 50 households. The quantitative household survey consisted of 10,107 people from 3,300 households, about 64 percent of whom were adults above the age of 20. Detailed information on health status, healthcare utilization and out-of-pocket payments was collected from these individuals. We combined three sets of data to measure the prevalence of NCDs/risk factors among individuals in the province: i) self-reported, ii) diagnosed, and iii) observed/measured. The latter included measurement of blood pressure, body mass index (BMI), waist circumference (WC) and waist-hip ratio (WHR). We compared the data on diagnoses and on observed health status (in the case of hypertension) to understand people's knowledge of their own health status, the characteristics of those who are not aware of their status, and the ability of patients to manage chronic conditions.

Key Findings

The findings show that the most common NCDs (diagnosed) posing a threat to healthy adult life in the province include hypertension, diabetes, cataracts, ischemic heart disease, and asthma. The less educated appear to have a higher burden of these conditions, but there is no systematic difference by economic status. More concerning is the fact that the onset of these conditions is early, suggesting that young adults live with health conditions for a substantial part of their lives. A special inquiry into two physiological risk factors (hypertension and obesity) for various NCDs revealed substantial concerns.

First, more than one in four adults (26 percent) are hypertensive, but as many as 70 percent of them are unaware of their status. Equally concerning is the finding that, of the 15 percent of adults who were once diagnosed with hypertension, only less than half (7 percent) were found to have it under control (i.e. systolic blood pressure ≤ 140 mmHg), suggesting a gap in managing the disease. The lack of awareness about one's hypertensive status is common across both genders, all places of residence, and all socioeconomic groups but is more extensive among some groups than others. Despite having a higher probability of being hypertensive, men are less likely to be aware of their hypertensive status, suggesting that use of preventive care differs by gender. While hypertension does not seem to be associated with socioeconomic status, the poorest and richest quintiles are more likely to be aware of their conditions than the middle 60 percent. As expected, groups less aware of their status are those that have the least contact with the health system (as suggested by the low utilization of outpatient care). For example, men are less likely to seek outpatient care than women.[1] Men and relatively younger people also seem to have the lowest rates of preventive care utilization**.**

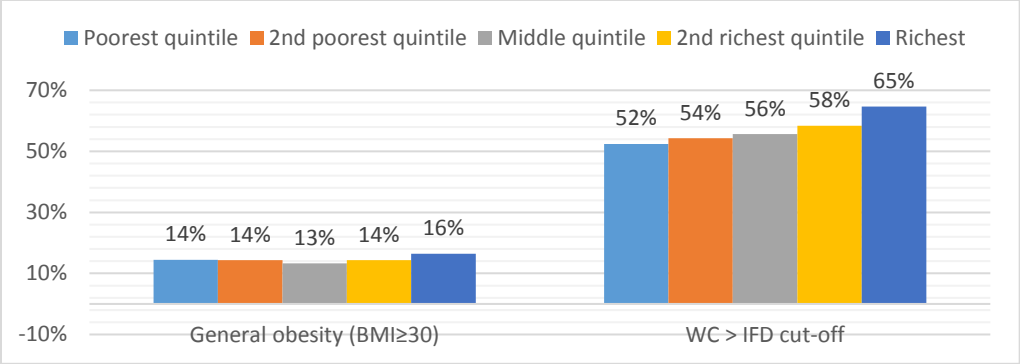
Diagnosis, Treatment, and Control of Hypertension



Second, the prevalence of general obesity in the province (15 percent) is substantially higher than the average for Sri Lanka (6 percent). Combined with the prevalence of abdominal obesity[2] (57 percent), this poses a significant risk for NCDs. Obesity disproportionately affects women and adults between 30 and 60 years of age. Although the rate of obesity is the highest among the richest quintile, it is alarmingly high even among the poor. Consistent with evidence from other countries, obesity in the province was found to be significantly associated with the risk of hypertension and diabetes.

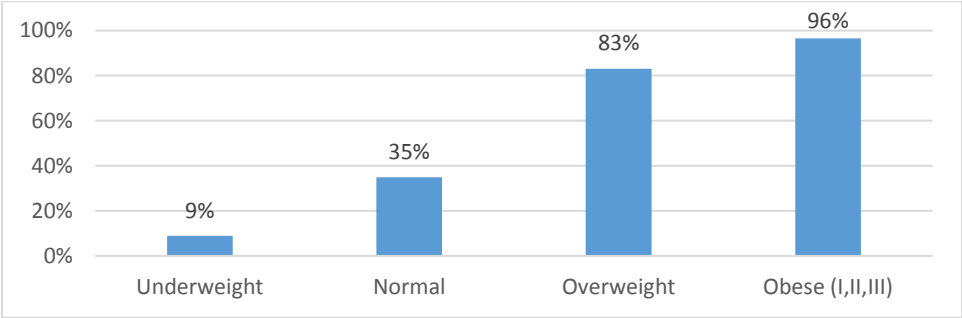
[1] Men, however, are more likely to seek inpatient care, which may be a result of choosing to forgo preventive outpatient care.
[2] Abdominal obesity is based on waist-circumference.

Obesity by Economic Status



Moreover, taking public health actions solely based on BMI-based risk classifications excludes a large proportion of adults, especially women, who are at a substantial risk of metabolic complications. Waist circumference appears to predict the risk of diabetes better than BMI-based obesity. A significant proportion of people in the normal BMI weight category is at risk of complications related to abdominal obesity. Given that the health risk of a given level of body fat in the Asian population is much higher than in other regions, policymakers need to give this issue a considerable amount of attention.

Abdominal Obesity Distribution Across BMI Categories (WC cut-off)



Behavioral risk factors such as smoking, betel chewing, and harmful alcohol consumption are generally not very widespread, but their concentration among older men and lower socioeconomic groups should be of concern for policymakers. The clustering of these risk factors among these vulnerable groups may worsen the existing economic disadvantages for such groups. Furthermore, the risk of hypertension is higher among those who practice these habits, which suggests that the potential health benefits of expanding preventive counseling services, especially to men, are large.

Environmental risk factors, particularly indoor air pollution, also increase the vulnerability of lower socioeconomic groups and those living in the rural parts of the province. About 47 percent of households in the Western province use unclean sources of fuel (43 percent use biomass and 4 percent use kerosene). Our readings of indoor air pollution in 50 households showed levels of pollution that were substantially

higher than WHO's interim target-1. Indoor air pollution is a greater risk factor for the health of poorer households, as they are more likely to depend on biomass for fuel and to have no functional chimney. Almost one-third of households in the poorest quintile cook with biomass but have no functional chimney, compared to only 4 percent of households in the richest quintile. Children from households that primarily use unclean sources of fuel are about 2 percentage points more likely (than children from households that use clean sources of fuel) to have symptoms of wheezing and whistling in the chest.

The poorer populations tend to use public facilities, while private facilities are largely used by the better-off, mainly for reasons of convenience and shorter waiting times. Among those who used some outpatient or inpatient care, the probability of choosing private care rather than public care is higher for the better-off, the better educated, and the elderly**.** Analysis of health-seeking behavior suggests that much of this preference is driven by differences in waiting times and the soft skills of health providers between public and private providers of care rather than by any major differences in infrastructure, amenities, or perceived clinical quality. Quantitative data, however, also show that individuals prefer to use public facilities for more serious healthcare concerns.

The data also revealed that a high proportion of people seeking care bypass primary care facilities in favor of higher-level services. This is particularly true for adult preventive services but is rarer for preventive MCH services. Consumers also often bypass primary care facilities for curative needs that could be met at the primary level. For example, 63 percent of respondents reported that they would go to a secondary facility for curative care for chronic conditions, while only 23 percent responded that they would seek care from primary facilities. Furthermore, a significant proportion of households did not know where they could seek care for adult preventive health services, such as counseling on nutrition. This an issue on which policymakers need to focus.

Out-of-pocket (OOP) payments are modest given Sri Lanka's per capita income, but ensuring this does not escalate will require public health actions to control NCDs. Most out-of-pocket spending in the province is for private care, but part of it is likely due to the unavailability of laboratory tests and medications in public facilities, forcing patients to use private laboratories and pharmacies**.** Considering the increasing prevalence of NCDs and physiological risk factors that are associated with higher healthcare use and spending, containing OOP spending will require reducing the prevalence of these risk factors and removing the quality constraints that drive people away from public care, especially for routine conditions. Early diagnoses and management of risk factors can reduce an otherwise costly treatment of NCDs (both for individuals and the government).

The curative side of the public health system is not well suited to deal with the overwhelming burden of non-communicable diseases. Primary level facilities provide facility based episodic NCD care, and they do not routinely initiate or coordinate such care. A culture of self-referral and lack of an effective gatekeeping mechanism produce discontinuity in client information between providers and constrain the doctor-patient relationship. The ability to choose doctors appears to be an important factor driving patients to utilize private facilities. Given that NCDs require long-term integrated care, however, a strong doctor-patient relationship is crucial for the effectiveness of treatment. In the current system, NCD patients cannot be tracked as they receive care from different facilities at different times, oftentimes resulting in lack of continuity of care. Tracking these patients is further complicated by the absence of an electronic health information system.

Recommendations

While the analyses were based on the Western province, recommendations are made for the country as a whole. There are two reasons for this. First, the focus on the Western province is a strategic one. Given the rate of urbanization and the relative homogeneity and size of the country, it can be argued that other provinces will follow the trends exhibited by the Western province. As other provinces urbanize and their socio-economic conditions and life styles change, they will be faced with similar challenges that the Western province is facing now. Therefore, reorienting the health system in anticipation of these challenges could lead to prevention of risk factors and early detection of NCDs, which would result in significant health gains nationwide. Second, several of the recommendations are systemic and institutional, and therefore would apply to the whole country.

A multi-pronged approach, consisting of multi-sectoral preventive interventions, health system reorientation and strengthening, and a targeted approach aimed at those most vulnerable to NCDs and NCD risk-factors, is required to address the challenges posed by the behavioral, physiological, and environmental risk factors for NCDs, as identified in this study. Vulnerable populations include men, people with multiple risk factors, and the poor (who suffer more from smoking, betel chewing, indoors pollution, etc.).

Even though the health sector bears most of the burden of prevention and treatment of NCDs, most interventions that could create health promoting environments lie outside the health sector. Acknowledging this, Sri Lanka has recently approved a National Multi-sectoral Action Plan for the prevention and control of NCDs (2016-2020) focusing on the following four strategic areas: i) leadership, advocacy, and partnership; ii) health promotion and risk reduction; iii) reorientation of the health system for early detection and management of NCDs and risk factors; and iv) surveillance, monitoring and evaluation, and research. The recommendations listed below are consistent with this Action Plan and are based on the findings presented in this study.

A. Interventions to control risk factors and prevent the onset of NCDs

I) Introducing and expanding population-based interventions: Population-based interventions, such as community-wide campaigns and national NCD literacy campaigns together with regulations and corporate social responsibility, can effectively reduce the trend in unhealthy aging populations. Such interventions are key for primary prevention of NCDs and are affordable even in low income settings. They do not require health system strengthening and have a low cost of implementation. These interventions target not only those already suffering from NCDs but also those at risk of NCDs. The Lancet NCD Action Group and the NCD Alliance propose the delivery of five priority interventions based on their health effects, cost effectiveness, low cost of implementation, and political and financial feasibility (Beaglehole et al. 2011). Among this set of five interventions, four are population-based.

Recommendations for population-based interventions

Recommendation	Actions
Reduce unhealthy diet and promote physical activity	- Mass media campaigns - Fiscal measures to discourage consumption of unhealthy foods (i.e. taxes) and promote consumption of fruits and vegetables (i.e. subsidies) - Food labelling and marketing restrictions to reduce consumption of unhealthy foods (such as saturated and trans-fat and sugar in sweetened beverages)
Reduce consumption of dietary salt	- Mass media campaigns to inform households about health risks of dietary salt - Nudge and/or regulate the private sector to change industry norms with regards to salt and fat content of processed foods
Control tobacco use	- Accelerate implementation of the WHO Framework Convention on Tobacco Control (FCTC) o Harmonization of taxes and further tax increases o Prohibition of illicit trade of tobacco products o Ban point of sale displays and all other forms of advertising - Regulating the content and emissions of tobacco products
Reduce harmful alcohol consumption	- Tax increases - Ban advertisements - Restrict access - Enforce the National Alcohol Policy - Establish mechanisms to reduce the production and sale of illicit alcohol.

II) **Targeted campaigns promoting healthy behavior:** To maximize impact, Sri Lanka should customize campaign messages for different target groups and use a tailored platform to communicate messages.

a) **Campaigns on behavioral risk factors:** The relatively high prevalence of smoking, excessive alcohol use, and betel chewing among the socio-economically disadvantaged, men, and the elderly suggest that these groups of people may not be fully aware of the health risks of such lifestyle choices. Campaign messages with hard-hitting evidence on health effects of these lifestyle related risk factors, such as smoking, could be designed such that they are appealing to these groups of population. The platform used for such campaigns could also be tailored to these population groups. In addition, to deter early initiation of unhealthy behaviors, school health programs should be designed and implemented.

b) **Campaigns on utilization of preventive check-ups and counseling services:** Campaigns that motivate people to have regular preventive check-ups and counseling services should especially target young adult men who are found to forgo such health services. This would help to delay the onset of NCDs and provide early treatment. It is, however, important to ensure that the elderly are not left behind, as they continue to be the most vulnerable due to their age and high prevalence of NCDs and

behavioral risk factors. This is particularly important considering Sri Lanka's rapid aging of the population and the implications this will have on future healthcare costs.

c) **Campaigns on healthy weight**: Campaigns on the health benefits of maintaining a healthy weight and how to achieve it should target women and younger adults who are at a higher risk of being overweight. This effort should raise awareness not only about the BMI-based risk of body fat but also about the health risks of abdominal obesity. These campaigns could involve messages on healthy foods and food based dietary guidelines, unhealthy diet (both for food prepared at home and purchased processed foods), and the health benefits of physical activity.

B. Health system reorientation and strengthening

I) Introducing integrated and continuous care with primary care as default first contact: The study's findings of widespread risk factors, low awareness of health conditions and ineffective management of diagnosed conditions suggest that Sri Lanka's health system is not as effective at dealing with NCDs as it has been for maternal and child health. The system provides facility based episodic care, but there is no routine initiation and coordination of NCD care at the primary level. A new NCD case is typically diagnosed within an outpatient department or in the hospital during inpatient admission, and its management is usually centered around a single disease by a specialist rather than patient-centered care that primary care providers could provide. Effective management of NCDs is also constrained by a culture of self-referral, which limits doctor-patient familiarity. As such, it is essential to establish an integrated NCD care system that goes beyond facility based episodic care to reach and screen those who forgo preventive care and ensure necessary follow-up. By institutionalizing primary care as the first point of contact, a more productive doctor-patient relationship can be established. Table below presents the recommendations and actions needed for the introduction of an effective and integrated chronic care model as a model of primary care service delivery.

Recommendations for health system reorientation and strengthening

Recommendation	Actions
Introduce integrated and continuous care with primary care as default first contact	- Constitute primary care teams to enable provision of comprehensive NCD care o Train providers to meet complex NCD needs (including facility based health promotion and behavior change services) - Regularly assess the capacity of the health system the pillars of health service delivery to provide high quality integrated primary NCD care services o Evaluate the availability of human resource, facilities, and drugs to ensure adequate access to quality care - Develop referral chains to ensure the continuum of care o Geographic mapping of facilities and primary care teams o Establish feedback mechanisms between different providers and levels of care - Invest in an electronic information system to transfer patient information between providers in the integrated delivery of care model
Institutionalize primary care level opportunistic NCD screening and counseling	- Develop and implement basic health services such as screening services for blood pressure, cholesterol and diabetes, and interpersonal communication program (for improved diet and life style)
Improve soft skills of providers at government health facilities to ensure patient comfort and trust	- Training on communication - Performance based incentives to encourage better communication with patients.

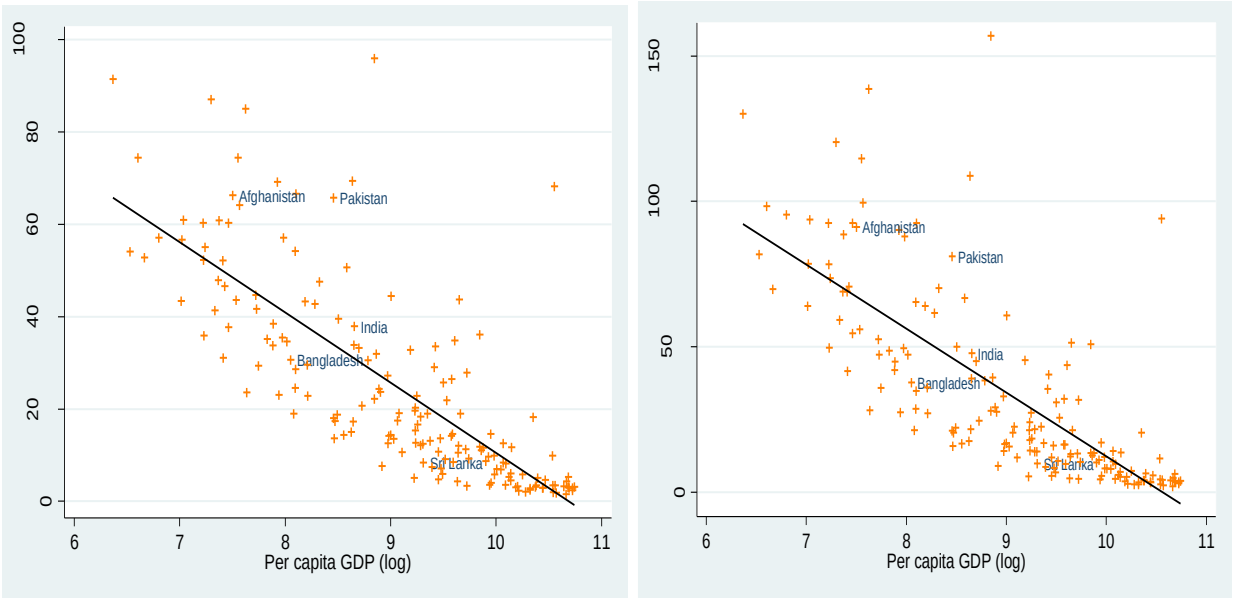
Implementing these recommendations will have economic benefits both at the micro and macro levels. At the micro level, the prevention and early management of NCDs protects households from loss of productivity and financial risk due to high OOP payment for medical care. At the macro level, the fiscal implications of rising NCDs could be substantial. While the aging of the population will result in higher costs for public provision of health care, NCDs could reduce the tax base of the economy by affecting productivity and labor supply. Given the large societal costs of premature mortality and morbidity due to NCDs, there is a strong case for investment in prevention and management of NCDs. Yet, the question of fiscal sustainability of these reforms remains to be explored, especially if these interventions are to be financed from the existing health budget. Efficiency gains from the gate-keeper system could be one source of fiscal space to strengthen the health system and launch population-wide interventions. Notwithstanding this, proper examination of the fiscal implications of these interventions requires scrutiny. It is also worth noting that given the developmental threats that NCDs pose in aging populations, there is a case for the Ministry of Finance to allocate more resources to the health sector.

Chapter 1. Introduction

1.1. The Context

1. **With its impressive maternal and child health outcomes and control of communicable diseases, Sri Lanka is often depicted as a success story.** It has better child health outcomes than would be predicted by its income level (Figure 1.1). In 2013, the country's under-5 mortality stood at 10 per 1,000 live births while maternal mortality ratio was 29 per 100,000 live births (WHO, 2015a). The country is also close to eliminating communicable diseases such as malaria, polio, tetanus, and measles. Life expectancy at birth increased from 70 in 1990 to 75 in 2014 and compares favorably with both the 2014 average for South Asia (68) and countries in Sri Lanka's income group (67) (WDI, 2015). However, because of years lived with morbidity and disability, healthy life expectancy at birth in Sri Lanka in 2012 was 10 years lower than life expectancy at birth (75) (WHO, 2015a). This is partly a result of non-communicable diseases (NCDs).

Figure 1.1. Global Comparison of Infant and Under-5 Mortality Rates



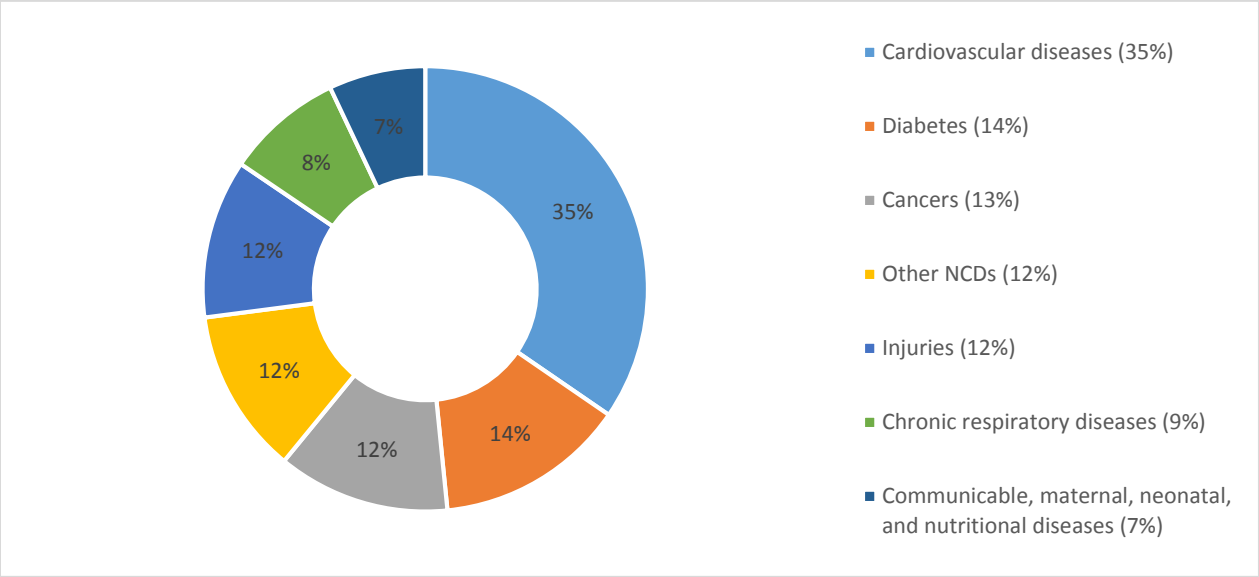
Source: World Development Indicators (2015)

2. **As is typical of a middle-income country, Sri Lanka's main health system challenge is increasingly becoming the need to address non-communicable diseases (NCDs).** NCDs, also known as chronic diseases,[3] are medical conditions that are not caused by infectious agents but result from a combination of physiological, behavioral, environmental, and genetic factors (WHO, 2017). According to the latest Global Burden of Disease estimates (IHME, 2017), NCDs account for 81 percent of total deaths in Sri Lanka (Figure 1.2). These include cardiovascular diseases (CVDs), cancers, chronic respiratory diseases, diabetes

[3] Not all NCDs are chronic, and some communicable diseases such as HIV/AIDS are considered chronic because they require ongoing management over a period of years or even decades.

and other NCDs. CVDs alone (including ischemic heart disease and stroke) account for 35 percent of the country's deaths. The three risk factors that account for the largest share of the disease burden in Sri Lanka are high fasting plasma glucose, dietary risks, and high blood pressure (IHME, 2016).

Figure 1.2. Causes of Deaths in Sri Lanka



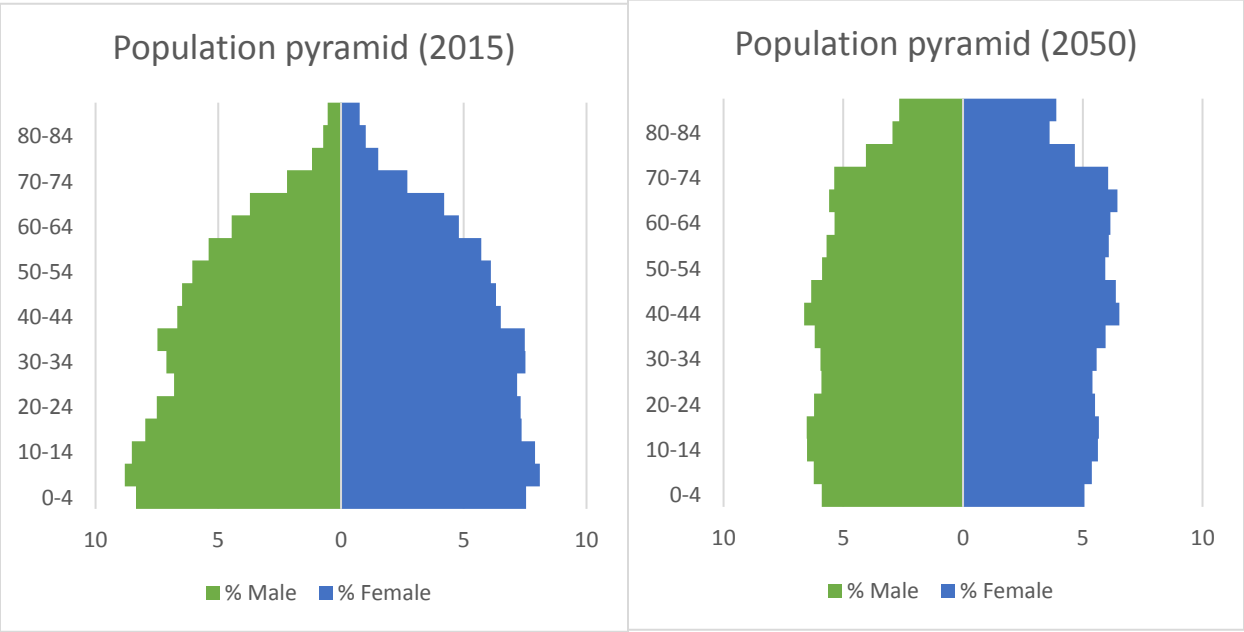
Source: IHME (2017)

3. **The increasing importance of NCDs is also evident from the major causes of disability-adjusted life years (DALYs), a summary measure of years of life lost to death and disease**. According to the Global Burden of Disease 2016, Sri Lanka's top three causes of DALYs are ischemic heart disease, diabetes mellitus, and self-harm. The trend between 1990 and 2016 shows that DALYs resulting from ischemic heart disease and diabetes mellitus are both on the rise, with diabetes exhibiting the highest increase in DALYs. Notably, diabetes mellitus and chronic obstructive pulmonary disease are two of the three causes that were in the 10 leading causes of DALYs in 2016 but were not on that list in 1990 (IHME, 2017).

4. **The socioeconomic impact of rising NCDs is likely to be substantial.** One of the targets of the UN's 2030 Agenda for Sustainable Development is to reduce premature deaths from NCDs globally by one-third. This commitment was made partly because the rapid rise in NCDs could impede poverty reduction initiatives in areas with limited resources. Vulnerable and socially disadvantaged people are at a higher risk of premature mortality than the better-off due to differences in access to health services. The death or illness of breadwinners and out-of-pocket payments for NCD-related healthcare could drain household resources and push vulnerable households into poverty (WHO, 2017). Sri Lanka's low poverty rate and provision of free public care may limit the extent of these negative outcomes but unless the rising rate of NCDs is contained, the progress made on these fronts may be under threat.

5. **Given Sri Lanka's aging population, it is important to understand the prevalence of NCDs and related risk-factors.** Aging populations, the globalization of unhealthy lifestyles, and rapid unplanned urbanization are the driving forces behind the increase in NCDs around the world (WHO, 2017). The current age composition of Sri Lanka's population (as of 2015) can be characterized by what is often referred to as a population pyramid, where the base of the pyramid consists of a large share of children in the total population while the tip consists of a smaller share of older age groups (Figure 1.3). However, the current age composition will be dramatically different in 2050 per projections made in 2015 by the UN Population Division. In fact, the population of Sri Lanka is aging at a faster rate than the average for lower-middle-income countries and the average for South Asia (Figure 1.4).

Figure 1.3. Age Composition in Sri Lanka in 2015 and 2050

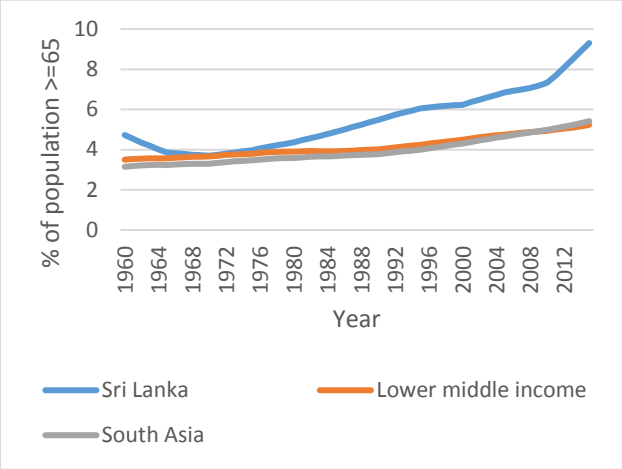


Source: Data from UN World Population Prospectus (medium fertility variant)

6. **Although official figures based on administrative definition of urbanization suggest that Sri Lanka is the least urbanized country in South Asia, rapid urbanization and agglomeration has taken place in its Western province.** According to the Department of Census and Statistics estimates, approximately 18 percent of the population in Sri Lanka resides in urban areas (Department of Census and Statistics, 2012), which is well below the average for the South Asia region of 33 percent (Figure 1.5). However, this official estimate of urbanization does not fully reflect the actual urbanization process that is taking place since the official definition of "urban" is based on administrative underpinnings (Weeraratne, 2016). A 2010 agglomeration index, which considered different features associated with urbanization, estimated Sri Lanka's level of agglomeration at 47 percent. When examining the country's urbanization from this perspective, it is evident that rapid urbanization and agglomeration has taken

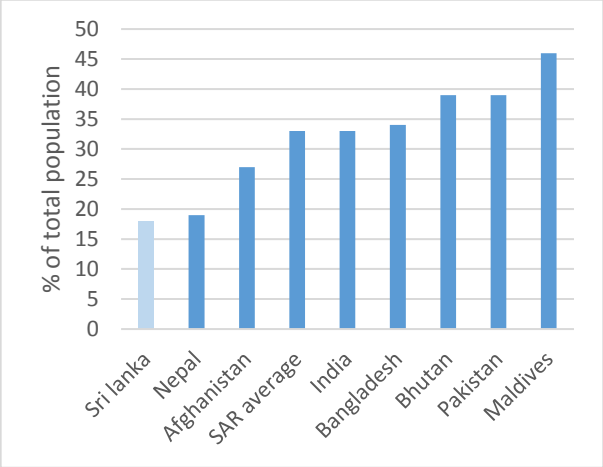
place, particularly in the Western province around Colombo, Kandy, and Galle (including the corridors that connect these cities) (World Bank, 2015a).[4]

Figure 1.4. Population Aged Over 65



Source: World Development Indicators, various years

Figure 1.5. Urban Population

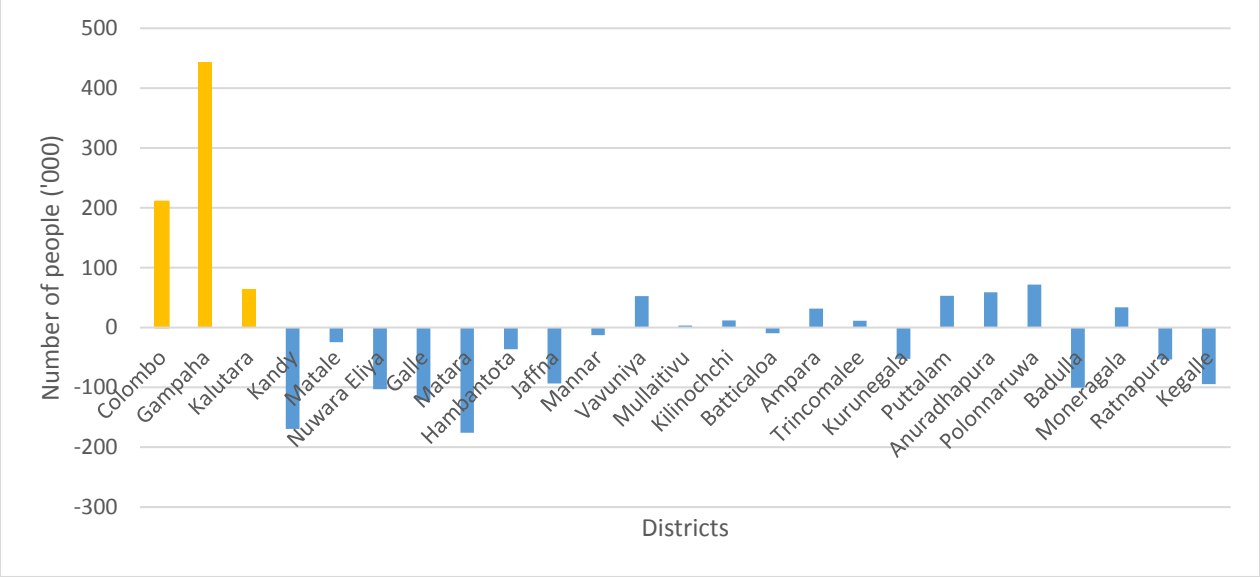


Source: World Development Indicators (2016)

7. **Of the country's nine provinces, the Western province is the most urbanized and is likely to be home to the largest share of the aging population, making it ideal to study patterns of NCDs and associated risk factors.** Using the administrative definition, the Western province, with a population of 5.8 million (28 percent of Sri Lanka's population), is the most urbanized (38 percent of its population live in urban areas) and densely populated province in Sri Lanka (1,600 people per square kilometer). The capital of this province, Colombo, is the most urbanized district in the country (77 percent of its residents live in urban areas). All other districts report urbanization levels in the range of 18 percent or less (Department of Census and Statistics, 2012). The Western province contributes 45 percent to Sri Lanka's gross domestic product and has the highest internal migration of all the provinces (Figure 1.6). It is projected that another 3 million people will be added to the population of the Western province over the next 15 to 25 years (Ministry of Megapolis and Western Development, 2016).

[4] This is evident from the night-time lights in 2012 compared to those in 2002 and 1992 (World Bank, 2015a).

Figure 1.6. Lifetime Internal Migration by Province



Source: Census of Population and Housing 2012 (Department of Census and Statistics, 2012)

8. **Increased population density accompanied by changes in the environment and lifestyles may put residents of the Western province at an increased risk of illness.** Urbanization negatively affects the environment, particularly through increased air pollution and overcrowding, which in turn affects the disease profile of urban centers. Nutritional outcomes may worsen because of over-dependence on processed or fast foods and physical inactivity due to the use of vehicles and poor urban planning (such as the absence of recreational centers). The combined effect of these factors may increase the proportion of people who are obese, leaving much of the aging population at a risk of different circulatory system diseases. These changes in turn may affect patterns of health service use and health care spending.

9. Monitoring trends and patterns of NCDs and their risk factors is key to detecting vulnerable groups and providing early treatment. NCD management interventions will be essential to achieve the global target of reducing premature deaths from NCDs by 2030. Managing NCDs involves detecting, screening, and treating these diseases and providing access to palliative care for people in need. It will also be crucial to reduce the risk factors associated with these diseases (WHO, 2017). WHO's 2015 STEPwise approach to Surveillance (STEPS) survey (WHO, 2015b) highlighted some challenges in Sri Lanka's health system performance regarding NCDs. More than one-fifth of adults with high blood pressure were not on medication for hypertension. Moreover, 71 percent of adults had never measured their total blood cholesterol, and about 29 percent of adults were either overweight or obese (WHO, 2015b).

1.2. Objectives

10. The primary objectives of this study are to examine the prevalence and distribution of NCDs and risk factors across socioeconomic and demographic groups (in the Western province of Sri Lanka) and assess the performance of the health system with regards to NCDs. The focus is on adult health. The study

also looks at patterns of health care use, the choice of public versus private care and the use of primary level facilities. The magnitude and drivers of out-of-pocket payments and how out-of-pocket payments relate to NCDs are also studied. The study further examines gaps in the existing health system in terms of delivering effective care for NCDs.

11. **The goal of this exploratory study is to contribute to policy dialogue on NCDs.** The study is uniquely placed to inform NCD-related policy dialogue because of its strategic focus on the most urbanized Western province. As different parts of the country urbanize and their socio-economic conditions and life styles change, they will be faced with similar challenges that the Western province is facing now. For this reason, while the study is focused on the Western province, recommendations apply to the country as a whole. In addition, the study presents data by socio-economic groups, which can allow for tailored approaches to address the growing burden of NCDs. Such disaggregated data are not available in the national health information system and most administrative data systems. This study attempts to fill those gaps.

1.3. Data and Methods

The Data

12. **The study mainly draws on household survey data that was collected specifically for this study in 2015.**[5] The quantitative household survey consisted of 3,300 households selected using multi-stage cluster sampling. In the first stage, all *grama niladhari* divisions (GND)[6] in the Western province were classified into three categories: rural, urban predominantly poor, and urban predominantly richer.[7] The classification of urban and rural areas used in the study follows the definition used by the Department of Census. Specifically, the classification depends on whether the GND is governed by a municipal council or an urban council. From each of these categories, 55 GNDs were selected randomly, and the survey was conducted in 20 households in each of these GNDs.[8] Overall, 3,300 households were sampled. The survey team attempted to collect detailed health-related information related to all children under 5 years old, all elderly people aged 60 and over, a maximum of one child between 5 and 19 years old, and a maximum of two adults aged between 20 and 59 years old. Due to logistical constraints, it was not possible to include all children and the elderly.[9] Overall, individual-level data were collected from 10,107 people living in these households, of whom 1,554 (15 percent) were children under 5 years of age, 2,047 (20 percent) were children aged between 5 and 19, 4,655 (46 percent) were adults aged between 20 and 59, and 1,851

[5] Additionally, the survey measured indoor air quality in 50 households (Chapter 2 for details).

[6] A *grama niladhari* division is a subunit of a divisional secretariat.

[7] This is based on the 2012 census data, which lists the percentage of households below the 40th percentile of the national household income distribution.

[8] The survey team located the center of the GND and sampled eligible households in a particular direction till the total 20 households per GND was reached. The eligibility of these households was based on meeting five predictive variables pre-identified through a stepwise regression model using data from the 2012/13 Household Income and Expenditure Survey.

[9] A comparison of household roster and individual-level health data shows that 164 children under the age of 5 and 644 individuals aged over 60 were not included although they were registered in the roster, suggesting that they were not available during enumerators' visits. We assume this exclusion is random for this study's purpose.

(18 percent) were adults aged 60 and over. About 67 percent of these individuals were from urban areas (6,733 individuals).

13. **To understand the health-seeking behavior and the perceptions and attitudes of service users and providers, we conducted various qualitative studies.** This included 32 focus group discussions with service users (consisting of different age groups in all three districts within the province). Each focus group discussion involved about eight service users. These were complemented by 14 health immersion observations in which a researcher accompanied patients to health service facilities to assess the quality of service delivery and identify any gaps. These visits were made to primary, secondary, and tertiary-level public and private facilities.

14. **To assess the quality of indoor air in the province, we measured indoor $PM_{2.5}$ concentration** (particulate matter smaller than 2.5 µm) using a real time continuous monitor.[10] Indoor air quality was assessed because fine particles that enter the respiratory tract originate primarily from combustion sources and may have a wide range of health effects, especially on respiratory and cardiovascular systems. These measurements were taken in 50 households which were deliberately selected from different geographical locations of the Western province. In 18 households, measurements were made during meal preparation times, spanning three hours. Another 32 households were monitored for 24 hours and their main cooking sessions were noted.[11]

Methods and Definitions

15. **This study combined three sets of data to measure the prevalence of NCDs among individuals in the province:** self-reported health status, diagnosed health status, and observed health status as reflected in biomarkers collected directly from survey respondents. We collected data on self-reported NCDs by asking respondents if they had an illness lasting more than six months that was not transmittable from person to person.[12] Self-reported health status, however, may not accurately capture the prevalence and distribution of NCDs across population groups due to the impact of differential educational and cultural backgrounds on awareness and self-reporting (Schultz and Tansel, 1997).

16. **Our second measure of health status was based on the individuals' diagnoses.** Respondents were presented with a list of eleven chronic conditions and were asked if they had been diagnosed with any of them. These diseases were diabetes, hypertension, ischemic heart disease, cancer, asthma, chronic obstructive pulmonary disease, cataracts, a cerebral vascular event, epilepsy, chronic kidney disease, and chronic liver disease.[13] Individuals had to provide a document verifying their diagnosis. We referred to these cases as "diagnosed NCDs." One problem with this approach, however, is that some households

[10] The monitor used was the DustTrak Aerosol Monitor model 8530, TSI Inc, USA.

[11] Monitors were fixed in the kitchen with the air inlet at 145 cm above the floor, 100 cm from the cook stove, and at least 150 cm away from open windows and doors. A correction factor of 1.65 was applied to all monitored data.

[12] Although often considered synonymous with "chronic diseases," NCDs are distinguished only by their non-infectious cause and not necessarily by their duration as the term chronic implies. Some chronic diseases of long duration may be caused by infections. These are not the focus of this study.

[13] The list includes the four major types of NCDs in the world - cardiovascular diseases (like heart attacks and stroke), cancers, chronic respiratory diseases (such as chronic obstructive pulmonary disease and asthma), and diabetes (WHO, 2017).

might be more systematic at keeping health records than others. Another problem is that, if certain groups are more likely to forgo care, then relying on records to examine how NCDs are distributed across households with different socioeconomic and demographic factors may be misleading.

17. **The third measure was observed health status, which was not subject to these limitations.** In the survey, elevated blood pressure (hypertension) and overweight/obesity were measured using biomarkers. These are the two leading physiological risk factors in terms of attributable deaths (WHO, 2017). For this reason, we explored them in greater detail. We compared the data on diagnoses and on observed health status (in the case of hypertension) to understand people's knowledge of their own health status, the drivers of forgone care, and the ability of patients to manage chronic conditions.

18. **The study took three readings of systolic and diastolic blood pressure from the adults in the sample.** We used the average of these three readings to classify adults as normal, pre-hypertensive, stage 1 hypertensive, or stage 2 hypertensive according to standard cut-off values presented in Table 1.1. Adults were considered to be hypertensive if they were either stage 1 or stage 2 hypertensive, in other words, had a systolic blood pressure of at least 140 millimeters of mercury (mmHg) or diastolic blood pressure of 90 mmHg.

Table 1.1. Cut-off Points for Classifying Hypertension Status

	Systolic blood pressure (mmHg)		Diastolic blood pressure (mmHg)
Normal	<120	And	<80
Prehypertension	120-139	Or	80-89
Stage 1 hypertension	140-159	Or	90-99
Stage 2 hypertension	≥160	Or	≥100

19. **We examined both general (BMI-based) obesity and abdominal obesity.** Of the different ways of determining whether a body is fat or fit, the most common method is the Body Mass Index (BMI), which is a ratio of a person's body weight in kilograms divided by the square of their height in meters.[14,15] Internationally recognized BMI cut-off points (Table 1.2) are used to identify individuals at risk of morbidity related to general obesity (a BMI equal to or over 30). However, while a high BMI strongly predicts the risk of chronic diseases and premature death (WHO, 2008a), the measure has some limitations. First, it does not distinguish between body fat and lean body mass. At the same BMI, women have more body fat than men. Second, it is not an accurate measure of body fat among the elderly.[16] Therefore, we supplemented our data on BMI-based general obesity with two measures of abdominal

[14] https://www.hsph.harvard.edu/obesity-prevention-source/obesity-definition/how-to-measure-body-fatness/

[15] Although the risk of type 2 diabetes and cardiovascular disease among the Asian population is substantial for BMIs lower than the existing WHO cut-off point for overweight, WHO consulted with experts and concluded that the original cut-off points should be retained as international classifications (WHO, 2004). Asian populations also have a higher percentage of body fat for a given BMI (Deurenberg-Yap et al, 2000).

[16] Huxley et al (2010) also underscored that abdominal obesity may be better than BMI as predictor of CVD risk, but its discriminatory capability may be higher when combined with BMI.

obesity - waist circumference (WC) and waist-hip ratio (WHR). The (South Asia specific) cut-off point that we used for WC is the one recommended by the International Federation of Diabetes (IFD). In the case of WHR, we used the WHO cut-off point based on a "substantially increased" risk of metabolic complications (WHO, 2011). One limitation of the study design was that the survey did not include questions on physical activity and diet. To partially fill this gap, we refer to WHO's STEPs survey (WHO, 2015b) on selected diet related and physical activity questions.

Table 1.2. BMI, WC and WHR classification

	BMI (kg/m2)		
BMI cut-off points			
Underweight	<18.5		
Normal	[18.5-25)		
Overweight	[25-30)		
Obesity, grade I	[30-35)		
Obesity, grade II	[35-40)		
Obesity, grade III	≥40		
Abdominal obesity cut-off points		**Men**	**Women**
Waist circumference (IFD)		90 cm	80 cm
Waist circumference (WHO)		102 cm	88 cm
Waist-hip ratio (WHO)		0.9	0.85

Note: In row 2-5, the range does not include the upper bound; The IFD cut-off points for WC are South Asia specific

20. **The health expenditure data in this study were collected from a subset of household members and comprises outpatient and inpatient spending on healthcare at both public and private facilities.** Individuals were first asked whether they used outpatient or inpatient care in the previous four weeks or 12 months, respectively, from either public or private facilities. If individuals reported seeking care, they were also asked to report their OOP spending on different healthcare-related items during the relevant reference period, including how much (if any) of the spending was reimbursed and if the patient and/or caregiver had forgone any income. The individual's monthly spending and forgone income was calculated by adding one-twelfth of the amount reported for inpatient healthcare (over the previous 12 months) to the corresponding amount for outpatient healthcare (reported for the previous month). One limitation of the expenditure data was that it was not at the household level, which made it impossible to compute catastrophic expenditures by household and to compare our estimates with those made in previous studies.

21. **The study distinguishes between households belonging to the bottom 40 percent and the upper 60 percent of the national household consumption expenditure distribution.** It predicted household consumption using a small set of easily observable variables using the SWIFT[17] approach (Box 1.1). The surveyed households were then categorized into two groups based on their predicted per capita

[17] The Survey of Wellbeing via Instant and Frequent Tracking (SWIFT) is an initiative by the Poverty and Equity Global Practice of the World Bank. It estimates household income/expenditure and produces poverty and inequality indicators based on data from household expenditure surveys and using the latest statistical methods, including cross-validation, multiple imputation, and small area estimation.

consumption and data from the 2012/13 Household Income and Expenditure Survey (HIES). The first group consisted of households that were predicted to belong to the poorest 40 percent of the national population, while the second group consisted of households predicted to belong to the upper 60 percent of the national population. In this report, these two groups are referred to as B40 and U60 (Yoshida et al, 2015). Twenty-one percent of the 3,300 households in this study belonged to the B40.

Using the Survey of Wellbeing via Instant and Frequent Tracking (SWIFT) approach, we first developed a consumption model for the Western Province using data from the 2012/13 Household Income and Expenditure Survey (Department of Census and Statistics, Sri Lanka, 2012). The model was designed to predict per capita household consumption based on a small number of easily observable independent variables, including the household's location, demographic characteristics, housing conditions, and durable asset ownership. Once the household survey in the Western Province had been completed, it was possible to predict the per capita consumption of the surveyed households using the estimated coefficients from the model and the data on the independent variables collected by the survey.

22. **The rest of the report is organized as follows.** Chapter 2 examines the population's health status and the physiological risk factors for NCDs. Chapter 3 explores behavioral and environmental risk factors. Chapter 4 reports patterns of health care use. In Chapter 5, the amount and distribution of out-of-pocket payments is explored. This is followed by Chapter 6, which examines gaps in the existing health system in terms of delivering effective care for NCDs. Finally, Chapter 7 presents conclusions and recommendations.

Chapter 2. Health Status and Physiological Risk Factors

Highlights:

- The prevalence of observed hypertension (26.1 percent) in the Western province is similar to the country's average while the prevalence of general obesity is 154 percent higher than the national average.
- The early onset of NCDs suggests that young adults live with ill-health for a considerable part of their life.
- NCDs are not diseases of the rich. The prevalence of obesity is substantial even among lower-income groups.
- The fact that so few people know their hypertensive status and that those diagnosed with hypertension have trouble managing their condition suggest gaps in effectiveness of preventive NCD care.
- Men and younger adults tend to forgo preventive health services.
- Obesity is a strong predictor of hypertension and diabetes in the province.
- Measuring abdominal obesity also captures general obesity whereas relying only on measures of general obesity is likely to exclude a significant proportion of at-risk individuals from public health initiatives.
- Measures of abdominal obesity may be better than measures of general obesity in predicting the risk of diabetes and hypertension.

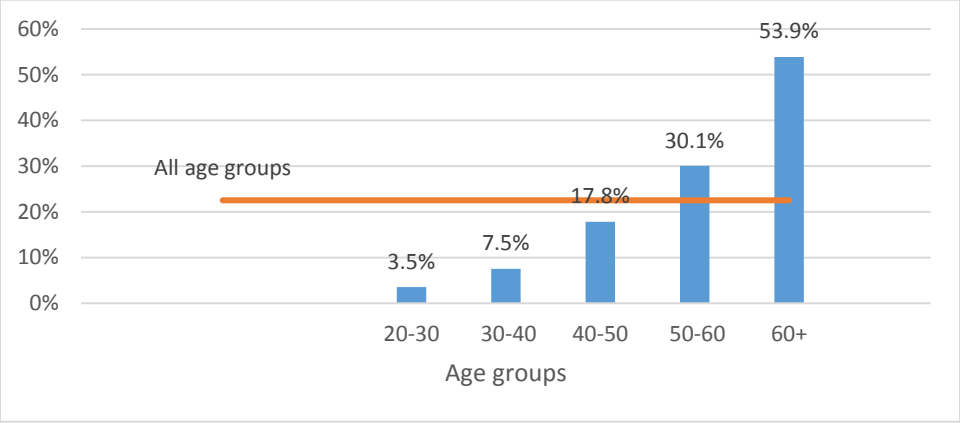
23. **This chapter examines the prevalence of NCDs and various risk factors and their distribution across different population groups in the Western province.** The framework for our analysis of risk factors comes from Pearson et al. (1993, pp 577-594) who distinguished three different categories of risk factors: (i) non-modifiable risk factors (such as age, sex); (ii) modifiable physiological risk factors (such as elevated blood pressure/ hypertension and overweight/obesity); and (iii) behavioral risk factors (such as smoking tobacco and harmful use of alcohol).[18] Behavioral risk factors and environmental risk factors are discussed in Chapter 3.

[18] Physiological risk factors are sometimes referred as metabolic risk factors and include high blood glucose levels (hyperglycemia) and high levels of fat in the blood (hyperlipidemia). Behavioral risk factors include physical inactivity and unhealthy diet (dietary cholesterol, saturated fat, and salt consumption). The survey used for this study did not look at these behavioral risk factors.

2.1 Prevalence and Distribution of Self-reported and Diagnosed NCDs

24. **Self-reported NCDs are concentrated among the elderly but their distribution across age groups indicate that they have an early onset.** NCDs are often associated with older age groups although young people are also vulnerable to the risk factors (WHO, 2017). More than one-fifth (22.5 percent) of the adult population in the Western province reported suffering from at least one NCD (Figure 2.1). Unsurprisingly, the prevalence of self-reported NCDs is highest among the elderly (those aged 60 or over), of whom more than half report having had an NCD (54 percent). However, almost 4 percent of adults between the ages of 20 and 30 also reported suffering from NCDs (4 percent). The prevalence of NCDs among young adults indicates a substantial loss of healthy life years in the province.

Figure 2.1. Prevalence of Self-reported NCDs



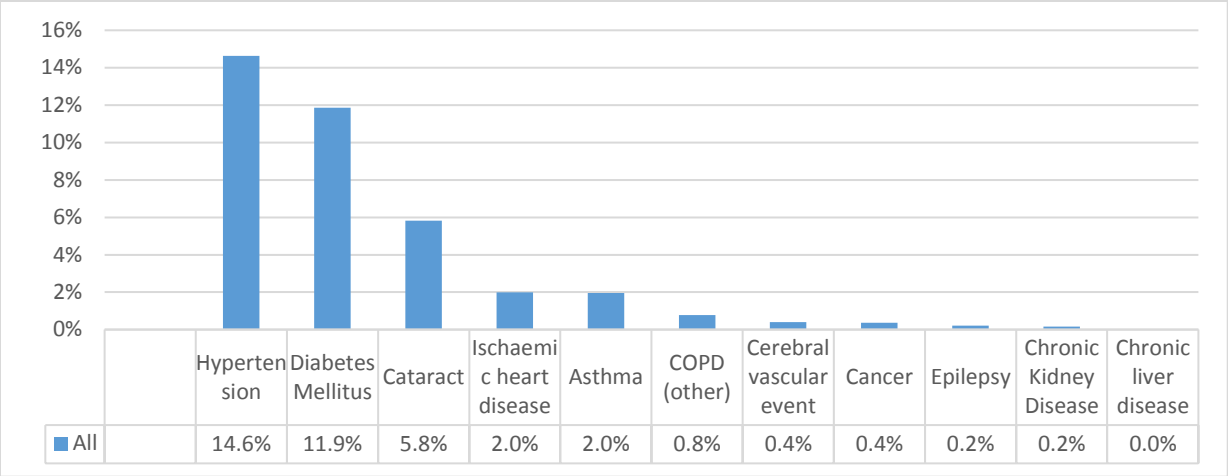
25. **The two most widespread diagnosed chronic conditions are hypertension (elevated blood pressure) and diabetes mellitus (high blood sugar).** As many as 15 percent and 12 percent of adults were diagnosed with hypertension and diabetes mellitus respectively (Figure 2.2). Other prevalent NCDs include cataracts[19] (6 percent), ischemic heart disease (IHD), and asthma (2 percent each). As mentioned earlier, in Sri Lanka, diabetes is one of the three leading causes of DALYs, while hypertension is one of the three risk factors that account for the greatest disease burden. Moreover, diabetes often coexists with hypertension, increasing the risk for life-threating CVDs.[20] The data show that one-in-ten adults in the province have at least two of the eleven diagnosed NCDs examined, while 17% of adults have only one of these eleven NCDs.[21]

[19] A cataract is a clouding of the lens of the eye that is associated with age, but it can also be a result of certain chronic diseases such as diabetes.

[20] In industrial countries, the risk of coronary heart disease is two to three times higher in diabetic patients aged over 40 years old (Vaughan et al, 1993).

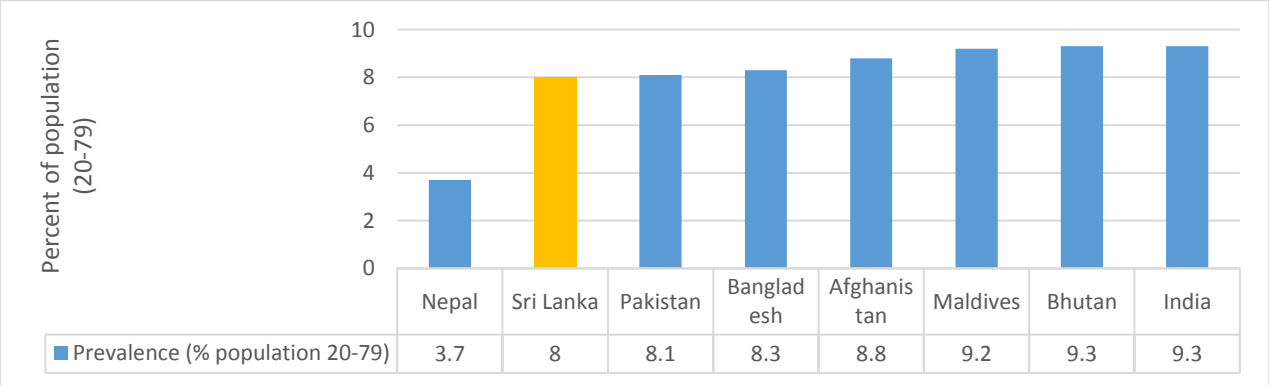
[21] These include chronic conditions such as cataracts and hypertension (a physiological risk factor). These are categorized as NCDs because they fulfill the definition of "a medical condition that is not transmissible."

Figure 2.2. Prevalence of Diagnosed Chronic NCDs



26. **The prevalence of diabetes in the province (12 percent) is higher than both the national average (8 percent) and the highest national average for other countries in the region (Figure 2.3).** It is important to understand what underlies this high prevalence as all types of diabetes mellitus (insulin-dependent, non-insulin dependent, and malnutrition-related) are likely to lead to complications later in life and thus to substantial economic costs. Studies show that increased food intake, obesity, and lack of exercise are associated with non-insulin dependent diabetes mellitus (Vaughan et al, 1993, pp 561-576). The association of diabetes with obesity and hypertension is explored in section 2.4 below.

Figure 2.3. Prevalence of Diabetes in South Asia

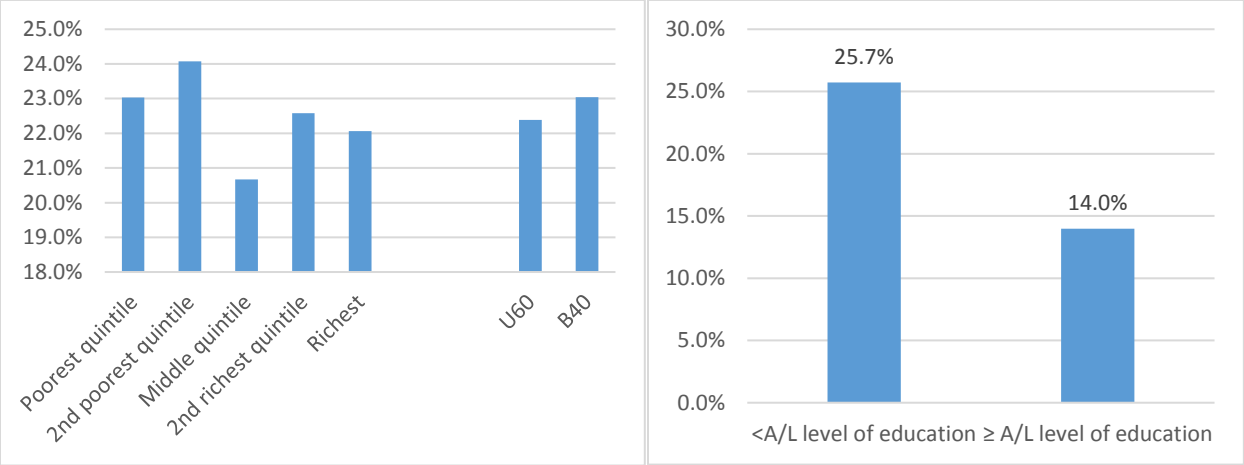


Source: World Development Indicators (2015)

Before embarking on a detailed analysis of the two most prominent physiological risk factors, in the remainder of this section, we examine the distribution of self-reported NCDs and the five most prevalent diagnosed NCDs/chronic conditions.

27. **The prevalence of self-reported NCDs does not vary with economic status but is higher among the less educated.** The prevalence of self-reported NCDs among the poorest quintile (23 percent) is not significantly different from the prevalence among the richest quintile (22 percent) (Figure 2.4). A regression analysis of the probability of self-reporting NCDs confirms this finding (Annex Table A2 and A3). With self-reporting, the less educated might under-report their actual ill-health due to lack of knowledge about what constitutes a healthy life. Contrary to this expectation, in our survey, a substantially higher proportion of adults who have not completed Advanced Level (A/L)[22] (26 percent) self-reported suffering from NCDs than those who have completed this level of education (14 percent). In the remainder of this report, individuals with an education below A/L level are referred to as less educated and those who have completed this level or higher are referred to as more educated.

Figure 2.4. Self-reported NCDs by Economic Status and Level of Education



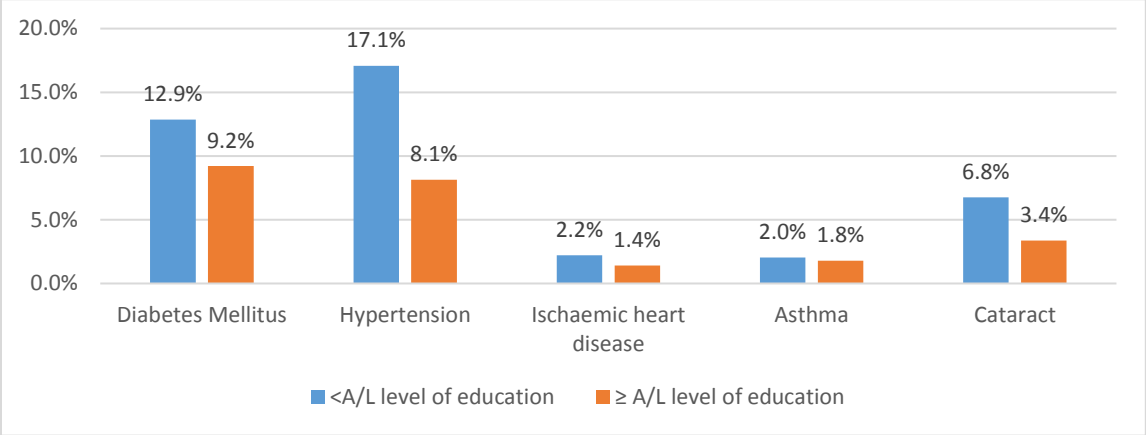
28. **The probability of being diagnosed with NCDs is not strongly associated with economic status, even after accounting for differences in a multitude of risk factors.** We estimated the probability of having each of these diagnosed NCDs using regression models and found no distinguishable difference between the B40 and U60 in the probability of self-reporting NCDs or being diagnosed with hypertension, IHD, asthma, or cataracts. There is also no clear economic gradient when economic status is measured by consumption quintiles (Annex Table A1, A2 and A3).

29. **The distribution of diagnosed NCDs collaborated our findings from the self-reports.** Specifically, we found that less educated adults in the province were more likely than more educated adults to have NCDs. This difference is statistically significant for diagnosed diabetes, hypertension, ischemic heart disease, and cataracts (Figure 2.5, Annex Table A1). This suggests that the difference in prevalence reflected in the self-reporting was not spurious. Higher NCD prevalence among the less educated may reflect the fact that the less educated are mostly older people who are biologically more prone to NCDs.

[22] Advanced Level is a General Certificate of Education qualification given after grade 13. This qualification is also used an entrance exam for Sri Lankan State universities.

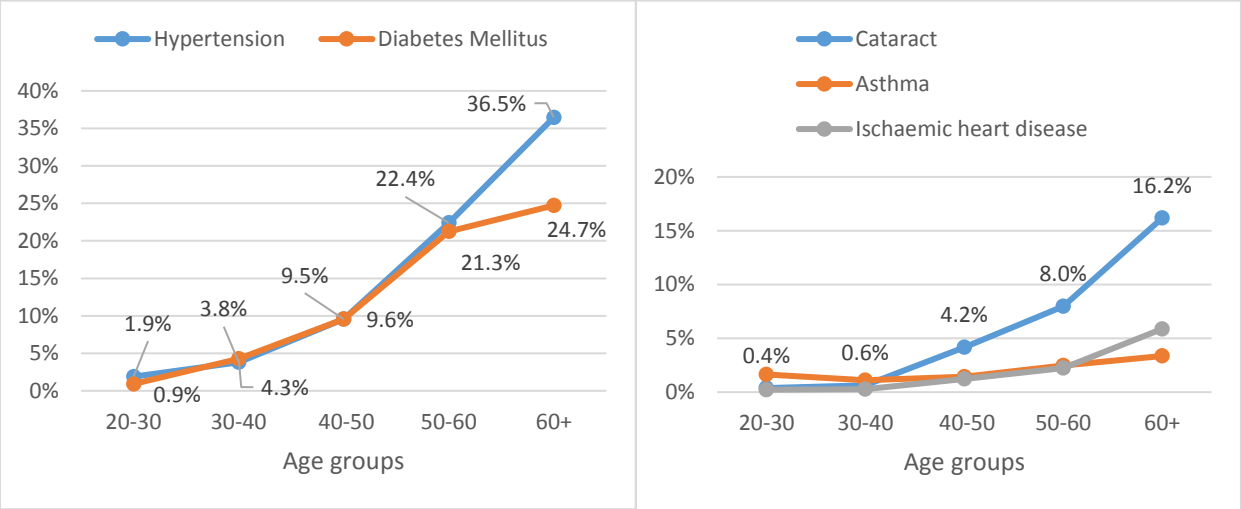
However, even after controlling for age, economic status and other risk factors, less educated adults are more likely to be diagnosed with or to self-report having NCDs (Annex Table A2).

Figure 2.5. Diagnosed NCDs by Education Level



30. **The early onset of NCDs is also evident from the data on diagnosed NCDs, suggesting that young adults live with health conditions for a substantial part of their lives.** As expected, the prevalence of almost all NCDs is higher among the elderly (those aged 60 or older) than younger adults (aged 20 to 59) (Annex Table A1). As many as 37 percent of the elderly have been diagnosed with hypertension and 25 percent with diabetes. This is not unexpected. However, a 10 percent prevalence of diabetes and hypertension among those aged 40 to 50 is substantial (Figure 2.6). Albeit at a lower rate, these and other NCDs also affect adults as young as 20 to 30 years of age.

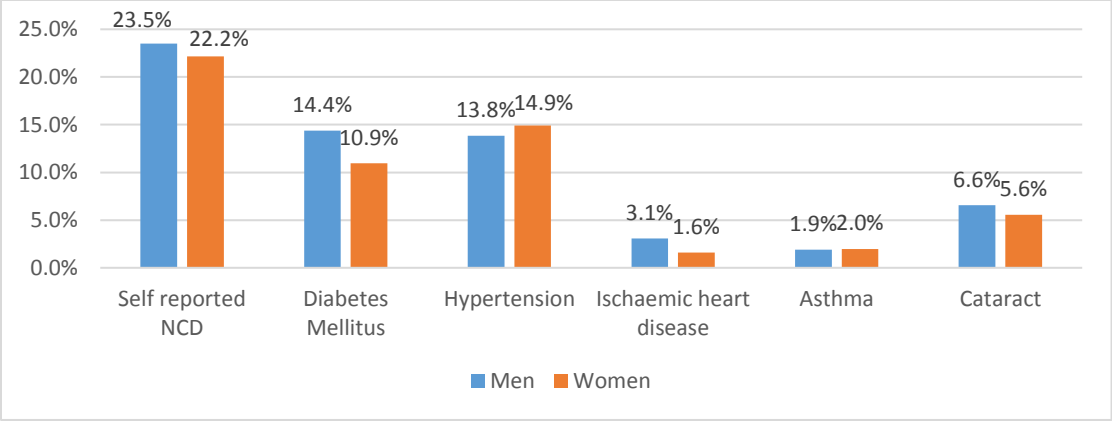
Figure 2.6. Prevalence of Diagnosed NCDs across Age Groups



31. **Gender differences in the prevalence of diagnosed NCDs suggest that men tend to forgo preventive care (Figure 2.7).** Men are more likely to be diagnosed with IHD than women and less likely to

self-report NCDs or to be diagnosed with hypertension and cataracts (Annex Table A2). The higher probability of being diagnosed with IHD is consistent with our finding that men are more likely to practice behavioral risk factors such as smoking (as discussed in Chapter 3). The finding that men are less likely to be diagnosed with hypertension is at odds with the higher prevalence of smoking and harmful alcohol use among men.[23] Our investigation of actual hypertension in section 2.2 showed that men are in fact more likely to be hypertensive, suggesting that their lower probability of being diagnosed with hypertension is an indication that they are forgoing care.

Figure 2.7. Prevalence of Self-reported and Diagnosed NCDs by Gender



2.2. Hypertension (Elevated Blood Pressure)

32. **Hypertension is a defining characteristic of a wide range of disorders of the circulatory system,** including coronary heart disease, stroke, peripheral vascular diseases, and hypertensive heart disease. It is one of the three risk factors that account for most of the disease burden in Sri Lanka (IHME, 2017). Elevated blood pressure negatively affects arteries, the heart, and the kidneys. It increases the risk of both stroke and coronary heart disease.[24] As a result, managing blood pressure is critical in preventing CVDs. This sub-section uses data from the biomarker section of the survey to analyze the actual prevalence and distribution of hypertension. Comparing these data with the data on diagnosed prevalence will help to quantify the extent of forgone care, new cases of hypertension, and the extent of patients' awareness of their health conditions.

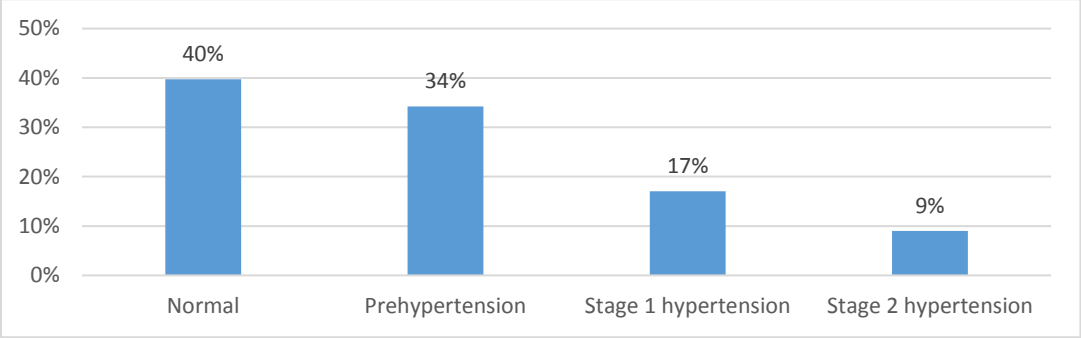
33. **The prevalence of observed hypertension, 26.1 percent, in the Western province is similar to the country's average** (Figure 2.8). The average systolic and diastolic blood pressure among the survey respondents was 125.5 and 79.4 mmHg, respectively. This is very similar to the average for Sri Lanka (125.1 and 80.5, respectively) as reported in WHO's most recent STEPS survey (WHO, 2015b). The need for early

[23] Higher obesity among women is, however, consistent with this finding.

[24] This risk is seen even in normal ranges for diastolic blood pressure, which puts into question the current cut-off for defining hypertension (Pearson et al, 1993, pp 577-594).

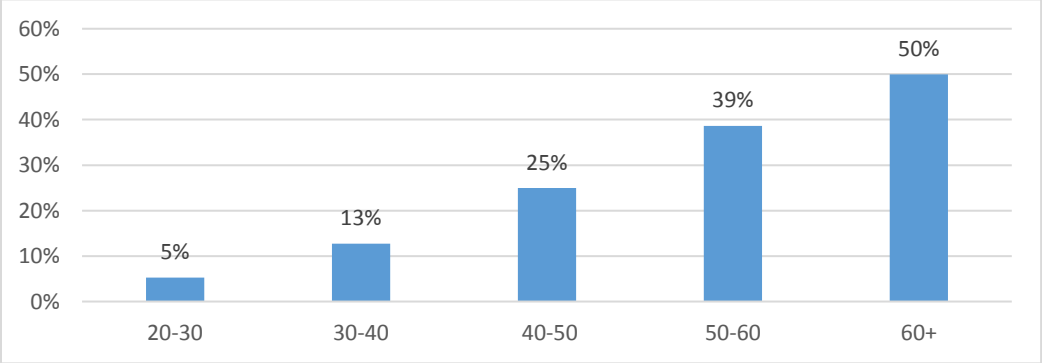
detection and management of blood pressure is obvious given that an additional 34 percent of adults were in the pre-hypertensive stage.

Figure 2.8. Observed Hypertension (% of adults)



34. **Although the prevalence of hypertension is concentrated among the elderly, its onset is very early.** As many as half of the elderly and a fifth of the population under the age of 60 were found to be hypertensive. The high concentration of hypertension among the elderly is consistent with the findings of WHO's 2015 STEPS Survey (WHO, 2015b), which reported a prevalence of 57 percent among those aged 60 to 69 years. What is particularly worrying in the Western province, however, is the early onset of hypertension (Figure 2.9).

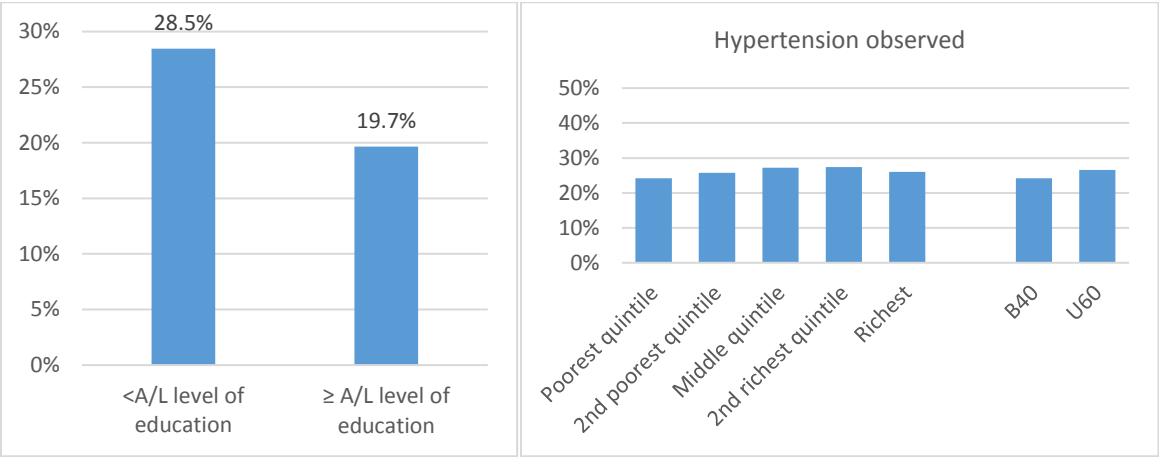
Figure 2.9. Observed Hypertension by Age Groups



35. **There is no difference in hypertension prevalence across socioeconomic groups** (between the B40 and U60 nor between the poorest 20 percent and richest 20 percent). However, consistent with the distribution of diagnosed hypertension, we found observed hypertension to be significantly higher among those who had not completed the A/L level of education (28 percent) than those who had (20 percent). However, as shown below, this difference does not seem to reflect differences in awareness of necessary preventive measures. After controlling for age, economic, and cultural factors, there is no difference in the probability of being hypertensive between the less and more educated. The simple difference in Figure

2.10 seems to be driven by the fact that the less educated are mostly the elderly, with 31 percent of the under-60s having at least an A/L level of education compared with only 13 percent of the elderly.

Figure 2.10. Observed Hypertension by Education Level and Economic Status



36. **After accounting for multiple socioeconomic factors, the probability of hypertension is still higher among men, the obese, and older age groups.**[25] Following the conceptual framework mentioned earlier, we included obesity and three measures of behavioral risk factors (daily smoking, daily betel chewing, and harmful alcohol consumption)[26] to test whether these factors are associated with hypertension (Annex Table A5). Our findings indicate the following. First, men are 5 percentage points more likely to be hypertensive than women. This is consistent with the descriptive analyses but is at odds with the indistinguishable difference for the whole of Sri Lanka. According to the 2015 STEPS survey (WHO, 2015b), the prevalence of hypertension among men is 25 percent, while it is 27 percent among women. Second, those who are obese are 9 percentage points more likely to be hypertensive than those who are not.[27] Third, there is a systematic age gradient in hypertension prevalence. The prevalence is the lowest among the reference group (20 to 30 years old) and the probability increases with each 10-year age interval.

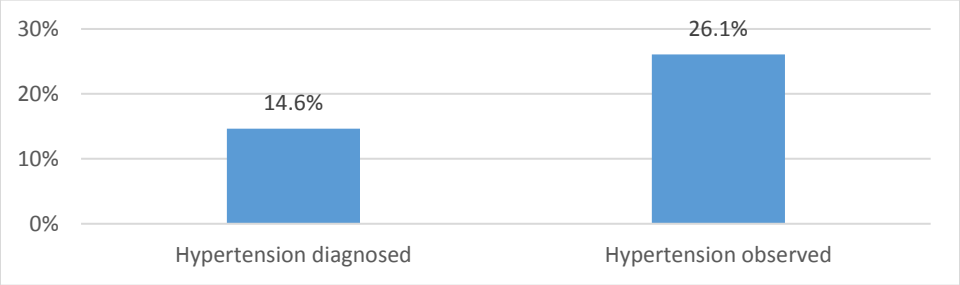
37. **The regression analysis also revealed that hypertension is not a disease of the rich nor does it vary with education level.** As in the descriptive analyses, there was no significant association between both measures of economic status and hypertension. Interestingly, after controlling for multiple socioeconomic and demographic factors, we found no difference in prevalence between the less educated

[25] Residents of urban areas and Kalutara district are also more likely to be hypertensive. Urban residents are 3 percentage points more likely to be hypertensive than rural residents. Residents of Kalutara are 13 percentage points more likely to be hypertensive than those in Colombo, while Gampaha residents are 6 percentage points less likely to be hypertensive than those in Colombo.
[26] These risk factors are discussed in detail in Chapter 3.
[27] None of the behavioral risk factors were significantly associated with hypertension. The reason why the two established risk factors (smoking and risky alcohol consumption) were not significantly associated with hypertension may be due to power issues. As will be discussed later, the prevalence of daily smoking and risky alcohol consumption in this sample is only 3 percent and 2 percent respectively.

and the better educated. It could be that the bivariate difference across education level reflected the fact that older people (who have a higher prevalence of hypertension) have lower educational levels.

38. **Comparing diagnosed and observed measures of hypertension suggests that a significant number of adults in the province are not receiving preventive primary care.** A substantial proportion of adults who had observed hypertension (70 percent) were unaware that they had hypertension. According to the respondents' own health records, only 14.6 percent of adults had been diagnosed as being hypertensive, but the observed measures of hypertension indicated that 26.1 percent of the respondents actually had hypertension (Figure 2.11).[28] Again, it is possible that our diagnosed hypertension data were under-estimated because some respondents could not provide health records, in which case the gap between observed hypertension and actual diagnosed hypertension would be smaller than these figures suggest.[29] This difference suggests either that a significant proportion of adults are not aware of their recent health conditions or that these individuals have had hypertension for a long time and have not sought medical care recently. Regardless of the explanation, the findings suggest that a significant number of adults are not receiving any preventive primary care.

Figure 2.11. Diagnosed versus Observed Prevalence of Hypertension



39. **Effective management of diagnosed hypertension also appears to be a challenge in the province.** Figure 2.12 shows the proportion of all adults who were observed to be hypertensive, diagnosed with hypertension, and medically treated for hypertension (in the previous two weeks) and those who had it under control (in other words, had been diagnosed but were not observed to be hypertensive in the survey).[30] While 15 percent of adults had been diagnosed with hypertension, only half of them (7 percent) have controlled it. Of the 7 percent, 5 percent controlled hypertension with medication and 2 percent did not use medication. Most of those who were not controlling their hypertension, however,

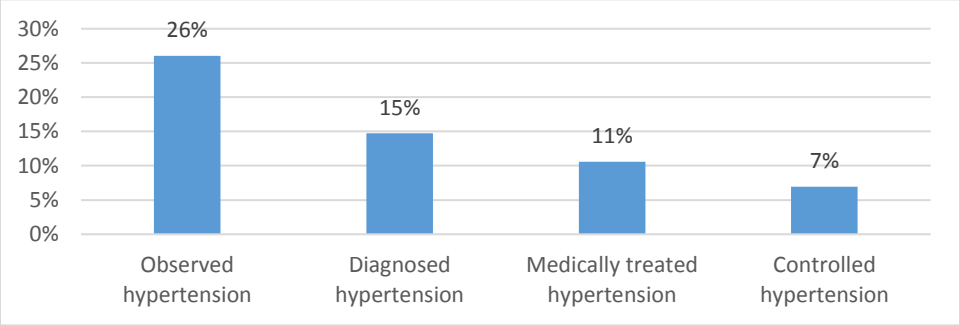
[28] Sixty-seven percent of adults were neither observed to be nor diagnosed as hypertensive.

[29] In fact, the data show that 4.1 percent of adults (266) were considered to have not been diagnosed although they self-reported having been treated with drugs for hypertension in the previous two weeks. This discrepancy could partly be due to our inability to verify their diagnosis. If these adults were to be considered as having been diagnosed, then diagnosed hypertension would increase from 14.6 percent to 18.6 percent, still leaving 8 percentage point difference between diagnosed and observed hypertension.

[30] This was calculated in the sub-sample of observations for which all four variables were non-missing. As such, the figures are slightly different (in decimal points). Moreover, to maintain consistency with the protocol for diagnosis, the 4.1 percent who reported receiving treatment even though we could not verify their diagnosis are assumed not to have been treated. If we had not done this, self-reported treatment in the previous two weeks would have been 15 percent.

were also on medication, suggesting patient non-adherence or ineffective drugs.[31] Together with the fact that observed hypertension is 11 percentage points higher than diagnosed hypertension, these findings suggest that NCDs are not being well-managed and there are significant gaps in care.

Figure 2.12. Diagnosis, Treatment, and Control of Hypertension



What are the characteristics of those who are not aware of their conditions?

40. **Men and younger adults seem to forgo preventive adult healthcare.** The prevalence of observed hypertension is higher than diagnosed hypertension across all sub-groups, but more so among men and younger adults (Table 2.1). The prevalence of diagnosed hypertension is not significantly different between men and women. However, observed prevalence is substantially and statistically significantly higher among men (34 percent) than women (23 percent). Furthermore, while the prevalence of observed hypertension among women is 56 percent higher than diagnosed prevalence, it is 148 percent higher among men. Similarly, observed prevalence among the under-60s is 128 percent higher than diagnosed prevalence, while it is only 37 percent higher among the elderly.

[31] Of the 8 percent adults who were not controlling their diagnosed hypertension, 6 percent were on medication and 2 percent were not treated with medication in the past 2 weeks.

Table 2.1. Distribution of Diagnosed and Observed Hypertension

	Hypertension	
	Diagnosed	Observed
All	14.6%	26.1%
Sex		
Male	13.8%	**34.2%**
Female	14.9%	**23.3%**
Sector of residence		
Rural	14.4%	25.5%
Urban	15.0%	26.9%
Economic status		
U60	14.4%	26.6%
B40	15.6%	24.2%
Poorest quintile	15.5%	24.2%
2nd poorest quintile	15.1%	25.8%
Middle quintile	12.4%	27.2%
2nd richest quintile	14.7%	27.4%
Richest	15.3%	26.0%
Educational level		
Below A/L	**17.1%**	**28.5%**
At least A/L	**8.1%**	**19.7%**
Age group		
Age <60	**8.5%**	**19.4%**
Age>60	**36.5%**	**49.9%**
District of residence		
Colombo	15.0%	**26.8%**
Gampaha	13.9%	**19.2%**
Kalutara	15.3%	**36.8%**

Note: Figures in bold show statistically significant difference in means between categories (p-value<0.1). See Annex Table A4 for different stages of hypertension.

41. **In order to analytically understand the characteristics of those who are (not) aware of their** hypertensive status, we estimated a probit regression for the sample of individuals who were found to be hypertensive. We constructed the 'awareness' variable using the difference between observed hypertension and diagnosed hypertension (Annex Table A5).

42. **Younger adults are less likely than older adults to be aware of their hypertensive status (Annex Table A5).** Among those categorized as hypertensive, we found younger adults to be less likely to be aware of their conditions than the elderly. The elderly were about 60 percentage points more likely to be aware of their hypertensive status than those aged 20 to 30. Higher use of care among the elderly (as shown in Chapter 4) and the targeting of this age group for disease screening seem to have contributed to this pattern.

43. **Men are more likely to be hypertensive but less likely to be aware of it, which suggests that they are not receiving sufficient preventive primary care.** Consistent with what was pointed out earlier, we found that men in the province were 13 percentage points less likely than women to be aware of their hypertensive status. The focus group discussions that we held as part of the study revealed that most adult men in the province did not seek preventive care to manage a risk factor or to delay the onset of diseases. Primary care facilities where such screening services are most likely to be provided are mainly used by the elderly, women, and mothers. Our regression analysis of patterns of utilization, discussed in Chapter 3, also showed that use of outpatient care is lower among men than women.

44. **The poorest and richest adults are more aware of their hypertensive status than those in the middle.** While there is no difference in awareness between the poorest and the richest 20 percent of consumption expenditure, the poorest are more likely to be aware than the middle three consumption quintiles. Moreover, those belonging to the B40 of the national consumption expenditure distribution are 8 percentage points more likely to be aware of their hypertensive status than those in the U60.

45. **Awareness does not vary with education status and place of residence.** Contrary to what might be inferred from Table 2.1 (a comparison of diagnosed and observed hypertension), whether or not individuals have at least an A/L level of education is not associated with awareness of their hypertensive status. Awareness is also not significantly different between those who live in Kalutara (the district with the highest prevalence of hypertension) and other districts. Moreover, despite the higher concentration of health facilities in urban areas, urban residents are not more aware than rural residents about their hypertension status.

2.3. Obesity

46. **Obesity is another vital physiological risk factor for cardiovascular diseases.** Overweight and obesity increase the risk of high blood pressure (as shown in the previous section) and high cholesterol, thereby increasing the likelihood of heart diseases and stroke. They also increase the risk of type II diabetes in adults (WHO, 2008a and Shaten et al, 1993). In addition to general obesity, abdominal obesity is a predisposing factor for CVDs, which are the main cause of obesity-related deaths (WHO, 2008a). Abdominal obesity is related to a range of metabolic abnormalities, including several risk factors for type II diabetes and CVDs (decreased glucose tolerance, reduced insulin sensitivity, and adverse lipid profiles).

47. **Our data showed that the Western province has a 154 percent higher prevalence of general obesity than the Sri Lankan average.** Table 2.2 presents the estimated prevalence of obesity in the Western province and the average for Sri Lanka based on WHO's 2015 STEPS survey (WHO, 2015b). As many as 15 percent of adults in the Western province were generally obese. This is mainly driven by the high prevalence among women (17 percent, which is significantly higher than that of men (8 percent).[32] The gender difference is also reflected in the averages for Sri Lanka as a whole. This difference is both substantial and statistically significant.

[32] Even after adjusting for differences in height, men have greater total lean mass and bone mineral mass and a lower fat mass than women (WHO, 2008a).

Table 2.2. Prevalence of General and Abdominal Obesity

	Sri Lanka			Western province			
	All	Women	Men	All	Women	Men	t-test for difference in means (Women=Men)
General obesity (BMI≥30)	5.9%	8.4%	3.5%	15%	17%	8%	***
Abdominal obesity							
WHR (WHO cut-off))				75%	75%	76%	
WC (IFD cut-off)				57%	65%	34%	***
WC (WHO cut-off)				29%	37%	7%	***

48. **The high prevalence of obesity could be a result of unhealthy diet and/or physical inactivity.** The 2015 WHO STEPs survey (WHO, 2015b) found that 30 percent of Sri Lankan adults aged 18-69 have insufficient physical activity (defined as less than 150 minutes of moderate-intensity activity per week) (Table 2.3). The gender difference in obesity seems to be a reflection of differences in physical activity. 38 percent of women have insufficient physical activity, which is significantly higher than that of men (23 percent). Unhealthy diet appears to be another factor contributing to obesity. More than a quarter of adults (26.6 percent) always or often eat processed foods high in salt, and about 73 percent of adults, on average, eat less than the daily recommended amount of fruits and vegetables (i.e 5 servings of fruit and/or vegetables per day). It is important to note that being the most urbanized and affluent province, physical inactivity and reliance on processed foods in the Western province could be much higher than the average for Sri Lanka.

Table 2.3. Diet and Physical Activity in Sri Lanka (Age 18-69)

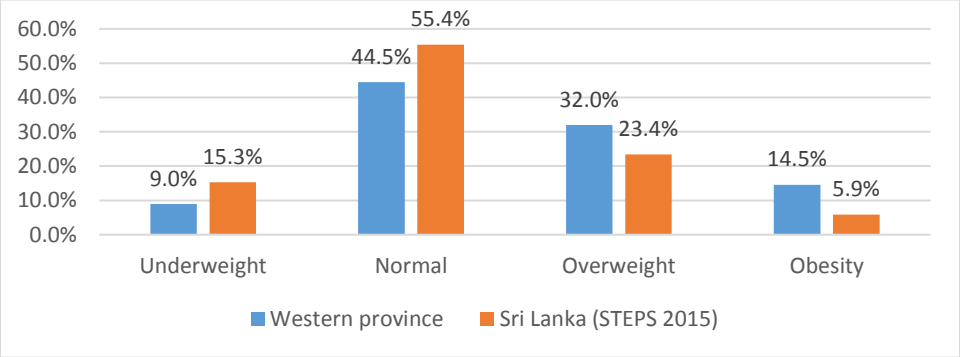
	All	Men	Women
Percentage who ate less than 5 servings of fruit and/or vegetables on average per day	72.5	73.1	72
Percentage who always or often add salt or salty sauce to their food before eating or as they are eating	21.8	21.8	21.8
Percentage who always or often eat processed foods high in salt	26.6	28.3	24.8
Percentage with insufficient physical activity (defined as <150 minutes of moderate-intensity activity per week)	30.4	22.5	38.4
Median time spent in physical activity on average per day (minutes)	77.1	124.3	42.8
Percentage not engaged in vigorous activity	73.6	58.3	89.2

Source: *WHO STEPs survey 2015 (WHO, 2015b)*

49. **The problem of abdominal obesity is also much higher in the Western province than in Sri Lanka as a whole.** The average waist circumference of men and women is 86.4cm and 84.8cm respectively.[33] Both are significantly higher than the Sri Lanka average (82.3cm for men and 82.1cm for women).[34] Using the aforementioned IFD WC cut-off point for South Asia, as much as 65 percent of women and 34 percent of men in the province have abdominal obesity. The proportion is lower using the non-ethnic specific WHO cut-off point. However, both indicate that the potential risk of metabolic complication is very high, especially among women for whom both abdominal and general obesity are a significant problem. The magnitude of the problem is even higher if WHR is considered, with about three-quarters of both men and women being at risk of abdominal obesity.

50. **Comparing the Western province with the national average also reveals that underweight prevalence is less widespread while obesity is more common.** Nearly half of adults (47 percent) in the Western province are either overweight or obese, while only 9 percent are underweight. For Sri Lanka, as a whole, a much smaller proportion (30 percent) of adults aged between 18 and 69 are either overweight or obese (with a BMI equal to or over 25), but a much higher proportion (15 percent) are underweight (Figure 2.13). This comparison and the finding that 57 percent of adults in the Western province are abdominally obese further strengthen the claim that obesity is a significant public health issue in the province. Sedentary lifestyles and unhealthy diets may have contributed to this.

Figure 2.13. Comparing the Western Province with the Average for Sri Lanka

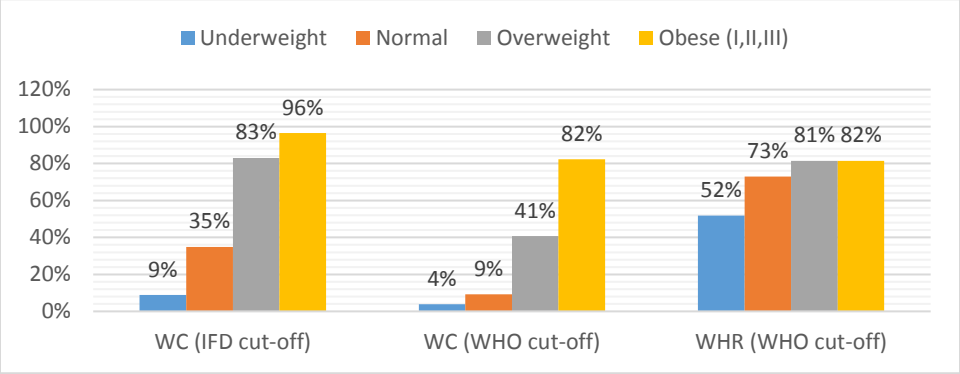


51. **A substantial proportion of adults who have a normal BMI have abdominal obesity, and this is the case even among those who are underweight, which suggests that relying only on BMI will undermine the effectiveness of public health initiatives on obesity.** Figure 2.14 shows an interesting distribution of abdominal obesity across levels of BMI. As expected, the prevalence of abdominal obesity increases with increasing BMI. What is perhaps more interesting in Figure 2.14 is that 35 percent of those who have a normal BMI (between 18.5 and 25) have abdominal obesity.[35] While this is worrying enough as it is, the WHR story is even worse. Close to three-quarters of adults within a normal BMI range have higher WHR than the cut-off point for a substantially increased risk of metabolic complications. This

[33] The average across all adults is 85.2cm.
[34] The differences are statistically significant (non-overlapping confidence intervals).
[35] This declines to 9 percent in the case of the standard WHO cut-off point for WC.

suggests that, in the case of the Western province, public health interventions should not be based entirely on people's BMI.

Figure 2.14. Abdominal Obesity Distribution across BMI Categories

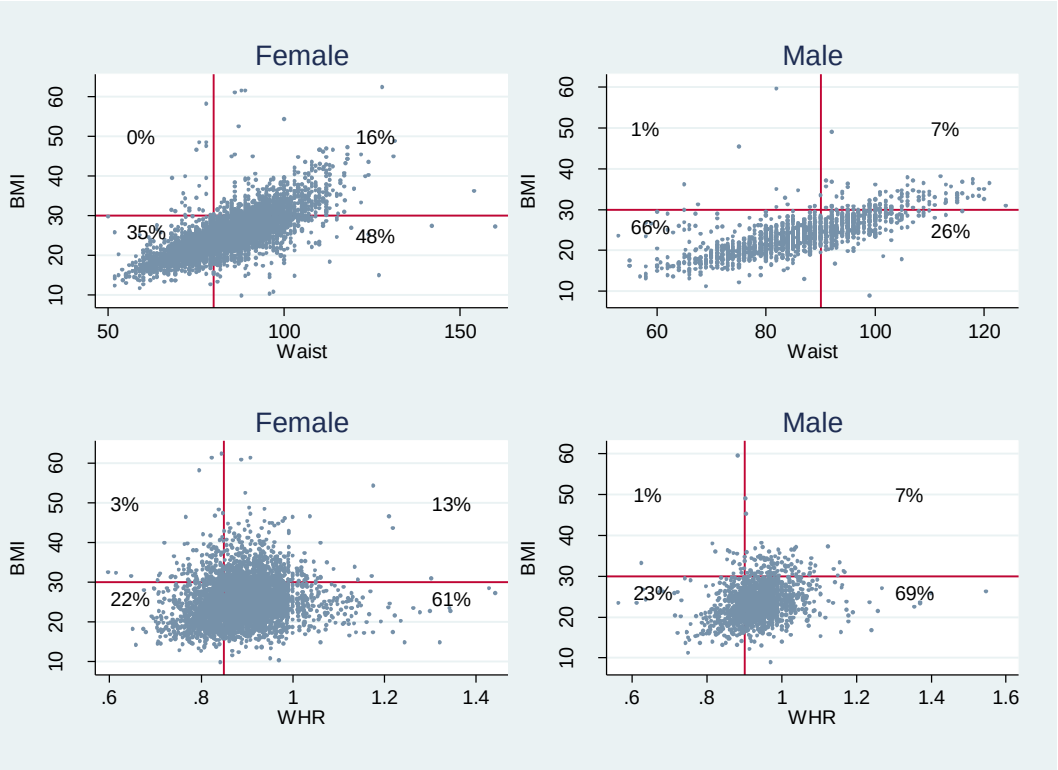


52. **Is measuring abdominal obesity better for identifying at-risk individuals (those with either general or abdominal obesity) than just using BMI-based obesity?** What proportion of adults have both forms of obesity? Figure 2.15 splits the whole sample into four quadrants. Each dot in the figure represents a woman or a man. Observations above the red horizontal line (BMI of 30) have general obesity and those below do not. Similarly, observations to the right of the red vertical line have abdominal obesity.[36] The numbers in each graph show the proportion of women/men: (i) who have both general obesity and abdominal obesity (right upper quadrant); (ii) who have neither (left lower quadrant); (iii) who have general obesity but not abdominal obesity (left upper quadrant); and (iv) who do not have general obesity but have abdominal obesity (right lower quadrant).

53. **Measures of abdominal obesity may be better at identifying at-risk individuals than BMI alone.** About 16 percent of women and 7 percent of men have both forms of obesity, while 35 percent of women and 66 percent of men have neither general nor abdominal obesity.[37] The remaining individuals are obese in either of the two forms. Interestingly, the lion's share of these are individuals who have abdominal obesity but not general obesity.[38] For example, close to zero percent of women have a BMI above 30 and a WC below 80cm. However, almost half of women have a BMI below 30 but a WC above 80cm. The pattern is the same for men and holds true when using the WHR cut-off for judging abdominal obesity. These findings reinforce our finding that measures of abdominal obesity may be better at identifying at-risk individuals than BMI alone. It is also easier to measure WC and WHR in the field than measuring BMI as the latter requires weighing scales.

[36] Those with a WC of 90cm for men and 80cm for women according to the IFD cut-off point in the first row of graphs and a WHR of 0.9 for men and 0.85 for women according to the WHO cut-off point in the second row of the graphs.
[37] This proportion declines to 22 percent (women) and 23 percent (men) when using the WHR cut-off for abdominal obesity.
[38] We also tested whether there is a statistically significant difference in the prevalence of abdominal obesity between those who have general obesity and those who do not. As expected, we found that the prevalence was significantly higher among the former group.

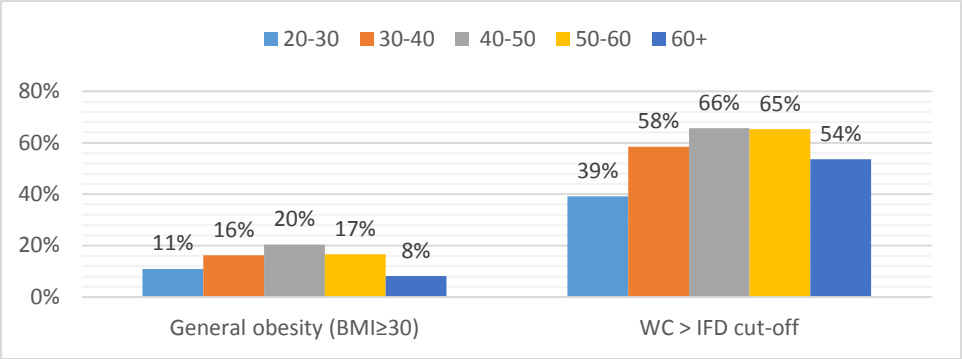
Figure 2.15. General and Abdominal Obesity (% of women and men)



Distribution of Obesity across Groups: Beyond Gender Differences

54. **Obesity is highly prevalent even among supposedly active age groups** (Figure 2.16). To explore the distribution of obesity (general and abdominal) and underweight across population groups other than men and women, we carried out a series of descriptive and analytical (multivariate) analyses. We found that as many as 39 percent of young people aged between 20 and 30 had abdominal obesity, while about 11 percent had general obesity. The prevalence of both forms of obesity increases in the subsequent age groups, reaching a maximum level in the 40 to 50 age group and declining thereafter. With both measures of obesity, adults under 60 are at a higher risk of diseases associated with body fat than those aged 60 or over (Annex Table A6). As physical activity often declines after the age of 60, the explanation for higher obesity among the under-60s may be related to diet rather than physical inactivity.

Figure 2.16. Obesity by Age Groups



55. **The prevalence of obesity is consistently high across economic groups.** The economically worse-off have a similar level of general obesity and a slightly lower prevalence of abdominal obesity than the better-off (Figure 2.17). Among the poorest 20 percent, the prevalence of abdominal obesity is 52 percent, while it is 65 percent among the richest 20 percent. However, with 52 percent of the B40 (and of the poorest quintile) being abdominally obese, the problem of obesity is of concern even among the economically disadvantaged. This is further corroborated by our finding that there was no meaningful difference in the prevalence of general obesity between the B40 and the U60 or between the poorest 20 percent and the top 20 percent (Annex Table A6). However, the prevalence of underweight is largely concentrated among the poorest quintiles (Figure 2.18).

Figure 2.17. Obesity by Economic Status

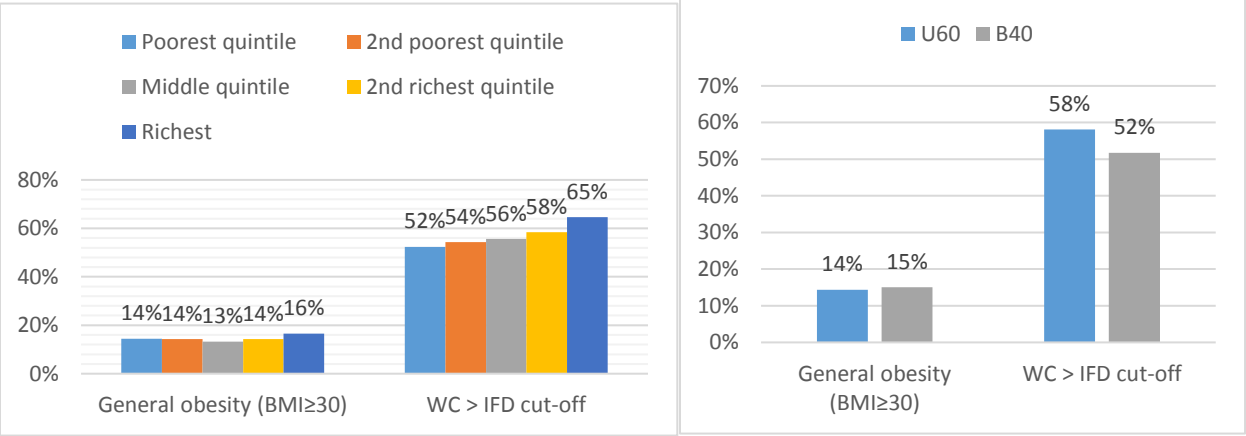
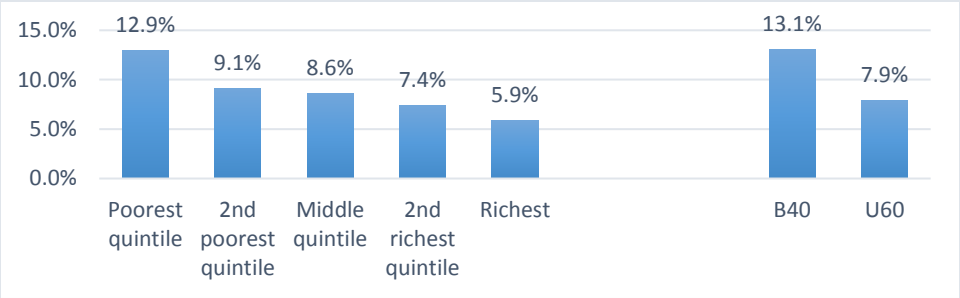


Figure 2.18. Underweight by Economic Status



56. **Some of the descriptive differences between groups may reflect differences in other socioeconomic and demographic characteristics.** Therefore, in order to identify the factors associated with obesity and underweight, we estimated a probit regression for: (i) the probability of having general obesity[39]; (ii) the probability of having abdominal obesity (according to the IFD-based WC cut-off point); and (iii) the probability of being underweight. Annex Table A7 presents the marginal effects from a specification akin to the one presented in Annex Table A5.

57. **We found that women and adults aged between 30 and 60 are more likely to be obese than men and other age groups, respectively.** Even after controlling for various socioeconomic and behavioral factors, men are 15 percentage points less likely to have general obesity than women and about 32 percentage points less likely to have abdominal obesity. The probability of being underweight is, however, similar between the two genders. Regarding age categories, obesity appears to be more prevalent among those aged between 30 and 60, while underweight is concentrated among the elderly and those between 20 and 30 years of age.

58. **The richest are at a higher risk of obesity and at a lower risk of having underweight-related health problems.** The probability of being underweight is negatively associated with economic status. The B40 have 7 percentage points higher probability of being underweight than the U60. The alternative specification also showed that this probability decreases from lower to higher consumption expenditure quintiles. With respect to obesity, the income gradient is not systematic, but the richest 20 percent are much more likely to be obese than the poorest 20 percent. The B40 are 6 percentage points less likely to be abdominally obese but are as likely to have general obesity as the U60.

59. **Adults who have completed at least an A/L level of education are about 6 percentage points less likely to be generally obese and 4 percentage points less likely to be underweight as those who are less educated.** Differences in education levels can lead not only to differences in economic status but also to differences in knowledge about health. Since our analyses accounted for differences in economic

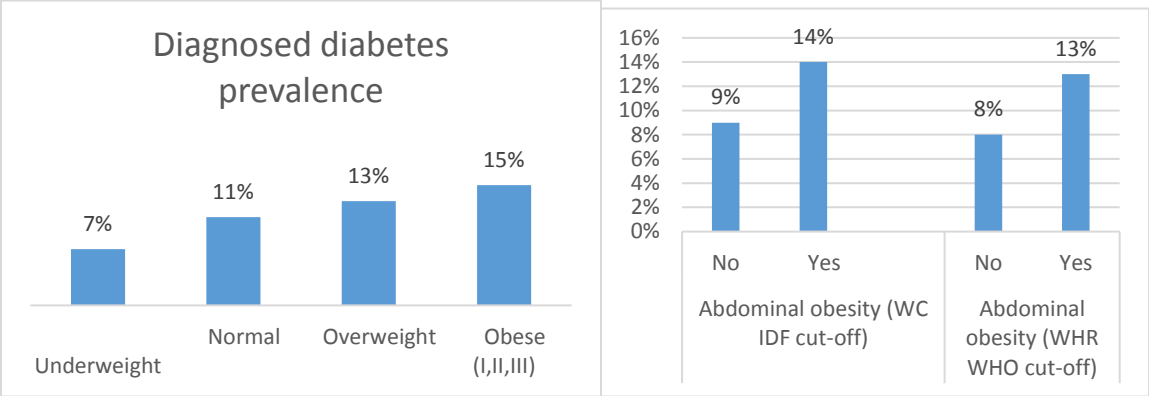
[39] The regression is on the subsample of individuals who are either obese or are normal weight.

status, the lower probability of obesity and underweight among the educated is likely to be due to their greater awareness about the benefits of proper diet and physical activity.[40]

2.4. Obesity as a Risk Factor for Diabetes and Hypertension

60. **Adults with general or abdominal obesity have a significantly higher risk of getting diabetes than those who are not obese.** Those who have general obesity have 36 percent higher prevalence of diagnosed diabetes (p-value<0.05) than those with a normal BMI (Figure 2.19). Depending on the measure used, the abdominally obese also have 55 percent (p-value<0.05) to 63 percent (p-value<0.01) higher prevalence of diagnosed diabetes than those with a normal BMI.

Figure 2.19. Obesity as a Risk Factor for Diabetes



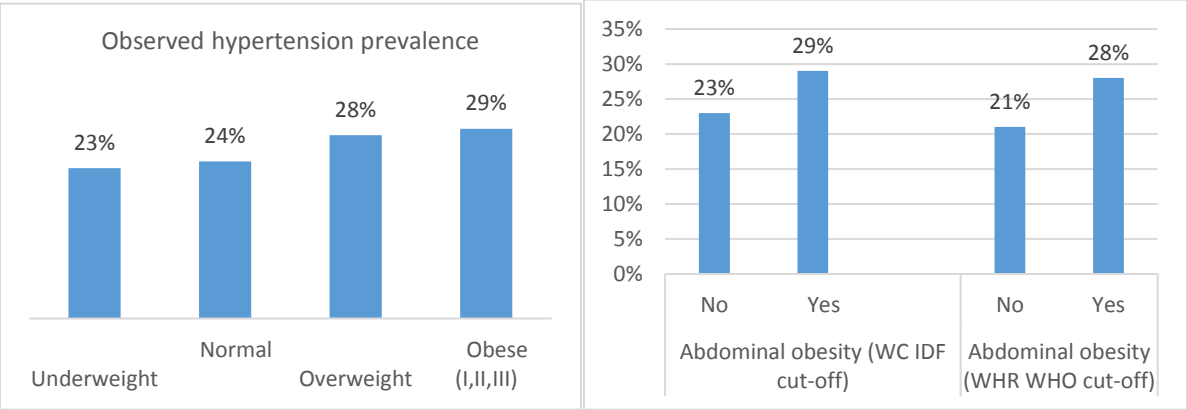
61. **There is a strong positive association between all forms of obesity and diabetes even after accounting for hypertension and various socioeconomic and demographic factors.** Although the association of obesity with diabetes has been long established, it is important to understand whether the positive association remains after accounting for differences in other risk factors, including hypertension. All three anthropometric measures of obesity used in this study have been found to be predictors of the risk of diabetes and CVDs (Qiao and Nyamdorj, 2010 and Huxley et al, 2010). In this study, we examined the association of diabetes with each of the three measures of obesity separately in a multivariate regression framework (Annex Table A8). We found that adults with general obesity are 2.3 percentage points more likely to be diagnosed with diabetes than those who are not obese. This positive association was even stronger with measures of abdominal obesity. Those with a WC higher than the cut-off suggested by the IFD were 5 percentage points more likely (than those with WC below the cut-off) to be diagnosed with diabetes. Similarly, adults with WHR greater than the WHO based cut-off point were 2.7 percentage points more likely (than those with WHR less than the cut-off) to be diagnosed with diabetes.

[40] In fact, the results for abdominal obesity suggest this. The significant positive association with education (column 3 of Annex Table A7) vanishes once a more refined measure of economic status is employed (consumption quintiles in column 4). This suggests that part of the information contained in the education variable relates to economic status. Since economic status works in the opposite direction, the actual association of obesity with awareness is likely to be more significant than is portrayed by the results presented here.

Moreover, the probability of being diagnosed with diabetes was 3.5 percentage points higher among those who were hypertensive than those who were not.

62. **Similarly, we found that adults with general or abdominal obesity had a significantly higher relative risk of having hypertension than those who were not obese.** Figure 2.20 shows the prevalence of hypertension across all BMI categories and by abdominal obesity status. It shows that hypertension prevalence was 21 percent higher (p-value<0.05) among adults with general obesity than among those with a normal BMI. Depending on the measure used, the abdominally obese have a 26 to 33 percent higher prevalence of hypertension than those with a normal WC and WHR (p-value<0.01). Even after accounting for other risk factors, obesity and hypertension are strongly associated (Annex Table A9). Those with either form of obesity (general and abdominal) are 9 percentage points more likely to be hypertensive than those who are not obese.

Figure 2.20. Obesity as a Risk Factor for Hypertension



63. **The relative magnitudes of association suggest that measures of abdominal obesity may be better than general obesity in predicting the risk of diabetes and hypertension.** The increased probability of diabetes indicated by WC is more than twice as large as that of general obesity. Furthermore, including all measures of obesity in the regression reveal that WC is a stronger predictor of the risk of diabetes than WHR and general obesity (column 4 of Annex Table A8).[41] Furthermore, in the case of hypertension, including both abdominal and general obesity in the same regression suggest that WC is a stronger predictor of hypertension than general measure of obesity (Annex Table A9). These findings further indicate that public health interventions in the province would perform better if they rely on WC for monitoring obesity and assessing the level of public health action needed.

Summary and implication

[41] Although there is some indication that the abdominal measures are better in predicting the risk of diabetes and CVDs (Seidell, 2010; Larsson et al., 1984; Lapidus et al., 1984)[41], a review done by 'WHO expert consultation' concludes that it is unclear which anthropometric measure is the most important predictor of diabetes in adults. Neither is there consensus over which of the two measures of central obesity are better associated with CVD risk (WHO, 2008a).

64. **To conclude, physiological risk factors for CVDs are very common in the Western province, and many adults from different socioeconomic and demographic groups are not aware of their health status.** The probability of being hypertensive is higher among men, but men are less likely to be aware of their hypertensive status, suggesting that they are less likely to use preventive health services. Higher awareness among women is consistent with Sri Lanka's strong mother and child health (MCH) services. However, even among women, gaps in awareness are evident, suggesting the need to strengthen existing MCH services. The existence of greater health awareness among older people could be due to their increasing contact with medical professionals as their health deteriorates with age. Men and younger people seem to have the highest rates of forgone preventive care. While hypertension does not seem to be associated with socioeconomic status, the poorest and richest are more likely to be aware of their conditions than the middle 60 percent. This likely reflects utilization patterns, with the richest and poorest having more contact with health professionals as a result of having more information and a higher propensity to fall ill, respectively.

65. **The prevalence of general BMI and abdominal obesity in the province poses a significant risk for NCDs.** This is especially the case among women and those between the ages of 30 and 60. Data from secondary sources suggest that physical inactivity and unhealthy diet in the country are of concern. Although the risk of obesity seems to be highest among the richest, it is alarmingly high even among the poorest quintile. We found obesity in the province to be significantly associated with a higher risk of hypertension and diabetes.

66. **Basing public health interventions solely on BMI-based classifications risks excluding a huge proportion of adults, especially women, who are at substantial risk of metabolic complications.** In fact, waist circumference appears to predict the risk of diabetes better than BMI-based obesity. A significant proportion of people who would be categorized as having a normal weight are at risk of metabolic complications related to abdominal obesity. Given that the health risk of a given amount of body fat in the Asian population is much higher than in other regions, policymakers need to make this a high priority.

Chapter 3. Behavioral and Environmental Risk Factors

Highlights:

- The current smoking rate in the Western province is lower than the national average as well as the average for countries in the region. The same is true for the proportion of current drinkers.
- Risky behavior is predominantly practiced by elderly men in lower socioeconomic groups.
- Betel chewing in the Western province is much more common than smoking and harmful alcohol use.
- Hypertension prevalence is higher among those who practice risky behavior.
- A huge proportion of households in the Western province use unclean sources of fuel as their primary cooking source.
- The potential burden of indoor air pollution is the largest for the poorest and those living in rural areas.
- Urban residents of the province have a higher risk of being exposed to outdoor sources of pollution.
- Sanitation infrastructure in the province is widespread, but there is huge room for improving drinking water sources for households at all economic levels.
- Unhygienic solid waste management is more prominent in rural parts of the Western province.

3.1. Behavioral Risk Factors

67. **Physiological risk factors such as hypertension and obesity can be indirectly modified through changes in behavioral risk factors.** Monitoring these risk factors and understanding how they are distributed across groups can help policymakers to design targeted interventions and predict disease burdens. The World Health Organization's 2008-2013 Action Plan for the Global Strategy for the Prevention and Control of NCD (WHO, 2008b) identified the monitoring of commonly shared risk factors as a key component for preventing and controlling four major NCDs: CVDs, diabetes, cancer, and chronic respiratory diseases. The most common of these risk factors are tobacco use, harmful use of alcohol, an unhealthy diet, and physical inactivity. This section looks at two of these behavioral risk factors (smoking and harmful alcohol use) as well as betel chewing, which is a risk factor that is commonly practiced in South Asia.

Smoking

68. **The Western province has a much lower prevalence of current smokers than the national average as well as the average for other countries in the region.** Only 4 percent of adults currently smoke tobacco products.[42] This is less than one-third of the prevalence in the country as a whole (Table 3.1) and much lower than the prevalence in other countries in the region. This low prevalence, however, masks large differences in smoking between men and women. Hardly any women in the Western province smoke (0.3 percent). Among men, the prevalence is around 16 percent, but this still is significantly lower than the national prevalence of 29 percent.

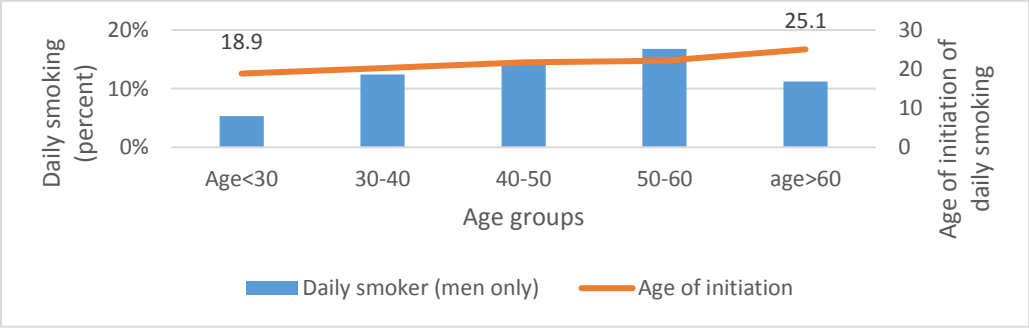
Table 3.1. Current Smoking Prevalence

	Western province	Sri Lanka (STEPS 2015)	Sri Lanka	Pakistan	India	Bangladesh	Nepal
All	4.4%	15					
Male	15.7%	29.4	28	42	20	40	37
Female	0.3%	0.1	0	3	2	1	11

Source: Columns 3-7 are from World Development Indicators (2015)

69. **Prevalence of smoking is highest among men in the 40 to 60 age group, but the average age at which individuals initiated smoking has been declining over time (Figures 3.1).** Among daily smokers, younger adults started daily smoking earlier than older generations.[43] Those who are currently above 60 started smoking daily at the age of 25, whereas those currently under 30 started almost a year after turning 18. Figure 3.1 shows that this trend has persisted (p-value<0.01). Though not as stark, WHO's 2015 STEPS survey (WHO, 2015b) also suggested this trend is also happening in Sri Lanka as a whole.

Figure 3.1. Daily Smoking Prevalence and Age of Initiation of Daily Smoking by Age Cohort

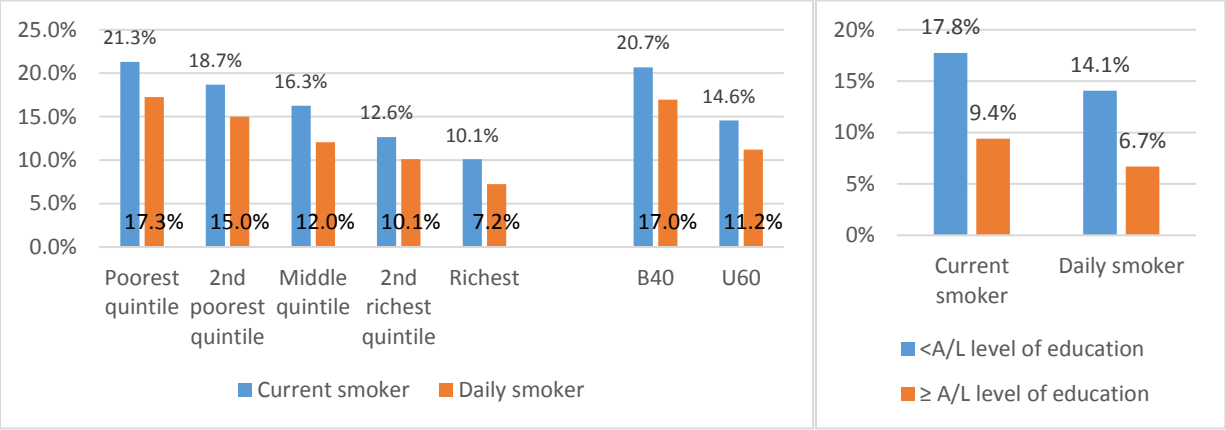


[42] Of those who currently smoke, the majority (75 percent) are daily smokers.

[43] A significant majority (93 percent) of daily smokers smoke manufactured cigarettes. Only 2.8 percent of them smoke hand-rolled cigarettes. About 16 percent smoke cigars, cheeroots, and/or cigarillos (multiple responses were allowed). Unfortunately, we cannot analyze the number consumed as the study did not collect such data.

70. **Smoking is predominantly a behavior exhibited by men in lower socioeconomic groups (Figures 3.2)**.[44] Daily smoking prevalence among the poorest quintile (17.3 percent) is more than double the prevalence among the top quintile (7.2 percent). Similarly, a significant difference exists between the B40 and the U60. Moreover, the prevalence of daily smoking among those with less than an A/L level of education (14.1 percent) is more than double the prevalence among those who have completed at least this level of education (6.7 percent). These descriptive patterns are confirmed by a regression analysis that accounts for differences across multiple dimensions (Annex Table A11). Men are about 12 percentage points more likely to smoke daily than not to smoke at all. Adults who have completed at least an A/L level of education are about 0.6 percentage points less likely to smoke daily than those who have not. Although this is not a large difference, it may suggest that educated people have a better understanding of the health risks of smoking. Furthermore, the B40 are 0.5 percentage points more likely to smoke daily. Using consumption expenditure quintiles also shows that the top 60 percent are less likely to smoke daily than the bottom 20 percent. Taken together, the findings suggest that smoking is more prevalent among those belonging to lower socioeconomic groups.

Figure 3.2. Smoking Prevalence by Economic Status and Education Level (men only)



Harmful Alcohol Use

71. **Although moderate alcohol consumption may have health benefits in terms of a lower risk of** coronary heart disease (Rimm et al, 1999), frequent drinking and binge drinking may increase the risk of chronic diseases such as hypertension and liver damage as well as acute diseases due to injuries. Alcohol dependence may also lead to social and psychological disorders and, therefore, it is usually classified as a clinical disorder.

[44] The prevalence of daily smoking is significantly higher among men, the poorest, the less educated, the elderly, and among residents of Colombo and Kalutara compared to residents of Gampaha (Annex Table A11).

72. **The US Centers for Disease Control defines three concepts to understand harmful alcohol use: binge drinking, heavy drinking, and excessive alcohol use.** Binge drinking is a pattern of alcohol consumption that results in a blood alcohol concentration (BAC) of 0.08 percent or more. This pattern corresponds to five or more drinks per occasion for men and four or more drinks per occasion for women. Heavy drinking is defined as drinking 15 drinks per week for men and eight for women. Excessive alcohol use includes binge drinking or heavy drinking. This study uses the same concepts and similar definitions except in the case of heavy drinking. Here heavy drinking is defined by the frequency of drinking. Adults who in the previous 12 months drank at least one alcoholic drink (beer, wine, arrack, spirits, fermented cider, or toddy) on five to seven days a week are categorized as heavy drinkers. Current drinkers are defined as those who consumed some alcohol in the previous 30 days.

73. **Similar to smoking, the proportion of current drinkers in the Western province (6 percent) is much smaller than the national average - 18 percent according to the 2015 STEPS survey (WHO, 2015b).** This average, however, disguises significant gender differences. While one-fifth of men had consumed some alcohol in the previous 30 days, only 0.3 percent of women had consumed any alcohol over the same period (Table 3.2). The gender difference is also reflected in the national average where the corresponding figure is 35 percent for men and 0.5 percent for women. From the standpoint of health effects, it is more important to understand the prevalence of excessive alcohol use than just current use.

Table 3.2. Prevalence of Alcohol Use, Binge Drinking, and Excessive Alcohol Use

	Any alcohol		Frequency of drinking			
	Past 30 days	Past 12 months	Daily	5-7 days/week (**Heavy drinkers**)	**Binge drinkers**	**Excessive drinkers**
All	5.6%	9.9%	0.4%	1.9%	0.3%	2.1%
Female	0.3%	2.1%	0.0%	1.0%	0.1%	1.1%
Male	20.1%	31.4%	1.6%	4.5%	0.8%	4.9%

Note: Excessive alcohol use is defined as drinking 5 to 7 days a week and/or binge drinking

74. **Only about 2 percent of adults in the province indulge in binge and/or heavy drinking** (in other words, are excessive drinkers). About one in twenty men consume alcohol excessively, and this figure goes down to one in a hundred among women. In the previous 12 months, only 0.4 percent of adults in the province drank daily. This is again much lower than the national rate of 5.5 percent). Heavy drinking, as defined earlier, is practiced by about 2 percent of adults.

75. **A regression analysis shows that excessive alcohol use is more common among elderly men from lower socioeconomic groups residing in rural areas**. The probability of excessive alcohol use is higher among men, the B40, the elderly, and those living in rural areas. Men are 2.3 percentage points more likely to be excessive drinkers than women (Annex Table A12). The B40 are 1 percentage point more likely to be excessive drinkers than the U60. Urban dwellers are 0.7 percentage points less likely to be excessive drinkers than rural residents. Adults who are older than 50 are more likely to be excessive drinkers than those who are between 20 and 30. The health implications of this are likely to be greater for the elderly who are already a risk group for certain physiological risk factors and NCDs.

Betel Chewing

76. **Similar to smoking and harmful alcohol use, the practice of betel chewing has also been found to be a risk factor for different diseases.** Ko et al (1995) found a statistically significant association between betel chewing and oral cancer. It has also been found to affect the central and autonomous nervous system and to increase heart rate and blood pressure (Chu, 2001).

77. **Betel chewing in the Western province is much more common than smoking and harmful alcohol use, and its use is concentrated among men**. About 7 percent of adults chew betel on a daily basis, and more than one-in-five have tried it at some point in their life (Figure 3.3, Annex Table A13). The gender difference in behavioral risk factors is again apparent with betel chewing. While 17 percent of men chew betel on a daily basis, only about 3 percent of women do so. Of those who have ever used it, close to one-third of them (31 percent) chew daily, with an additional 10 percent chewing more than once a week but not daily (Figure 3.4).

Figure 3.3. Prevalence of Betel Chewing by Gender

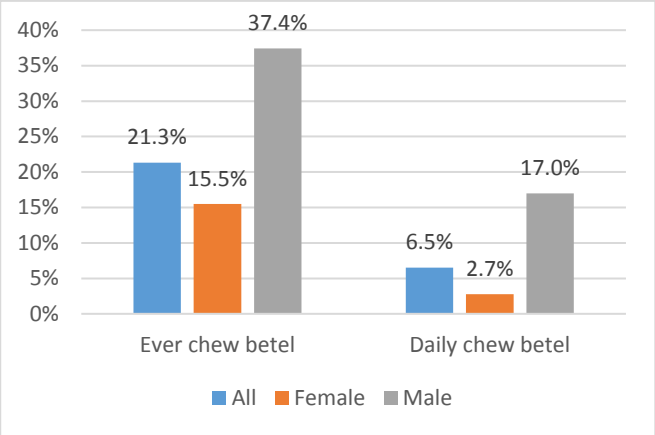
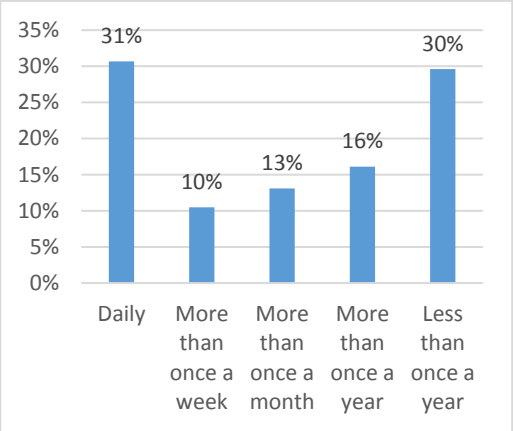
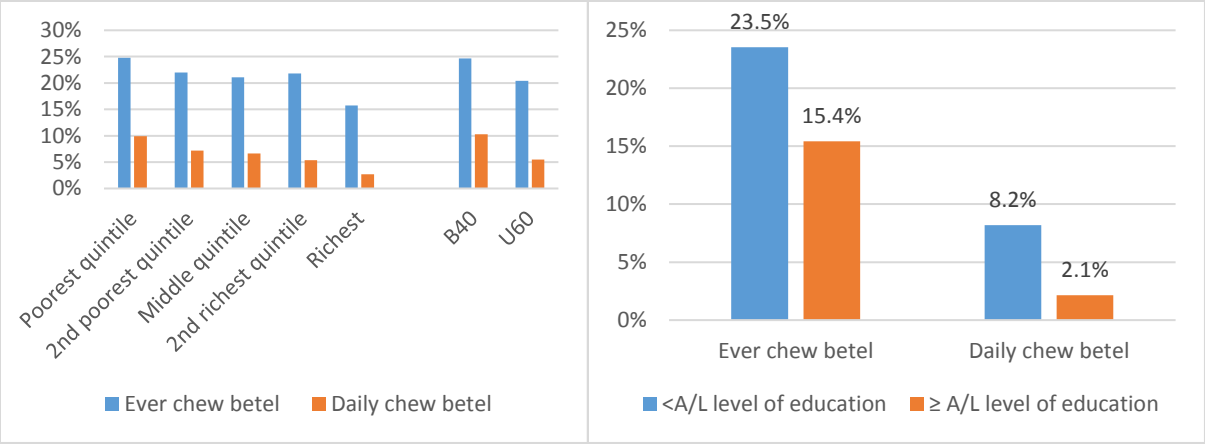


Figure 3.4. Chewing Frequency



78. **Similar to smoking and excessive alcohol consumption, the prevalence of betel chewing is concentrated among lower socioeconomic groups, suggesting that these groups are at a much higher risk for NCDs (Figure 3.5).** Daily betel chewing among the B40 (10.3 percent) is almost twice as widespread as it is among the U60 (5.5 percent). The difference between the bottom 20 percent and the top 20 percent of the consumption expenditure distribution also shows a similar pattern. Similarly, the prevalence of daily betel chewing is higher among those with lower levels of education, which is confirmation that these behavioral risk factors are concentrated among lower socioeconomic groups. These patterns hold even after accounting for other differences such as gender, ethnicity, age groups, and place of residence (Regression results in Annex Table A14).

Figure 3.5. Betel Chewing Prevalence by Socioeconomic Groups



79. **Daily betel chewing is more common among older people and those living in rural areas** (Figures 3.6 and 3.7). These simple differences are confirmed by the results of a regression analyses that controls for socio-economic and other differences (Annex Table A14). The probability of daily betel chewing increases with each age group, with the practice being most widespread among the elderly (those aged over 60). Rural residents are more than 5 percentage points more likely to chew betel daily than not to have tried it at all (Annex Table A14).

Figure 3.6. Daily Betel Chewing by Age Group

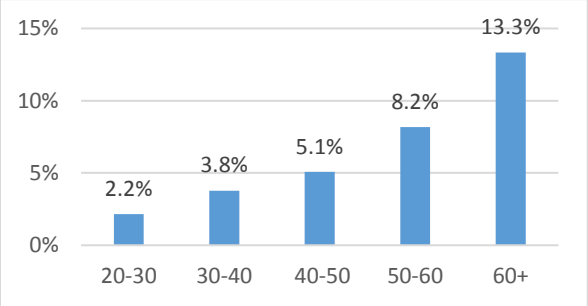
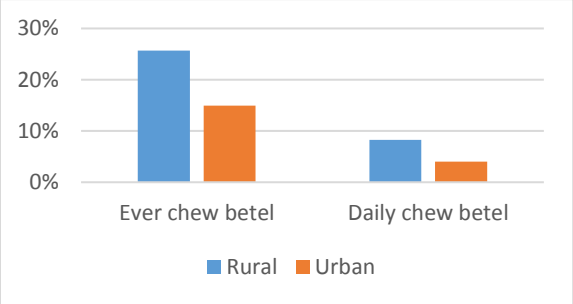
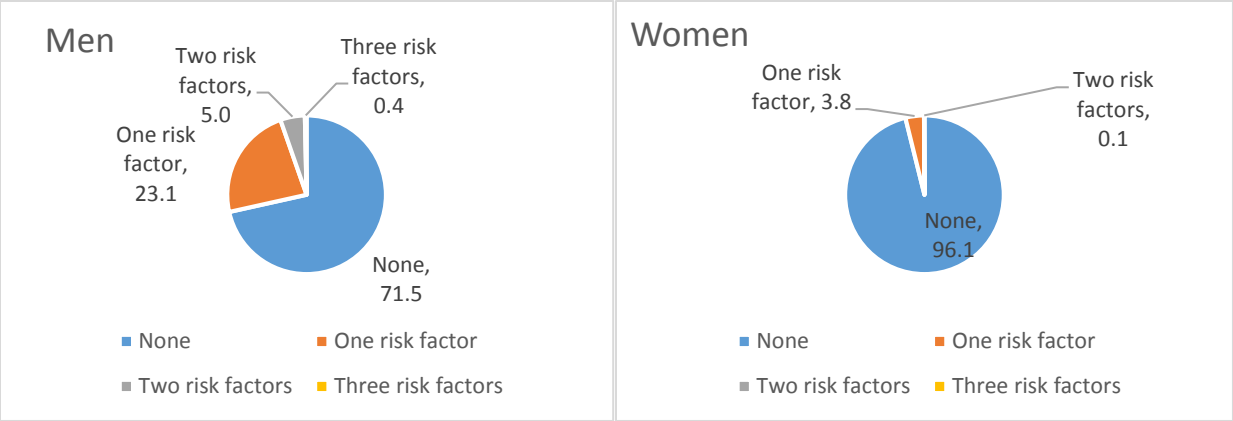


Figure 3.7. Daily Betel Chewing in Rural and Urban



80. **While behavioral risk factors could be a pressing health issue for men, they do not appear to be a problem for women.** In order to understand what proportion of adults engage in any or multiple risky behaviors, Figure 3.8 puts the sample into four categories: (i) those engaging in none of the risk factors (daily smoking, daily betel chewing, and excessive alcohol consumption); (ii) those who engage in one risky factor; (iii) those who engage in two; and (iv) those who engage in all three. About 90 percent of all adults (72 percent of men and 96 percent of women) do not practice any of the three behavioral risk factors, and the proportion engaging in all of them is negligible (Figure 3.8).

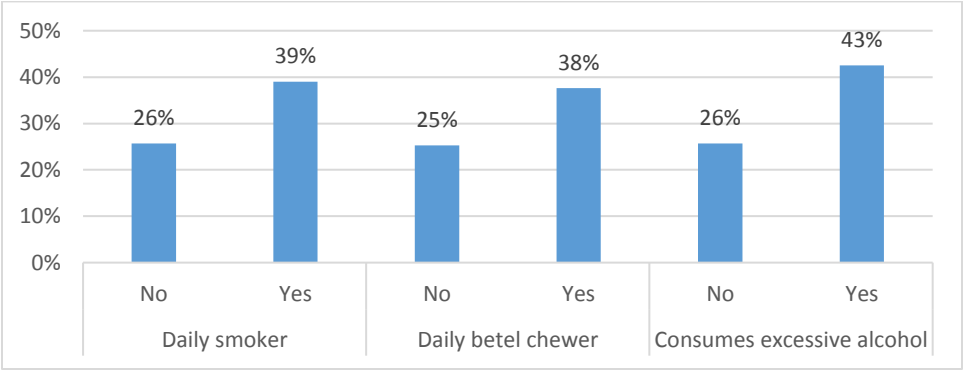
Figure 3. 8. Multiple Behavioral Risk Factors (%)



Risk to Health of Behavioral Risk Factors

81. **The prevalence of hypertension among adults who practice these risk factors is statistically significantly higher than the prevalence among those who do not practice any of these behavioral risk factors (Figure 3.9).** The prevalence of hypertension among daily smokers is 39 percent, which is significantly higher than the prevalence among those who do not (26 percent) (p-value<0.01). Similarly, while 38 percent of daily betel chewers are hypertensive, only 25 percent of those who do not chew daily are hypertensive. The difference is even more pronounced in the case of excessive alcohol use. As many as 43 percent of those who consume excessive alcohol are hypertensive, which is 17 percentage points higher than among those who do not use alcohol excessively (26 percent).[45]

Figure 3. 9. Hypertension Prevalence by Behavioral Risk Factors



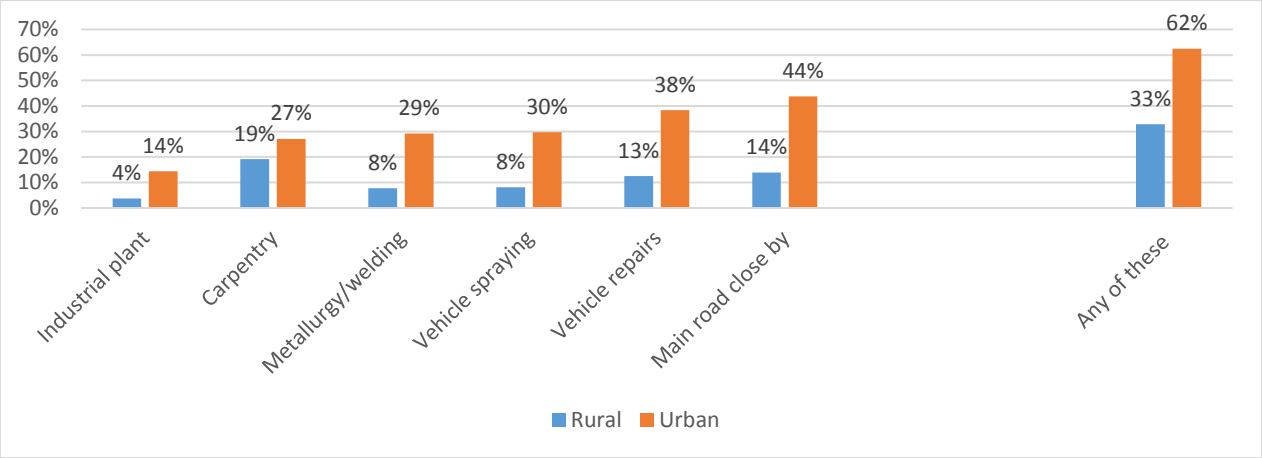
[45] Perhaps because of the low prevalence of these behavioral risk factors, the association with hypertension is not significant once other factors are taken into account (Annex Table A9).

3.2. Environmental Risk Factors

This section looks at the prevalence and distribution of environmental risk factors in the Western province. The major focus is on indoor air pollution.

82. **The evidence broadly suggests that the health impact of air pollution in major urban centers is worsening despite some improvement in air quality.**[46] Air pollution (including household and outdoor pollution) is now the third most significant fatal health risk in the country after metabolic and dietary risks and ahead of tobacco smoke (Box 3.1 on the health impact of air pollution in Sri Lanka). Judging by the proximity of polluting economic activities such as industrial plants, carpentry, metallurgy, vehicle spraying, vehicle repairs, and the existence of a main road to residences, urban residents are at a higher risk of outdoor air pollution than rural residents. Sixty-two percent of urban residents have one of these polluting economic activities in their immediate neighborhood while the corresponding figure for rural areas is only 33 percent (Figure 3.10).

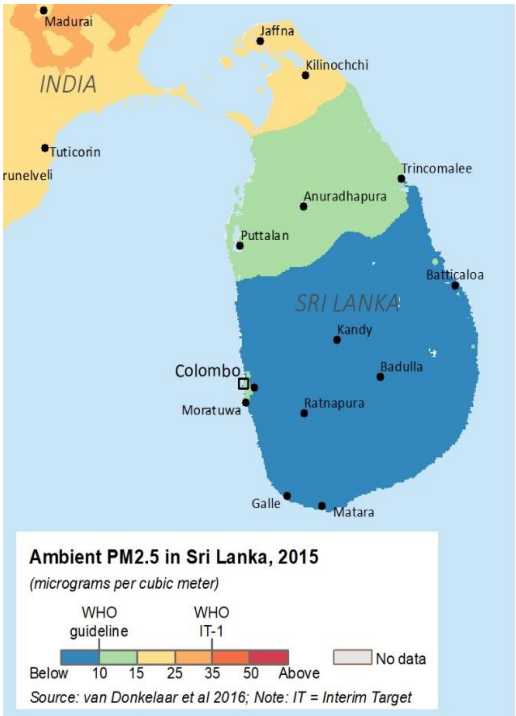
Figure 3.10. Risk from Outdoor Sources of Pollution

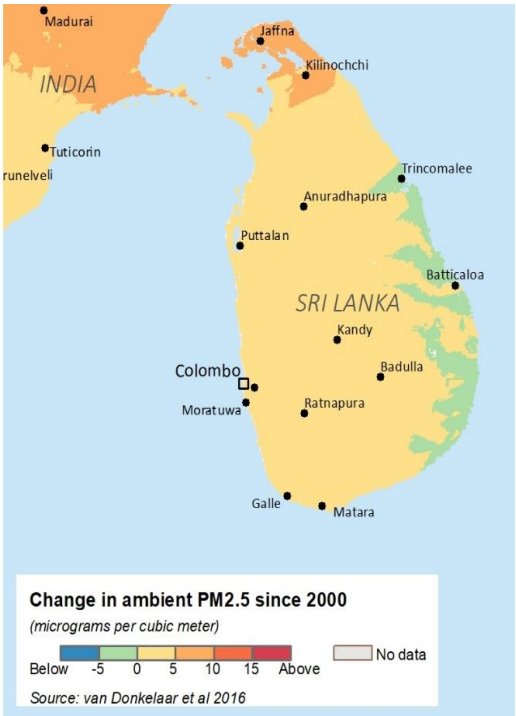


[46] Nandasena et al. (2010) also note that air pollution contributes considerably to the disease burden in Sri Lanka.

Box 3.1. Premature Deaths from Air Pollution in Sri Lanka

In Sri Lanka, the health effects of air pollution are on the rise despite some improvements in air quality. Between 1990 and 2015, average exposure to outdoor $PM_{2.5}$ across the country declined from 30 micrograms per cubic meter (µg/m^3) to 28 µg/m^3—still nearly three times the WHO guideline value. The share of people who rely on solid fuels for heating and cooking has fallen from 88 percent to 73 percent. Yet deaths have increased as the population has aged and more people have migrated to areas with higher levels of exposure.





The annual number of premature deaths in Sri Lanka attributed to air pollution reached about 15,000 in 2015. Air pollution (including household and outdoor pollution) is now the number-three fatal health risk in the country, after metabolic and dietary risks and ahead of tobacco smoke. More than 10 times as many people die from air pollution each year in Sri Lanka as from HIV/AIDs, tuberculosis, and intestinal infectious diseases combined.

Source: Research by the World Bank and the Institute for Health Metrics and Evaluation (IHME)

Indoor Air Quality

83. **Indoor air pollution poses a significant risk to residents of the Western province.** According to the measurements taken over a 24-hour period, more than four-fifths of the surveyed households (81 percent) had a concentration of $PM_{2.5}$, which was above the WHO's interim target-1 of 75 µg/m^3. It is noteworthy that WHO's air quality guideline for the 24-hour concentration of $PM_{2.5}$ is 25 µg/m^3. Given this, the finding of 81 percent of households having $PM_{2.5}$ concentration above 75 µg/m^3 is alarming. According to WHO, the epidemiological evidence shows that both short-term and long-term exposure to particulate matter has adverse effects. It is recommended that countries with areas that do not meet the 24-hour guideline values take immediate action to achieve these levels in the shortest possible time (WHO, 2005).[47]

84. **Indoor air quality is worse among households living close to outdoor sources of pollution and among those that use biomass as a primary cooking fuel, especially when they have no functional chimney.** Although the small sample size does not allow for statistical tests, a comparison of air quality between households that primarily use clean sources of fuel (LPG) and those who use biomass (wood) shows that households that use biomass have a higher concentration of $PM_{2.5}$ (Table 3.3).[48] Households that have no functional chimney but use firewood as the primary source of fuel have $PM_{2.5}$ concentrations more than three times higher than households who use clean fuels. In order to understand how outdoor sources of air pollution affect indoor $PM_{2.5}$ concentrations, a comparison was made between households using clean sources of fuel (LPG) but living in close proximity to outdoor pollution sources (within 50 meters of an arterial road, open burning sources, or an industry with a visible smoke stack) with those using clean sources of fuel but living further away from outdoor sources of pollution. Results show that the former have 17 percent more $PM_{2.5}$ concentrations than the latter.

[47] During meal preparation, 78 percent of the surveyed households registered concentrations higher than 75 µg/m3.
[48] Comparison is made among households with no outdoor pollution source close by.

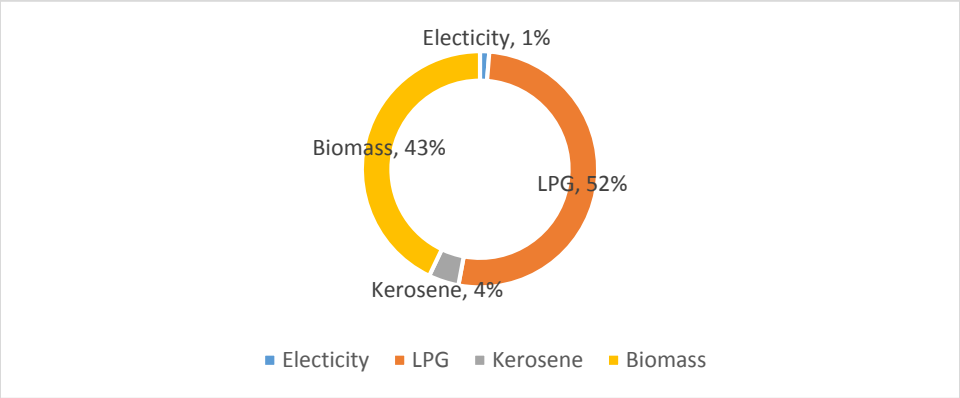
Table 3.3. Indoor $PM_{2.5}$ Concentrations under Different Conditions

Scenarios		Sample size	$PM_{2.5}$ concentration median (25th -75th percentile)*	Remarks
	Indoor air quality difference by primary source of fuel**			
LPG (Primary cooking fuel)**		16	114.6 (87.1 - 154.4)	More than 37% more $PM_{2.5}$ concentration if wood is used as the primary source (irrespective of other potential determinants of indoor air quality)
Wood (Primary cooking fuel)**		10	157.1 (43.1 - 595.2)	
	Does air quality gap increase if biomass users have no functional chimney?***			
LPG (Primary cooking fuel)		34	125.0 (88.2 - 174.5)	More than threefold more $PM_{2.5}$ concentration if wood is used as the primary source in households with no functional chimney (irrespective of outdoor sources)
Wood with no functional chimney (Primary cooking fuel)		8	410.2 (120.7 - 649.7)	
	Role of outdoor pollution among households where LPG is a primary source			
Outdoor pollution exists		16	133.7 (114.9 - 192.7)	17% more $PM_{2.5}$ concentration when there is outdoor source of pollution in households using LPG as the primary source
No outdoor pollution		19	114.6(87.1 - 154.4)	

Notes: * Figures are based on three-hour average value during the main cooking session. ** Sample of households who do not have a close outdoor pollution source. *** Sample of households irrespective of having a close outdoor pollution source.

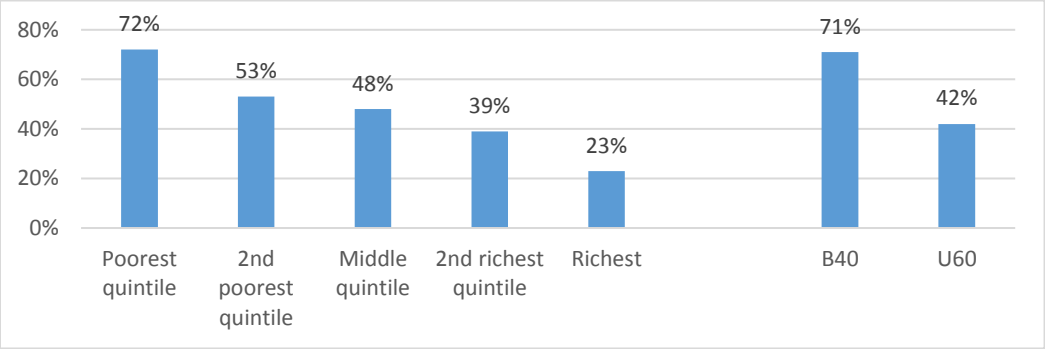
85. **A huge proportion of households in the Western province use unclean sources of fuel as their primary cooking source** (Figure 3.11). The unhealthy sources of fuel (kerosene and biomass) together account for nearly half of the households (47 percent). Air pollution from household fuel combustion is an important global environmental health risk. A high level of household air pollution due to cooking with kerosene and wood is responsible for 5 percent of the global disease burden (WHO, 2014). In urban areas, where population density is higher, the use of such fuels for cooking could negatively affect the health of city dwellers.

Figure 3.11. Primary Sources of Fuel in the Western Province



86. **The potential burden of indoor air pollution is the heaviest for the poorest.** With improvements in socioeconomic conditions and mechanization, households tend to switch from cheaper fuel sources that affect indoor air quality to more expensive but cleaner sources. The gap between the bottom 20 percent and the richest 20 percent in the use of unclean sources of fuel is very wide (72 percent versus 23 percent) (Figure 3.12). This indicates the high susceptibility of poorer households to pollution-related health risks. Conversely, the better-off are significantly more likely to use LPG as a primary source of fuel than the worse-off (Annex Table A15).

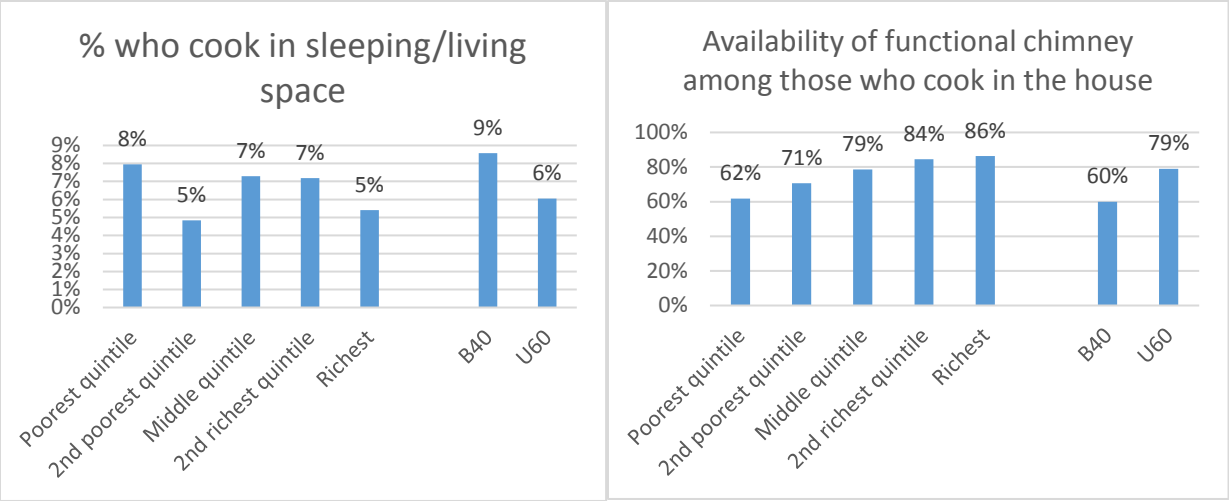
Figure 3. 12. Use of Unclean Fuels (Biomass or Kerosene) by Households' Economic Status



87. **Cooking in living and sleeping spaces with no functional chimney puts the poorest at higher risk of indoor air pollution.** About 7 percent of households who use biomass usually cook in their living or sleeping space. This rate is not significantly different across economic groups (Figure 3.13).[49] About three-quarters of households that use biomass within their building (rather than outdoors or in a separate hut) have a functional chimney. This is encouraging from the standpoint of limiting the air quality effects of using biomass. However, the availability of a functional chimney is lower among the poor than the rich (Figure 3.13).[50]

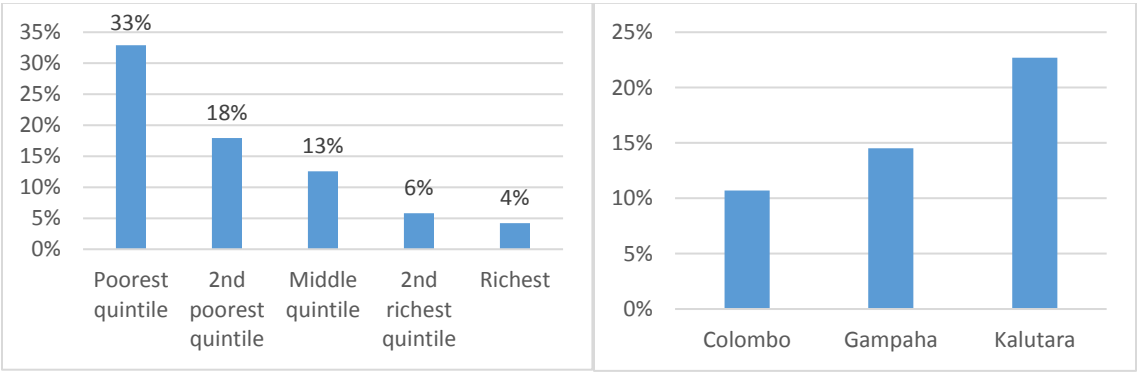
[49] However, it is highest in Kalutara (15 percent) and lowest in Gampaha (2 percent).
[50] Only 2 percent of households in the province use biomass without functional chimney and sleep where they cook.

Figure 3.13. Risky Practices among Households Who Mainly Use Biomass



88. **The risk of indoor air pollution caused by cooking fuel is highest among poorer households and those located in rural areas.** Given the findings of the air quality assessment presented at the beginning of this section, households can be categorized into two groups: (i) those at high risk of indoor air pollution due to cooking with biomass and no functional chimney and (ii) those at a low risk due to use of relatively clean fuel sources or the availability of a functional chimney. Defined this way, 15 percent of households in the province have a high risk of indoor air pollution. This greatly varies by economic status and place of residence. The poor and those living in Kalutara district and rural areas have the highest risk of indoor air pollution (23 percent) (Figure 3.14).

Figure 3.14. Percentage of Households with No Functional Chimney Using Biomass



89. **Indoor air pollution from a range of cooking fuels increases the risk of developing respiratory diseases.** Children from households that primarily depend on unhealthy sources of fuel (kerosene, wood, straw, and sawdust) are about 5.5 percentage points more likely to have experienced illness in the previous 12 months and about 2 percentage points more likely to have had symptoms of wheezing and

whistling in the chest**.** This association may reflect the adverse health effects of the particulate matter emitted by these unclean sources of fuel.

Summary

90. **The overall prevalence of behavioral risk factors in the province is moderate in comparison with the national average, but the distribution suggests that efforts to reduce these risk factors need to target men in lower socioeconomic groups.** The current smoking rate in the Western province is lower than the national average as well as the average for other countries in the region. The same is true for the proportion of current drinkers in the province. However, betel chewing in the Western province is much more common than either smoking or harmful alcohol use. The risk group for daily betel chewing overlaps with the risk group for excessive alcohol use and smoking. These behavioral risk factors are predominantly exhibited by men, especially those between 40 and 60 years old and those from lower-income groups. This emphasizes the need to expand hypertension screening and counseling services and target them to men, who tend to forgo preventive care.

91. **Lower-income groups and residents of rural areas have a higher risk of experiencing indoor air pollution.** A large proportion of households in the Western province use unclean sources of fuel as their primary cooking source. The risk of indoor air pollution caused by cooking fuel is highest among lower-income households and those located in rural areas.

Chapter 4. Use of Health Services

Highlights:

- Private facilities are more popular as sources of outpatient care, while public facilities are a popular source of inpatient care.
- While public facilities are to some extent pro-poor, private facilities are dominantly used by the rich, mainly due to their convenience and shorter waiting times.
- NCDs and changing lifestyles are imposing a significant burden on the health system.
- Households tend to prefer private healthcare for their children and the elderly rather than for the middle aged.
- Although public facilities are generally more popular for adult preventive services, a significant proportion of households do not know where they could seek care for adult preventive health services, such as counseling on nutrition, smoking, and alcoholism.
- For curative MCH and adult health services, the preference for private care declines with the severity of the illness.
- Households rarely by-pass primary-level facilities when seeking maternal and child preventive services but do so more often when seeking adult preventive services.
- A significant proportion of households by-pass primary-level facilities when seeking care for chronic conditions**.**
- The ways in which the public health system needs to be improved include strengthening the "soft" skills of healthcare providers and simplifying procedures and reorganizing facility-level systems to reduce the time that the consumer has to spend seeking care.

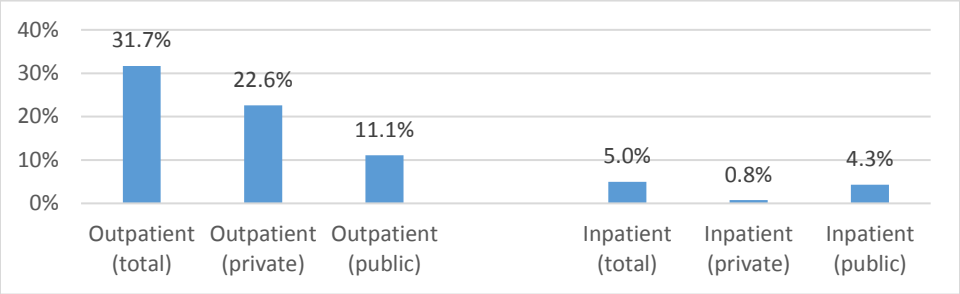
92. **This chapter studies patterns of health care utilization in the province.** It examines rates of health care use and the factors associated with them, including the role played by NCDs. It also studies what drives the choice of public or private facilities. It approaches this in two ways. The first is by exploring which factors are associated with the use of private care as opposed to public care. This is then supplemented by analyses of where households say that they would seek care for some hypothetical healthcare needs. This approach is also used to examine to what extent people by-pass primary healthcare facilities. The last part of the chapter highlights gaps between health service needs and the services available to residents of the Western province.

4.1. Use of Healthcare

93. **Private facilities are more popular for people seeking outpatient care, while public facilities are more commonly used for inpatient care.** Individuals were asked about outpatient and inpatient care for any medical conditions for which they had sought treatment during the previous four weeks and the

previous 12 months, respectively. Over this recall period, about one-third of all individuals (32 percent) sought outpatient care, while one in 20 (5 percent) sought inpatient care (Figure 4.1). This was the case in both rural and urban areas. Most people sought outpatient care from private facilities and inpatient care from public sources (Figure 4.1).

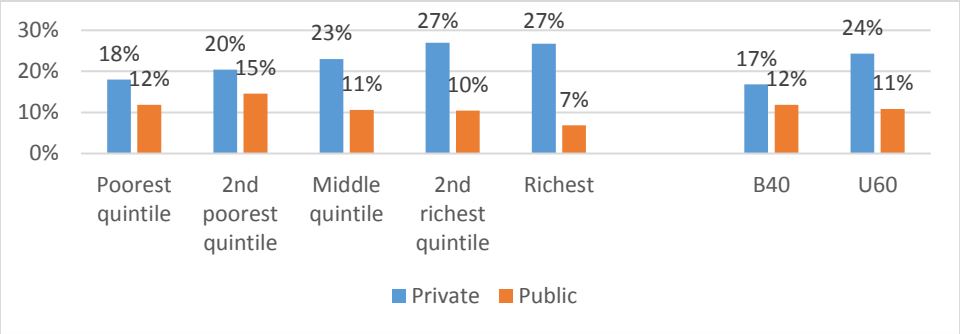
Figure 4.1. Use of Outpatient and Inpatient Healthcare



94. **The poorer populations tend to use public facilities, while private facilities are largely used by the better-off.** Simple differences across economic groups suggest that use of private outpatient care increases with economic status, while use of public outpatient care is slightly higher among the poor (Figure 4.2). This association remains after accounting for other differences.[51] Individuals belonging to B40 households have a similar probability of using public outpatient care as those in the U60 (Annex Table A18). Yet, those in the top quintile are 4 percentage points less likely to use public outpatient care than those in the bottom quintile. On the other hand, the probability of using private outpatient services increases systematically with increasing consumption quintiles, suggesting that the use of private care is more concentrated among the rich. Similarly, individuals from households headed by people with more than an A/L level of education are more likely to use private outpatient care and less likely to use public outpatient care. Overall, use of any kind of outpatient care (either public or private) is higher among the economically better-off, while the probability of using any kind of inpatient care is similar across economic groups (Annex Table A19).

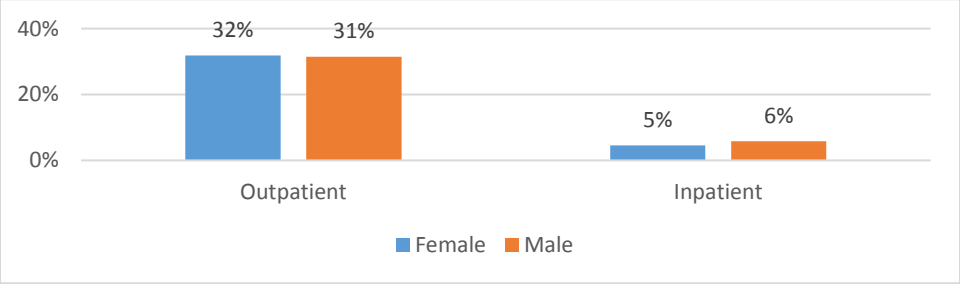
[51] In order to understand who is most likely to use healthcare, we estimated a probit regression for outpatient and inpatient use separately. The regression included: (i) a dummy for the household's economic status (belonging to the B40 or consumption quintiles); (ii) a dummy for the household's living conditions as assessed by the survey enumerator's assessment of the structural quality and durability of the dwelling, its access to safe water and sanitation, whether the living area is sufficient, and the security of tenure with the lack of two or more of these being used to define poor living conditions; (iii) whether the household's main source of fuel is unclean; (iv) whether the head of the household has completed at least an A/L level of education; (v) non-modifiable risk factors (a dummy for male gender, age, and squared age); (vi) environmental risk factors (whether the household uses unsanitary garbage disposal practices and whether a member of the household works under hazardous conditions (as some working-related risks may expose all household members to communicable diseases); and (vii) measures of socio-cultural factors (a dummy for living in urban areas, ethnicity, and district of residence).

Figure 4.2. Source of Outpatient Care by Households' Economic Status



95. **Men are less likely than women to seek outpatient care but more likely to seek inpatient care.** Use of outpatient care is similar across genders, while a statistically significantly higher share of men uses inpatient care (Figure 4.3). After accounting for other risk factors and economic status, men are 3 percentage points less likely than women to seek outpatient care but 0.7 percentage points more likely to seek inpatient care. This finding is consistent with the finding from Chapter 2 that men are more likely to be hypertensive but are less likely to be aware of their hypertensive status. Forgoing preventive and curative outpatient care may lead to health complications that ultimately require hospitalization.

Figure 4.3. Use of Healthcare by Gender



96. **The burden on the healthcare system imposed by NCDs and changing lifestyles is apparent from patterns of healthcare use among the adult sample.** The two physiological risk factors (obesity and hypertension) are strongly associated with the probability of using outpatient care. While there is no difference between normal weight and underweight adults, overweight and obese adults are 6.2 and 6.7 percentage points more likely to use outpatient care than normal weight adults (Annex Table A20 and A21).[52] This is the case even after accounting for differences in hypertension and diabetes status for which overweight and obesity are risk factors. Moreover, hypertensive adults are 4.2 percentage points more

[52] This also held true when the regression was estimated for public and private care use separately. Overweight and obese adults are 3.2 and 3.9 percentage points more likely to use public outpatient care and 2.4 and 3 percentage points more likely to use private outpatient care than normal weight adults.

likely to seek outpatient care than those who are not hypertensive. Diabetic adults are 27 percentage points more likely to seek outpatient care than those who are not diabetic and about 4.3 percentage points more likely to seek inpatient healthcare.

4.2. Use of Healthcare by Source of Care

97. **One of the merits of urbanization is the multiple types of healthcare facilities that become available as population density increases**. In addition to public primary and secondary-level facilities, urban areas often have a higher concentration of tertiary facilities and a strong private sector presence. Having a range of services to choose from is good, but how people exercise that choice matters from the perspective of the efficient use of scarce resources. Despite the existence of free public health care, the use of private healthcare in Sri Lanka is growing (for reasons explored at the end of this chapter). Therefore, it is important to understand what drives the choice of private care and the socioeconomic characteristics of those who are choosing private over public care. It is also useful to find out which medical conditions are prompting people to seek private instead of public care. In addition, the absence of a referral system may lead consumers to by-pass primary healthcare facilities, and we explore whether that is happening in the Western province, which is arguably the province that offers the most choice.

98. **This section first looks at which socioeconomic factors are associated with the choice of private outpatient care over public care.** This is based on the actual data on healthcare use described above. It then examines whether residents of the Western province understand the range of different types of health services available to them when they normally seek care (public versus private facilities and primary, secondary, or tertiary facilities).To elicit the typical source of care for the household, the survey provided respondents with a list of health facilities, which was re-classified into public or private facilities and primary, secondary, or tertiary facilities.[53] The section discusses their responses first regarding the choice of private over public facilities and then regarding whether they tend to by-pass primary healthcare facilities.

Choice of Private Over Public Care

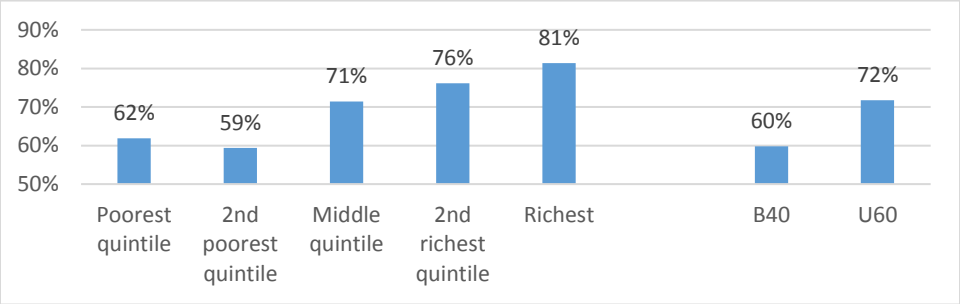
99. **The probability of choosing private care is positively associated with socioeconomic factors.** In order to understand what factors are associated with the choice of private over public care, we looked into the sub-sample of households that had sought outpatient care in the previous four weeks.[54] Among those who sought outpatient care, a significantly higher share of better-off individuals sought private care than those from lower income groups (Figure 4.4). Even after accounting for individual and socio-cultural differences, the B40 were 7 percentage points less likely to seek private outpatient care than public care (Annex Table A22). In an alternative specification where consumption quintiles were used rather than the B40-U60 distinction, we observed similar associations. Similarly, individuals from households headed by someone who has completed at least an A/L level of education are 10 to 12 percentage points more likely

[53] To accommodate the chance that the household had not experienced a specific health need, they were asked where they *or* people in their neighborhood would typically go for specific health care needs.

[54] The dependent variable takes the value 1 if care was sought from a private source and 0 otherwise. The regression includes all of the variables described in the above healthcare use regression.

to seek private outpatient care than public care. Our qualitative findings suggest that private facilities are preferred for reasons of convenience, easy access, and less waiting time – aspects of quality for which the better-off are willing to pay.

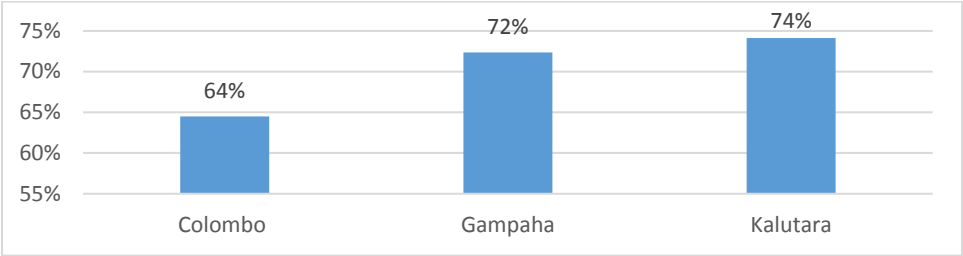
Figure 4.4. Individuals Who Sought Private Outpatient Care as a Percentage of All Who Used Outpatient Care



100. **Private care also appears to be preferred when healthcare is sought for the elderly rather than for the middle aged.** This may be due to the additional compassionate and diligent care that this age group requires, an aspect of quality of care at which private sources are usually better. Waiting times may be another factor behind this as the elderly may not be comfortable waiting for long hours before seeking care. The qualitative data support this claim.

101. **The existence of public health infrastructure and socio-cultural factors both appear to be associated with the choice of private care.** Residents of Colombo are less likely to seek private care than those living in Gampaha and Kalutara. Given that Colombo has the highest concentration of secondary and tertiary facilities in the province, its residents may find it economical to seek care in the well-equipped public facilities. Conversely, those who do not have as much choice among public facilities (in Gampaha and Kalutara) may choose private care over public care.

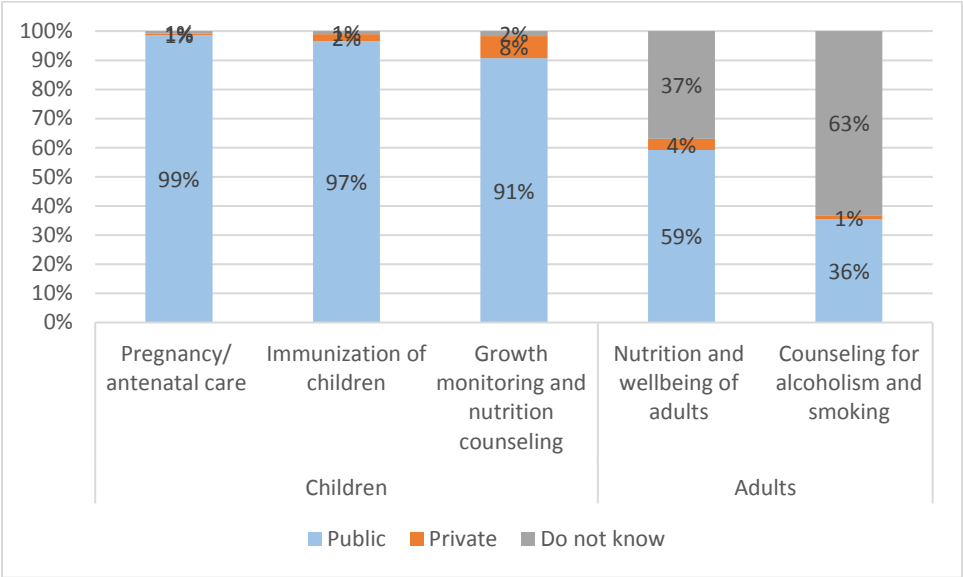
Figure 4.5. Individuals Who Choose Private Outpatient Care as a Percentage of All Who Sought Outpatient Care (by district)



Typical Source of Care for Different Healthcare Needs

102. **Public health facilities are the main providers of preventive MCH care services and are popular providers of adult preventive services.** Almost all households reported that they seek preventive MCH care from public facilities (Figure 4.6). This finding mirrors the nationwide pattern. Reflecting Sri Lanka's commendable achievement in improving MCH outcomes, most respondents knew where they could seek care for preventive MCH services, such as antenatal care, immunization and growth monitoring services, and nutrition counseling.

Figure 4.6. Preventive MCH and Adult Services

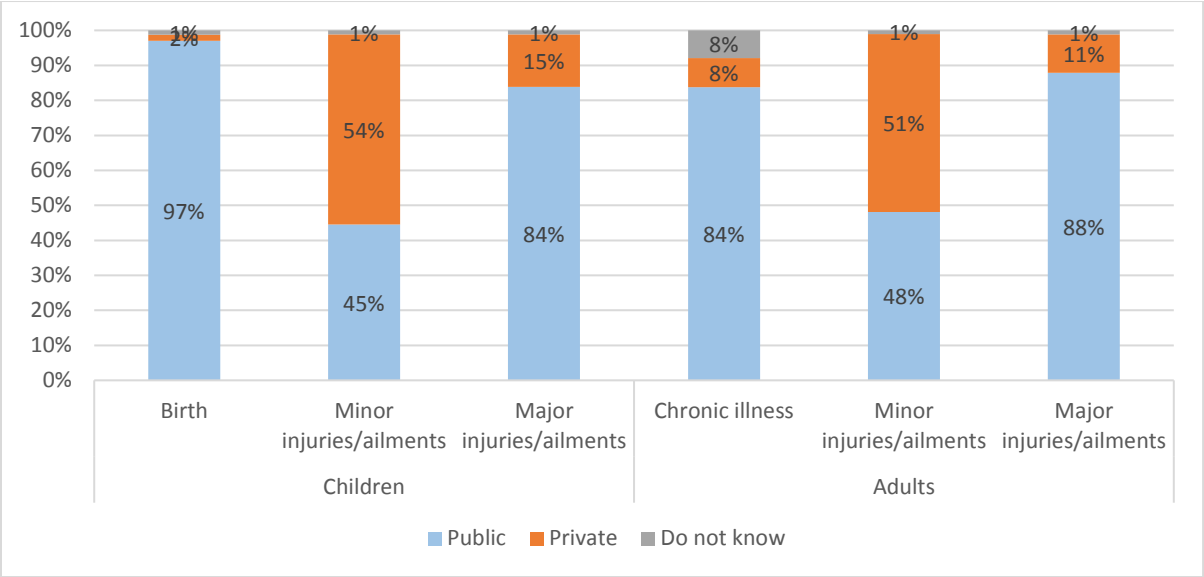


103. **Although the public sector is more popular for adult preventive services, a significant proportion of households did not know where they could seek care for adult preventive health services, such as counseling on nutrition, smoking, and alcoholism (Figure 4.6).** Thirty-seven percent of households did not know where they could seek care for counseling on adult nutrition, while 63 percent were not aware of available counseling services for smoking and alcoholism. Part of the reason for this is that alcohol and

cigarette addiction is rare in the province (as shown in the previous chapter). However, given the pervasiveness of the problem of malnutrition in the province (Chapter 2), the latent need for nutrition counseling is obvious.

104. **For curative MCH and adult health services, the preference for private care declines with the severity of the illness.** Public facilities are universally preferred for childbirth (Figure 4.7). They are also the most popular source of care for major ailments and injuries among children as well as adults. The respondents also tended to use public follow-up services for chronic adult diseases. For minor ailments or injuries, a slightly higher share of households reported they would seek care at private facilities rather than public. Our qualitative findings suggest that the reason why people choose private care for these medical issues is for reasons of convenience, easy access, and immediate service.

Figure 4.7. Curative MCH and Adult Services



105. **Our quantitative finding that private care is used for minor illnesses or injuries among both children and adults (as opposed to major illnesses) was confirmed by the results of our focus group discussions.** These showed that the private sector is chosen for certain minor conditions and short-term illnesses such as fever, wheezing, wounds, and gastritis. The main reasons that the focus group participants gave for seeking private care included hassle free access to a preferred doctor, easier access due to long opening hours, sufficient privacy to discuss needs, perception that more effective drugs are prescribed, efficient service including less waiting time, more time with doctors, and compassionate staff.

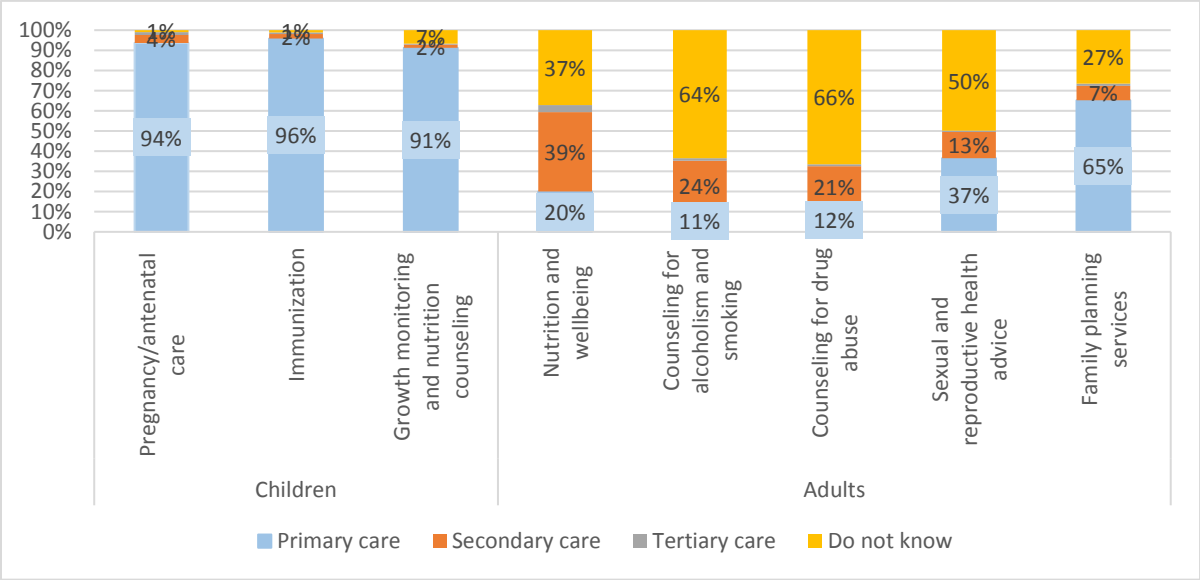
106. **The most common reason given for choosing public facilities for major illnesses and injuries was free health services.** The focus group discussions revealed that people prefer the public health sector when seeking care for accidents, emergencies, animal bites, heart diseases, acute conditions, and unbearable symptoms. As the severity of the illness increases, the cost of private care becomes unaffordable, thus leading to the choice of public care. In addition, the participants preferred public care for major illnesses because public facilities are better equipped with specialized units and competent

doctors and nurses. The 24-hour availability of emergency services is another reason they cited for choosing public care for major ailments.

Use by Level of Care: By-passing Primary Healthcare Facilities

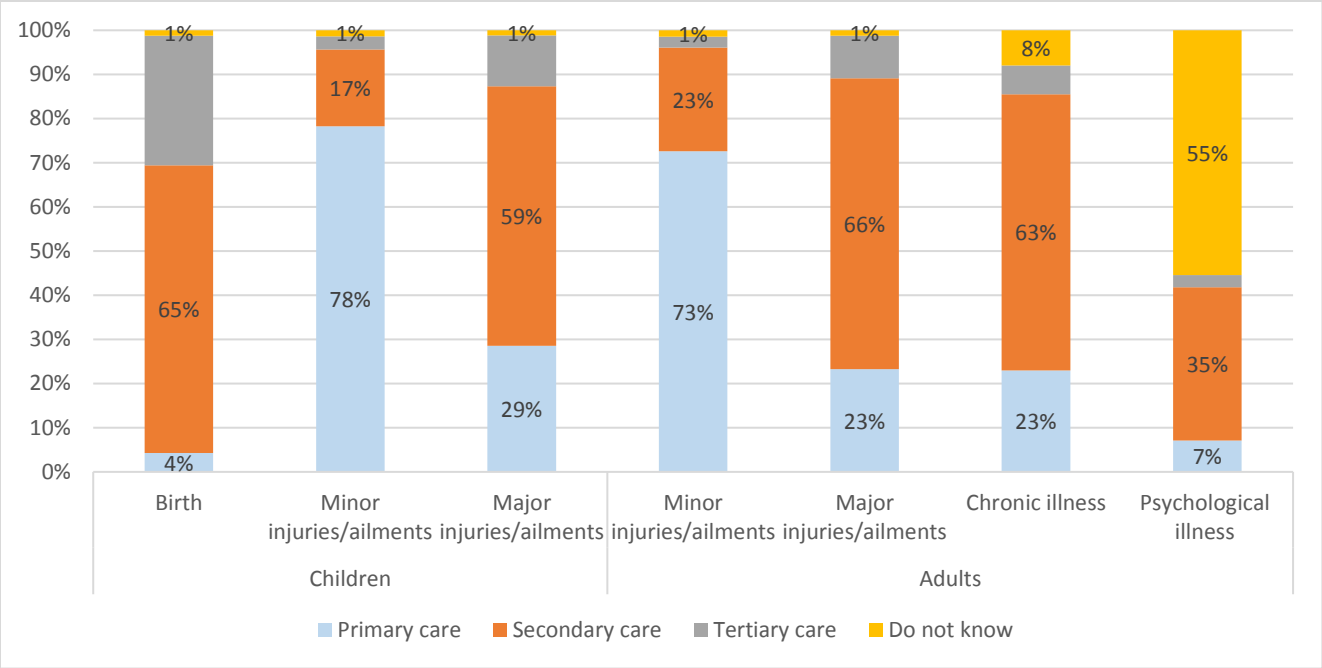
107. **Primary-level facilities are rarely by-passed when individuals are seeking MCH preventive services, but this is more common for adult preventive services.** A significant majority of households seek preventive MCH services (antenatal care, immunization and growth monitoring, and nutrition counselling) from primary-level facilities (Figure 4.8). Only 5 percent of households reported going to either secondary or tertiary-level facilities for these preventive services. A smaller proportion of households reported that they would visit primary-level facilities for adult preventive services (counseling on nutrition and wellbeing, smoking and alcoholism, drug abuse, sexual and reproductive health advice, and family planning services). For example, excluding those who did not know where they could seek care, only 32 percent of households reported that they would seek counseling on nutrition and well-being in primary facilities.

Figure 4. 8. Level of Care Chosen for Preventive MCH and Adult Health Services



108. **A significant proportion of households by-pass primary-level facilities when seeking curative services for common conditions that could be managed at the primary level**. Only 23 percent reported that they would seek treatment for chronic illnesses from primary facilities (Figure 4.9). Chronic conditions such as hypertension can easily be treated and managed in primary facilities if there are no complications. The absence of a referral system is responsible for this kind of health-seeking behavior that leads to inefficient use of resources. The respondents seemed to prefer primary-level facilities for the minor injuries or ailments of both children and adults. For minor ailments in children, about 78 percent of households would seek care at a primary-level facility.

Figure 4.9. Level of Care Chosen for Curative MCH and Adult Health Services



109. **By-passing lower-level facilities is more common among certain age-sex groups** as suggested by the focus group discussions. Young adults, especially men, often by-pass primary care facilities, which are primarily used by the elderly, women, mothers, and children. Adult men often use secondary and tertiary care to treat illnesses, but most do not seek preventive care to manage a risk factor or delay the onset of diseases (Figure 4.10).

110. **It is important to understand why people prefer tertiary facilities for common and relatively easy-to-treat conditions to be able to channel the demand from this level to lower and more appropriate levels of care.** The focus group discussions yielded a list of factors that deter people from using primary and secondary facilities. The most important of these are time-consuming processes, long waiting lists, neglect, carelessness, hostile attitudes of staff, and poor infrastructure. Other less important factors that were mentioned are the unavailability of required medicines, an insufficient number of beds, unreliable lab reports, and trade union actions (such as strikes). In contrast with these perceptions of primary and secondary care, the focus group participants perceived tertiary-level facilities much more favorably, particularly in relation to competence and compassion of staff as shown in the quote below.

> *"When my daughter was taken to a public secondary-level facility (Panadura hospital in Colombo), the nurses should have done something to prevent the bleeding instead of saying "That happens." That is not what they should have said. She was soaked with blood. We were scared, but the nurses didn't take it seriously. At the public tertiary hospital (Lady Ridgway Hospital), they attended to her immediately. They were very kind. After the operation too, they came to the child and said "Now you are better!" They came often and talked to the child nicely."* ***(Moratuwa – Urban – Poor)***

Figure 4.10. Demographic Profile of Healthcare Users by Different Levels of Care

	Tertiary care (Public)	Secondary care(Public)	Primary care(Public)	Secondary/Primary care (Private)
Curative – Communicable diseases where timely intervention is required to restore health				
Curative – Non-communicable diseases and pregnancy Diagnosis and intercept progression				
Emergency – Accidents and sudden illness				
Chronic disease care – Managing illness and preventing it from progressing				
Preventive care – Guidance and coaching to stay healthy				

4.3. Perceived Gaps in the Package and Quality of Health Services

111. **People's perception about the adequacy and quality of public health services is likely to affect two important health-seeking decisions: whether to seek care and where to seek care.** The focus group discussions examined this. The participants perceived that the public health system provides a comprehensive and satisfactory package of services on all matters related to childbirth, antenatal and postnatal care, immunization, and nutrition counselling for children. However, they perceived sexual and reproductive health and family planning services to be inadequate. Specifically, the participants identified the following perceived gaps in quality of care: (i) poor outpatient department services; (ii) poor emergency care at secondary hospitals; (iii) inefficient pharmacy services; (iv) inefficient follow-up care clinics in tertiary and secondary hospitals; (v) inefficient laboratory services; (vi) a lack of special care for senior citizens; and (vii) a lack of specialized pediatric services in secondary-level facilities. The issues corresponding to each of these perceived gaps are presented in Table 4.1. Overall, the areas where the government health services need the most improvement are strengthening the soft skills of healthcare providers (in other words, their compassion and consideration for patients) and simplifying procedures and reorganizing facility-level systems in order to reduce time spent seeking care.

Table 4.1. Perceived Gaps in Public Health Service Quality and Completeness

Major gaps	Explanation

Outpatient department services are of poor quality.	• Medical personnel are often off-hand and lack empathy.
	• The doctors do not devote enough time to understanding the patient's condition as they spend only a maximum of two to three minutes with each patient.
	• The patient is not given an opportunity to ask for advice or clarify their concerns.
	• The doctor does not give a direct diagnosis and simply prescribes medication.
	• Most outpatient departments are overcrowded and have inadequate facilities, including:
	  ○ Poor light and ventilation
	  ○ Lack of seating
	  ○ Unhygienic surroundings
	  ○ No canteen or toilets.
	• There is no process or system for tracking a patient's treatment history.
	• The process of acquiring treatment is time-consuming and frustrating.
	• Although some outpatient departments are open for long hours, the pharmacy is not.
	• Most outpatient departments in secondary hospitals operate only until 4pm.
	• Patients are given no opportunity to pick their preferred doctor and build a rapport and ongoing relationship with him/her.
	• Support staff such as security workers and laborers can be uncooperative and abusive.

Emergency care at secondary hospitals is poor.	• The ability to handle accidents and emergency cases varies widely across secondary hospitals.
Pharmacy service is inefficient.	• Pharmacies are crowded and it is time-consuming to obtain medicines. • Most medicines are often out of stock. • Pharmacies dispense poor quality medicines with no proper packaging or standards. • The pharmacists do not take time to explain how to take the medicine. • The pharmacy areas are unhygienic, unsafe, and have poor facilities.

Follow-up care clinics at tertiary and secondary hospitals are also inefficient at providing follow-up care for conditions such as arthritis, diabetes, heart diseases, hypertension, neuro conditions, and wounds.	• Patients have to spend at least half a day to obtain care. • The clinics keep patients waiting, sending them from one room to another. • The pharmacy queue is the most time-consuming (meaning patients have to come very early). • The nursing staff lack any standards of behavior and intimidate the patients. • The clinic conditions are unhygienic, with no light or ventilation and insufficient seating. • The clinics have a poor layout and are badly planned.
Laboratory services are inefficient.	• It is time-consuming to obtain reports. • The quality of the lab results is dubious. • Some forms of basic testing not available and have to be paid for out of pocket.
There is a lack of special care for senior citizens.	• Senior citizens are not offered any special privileges, having to stand for long hours at the pharmacy counter and walk long distances to get to their clinics.

Summary

112. **Although the provision of free public healthcare in the Western province has resulted in somewhat pro-poor use of public health facilities, total healthcare use (public plus private) in the province does not appear to be equitable.**[55] This is likely due to a strong ability-to-pay gradient for the use of private facilities, which is the primary source for outpatient services in the province. Men are less likely to seek outpatient care than women but are more likely to seek inpatient care (likely as a result of forgoing preventive outpatient care). NCDs are strongly associated with the use of both outpatient and inpatient care. The burden put on the health system by modifiable physiological risk factors (such as obesity and hypertension) is also apparent in the data. Among all those receiving care, the probability of seeking private care rather than public care is higher for the better-off, the better educated, and the elderly. Our analysis of health-seeking behavior suggests that much of the preference for private over public care is driven by the greater convenience of the private sector (including longer opening hours and shorter waiting times), the ability to choose a doctor, and the soft skills of staff at private health facilities. The better-off seem to be willing to pay for these quality aspects in private facilities. Otherwise, there does not seem to be much difference in the clinical quality of care between public and private healthcare

[55] This may be because of indirect healthcare costs (such as transport costs) and differences in other determinants of health-seeking behavior.

in the province (Rannan-Eliya and Sikurajapathy, 2015). This is also apparent in the quantitative data, which shows that most consumers prefer public care when their healthcare needs are more serious. By-passing primary care is another feature of health-seeking behavior that is evident in the data. While bypassing is more common for adult preventive services, it is rare for preventive MCH services. Consumers also often by-pass primary care facilities for curative needs that could be met at the primary level. For example, 63 percent of respondents reported that they would go to a secondary facility for curative care for chronic conditions. Finally, a significant proportion of households do not know where they could seek care for adult preventive health services, such as counseling on nutrition and life style.

Chapter 5. Out-of-pocket Health Expenditures

Highlights:

- The amount of out-of-pocket payments in the province is modest given the level of Sri Lanka's per capita income.
- Public facilities in Sri Lanka provide services for free. However, given that patients are sometimes directed to private facilities for laboratory tests and medicines, seeking care from public facilities does involve some costs.
- The major component of health expenditure associated with accessing healthcare in public facilities is medicine, followed by laboratory tests and transport costs.
- Economically well-off households pay significantly higher out-of-pocket payments than the worse-off, which reflects the fact that they receive most of their care from private facilities.
- Physiological risk factors and NCDs are associated with higher out of pocket payments.

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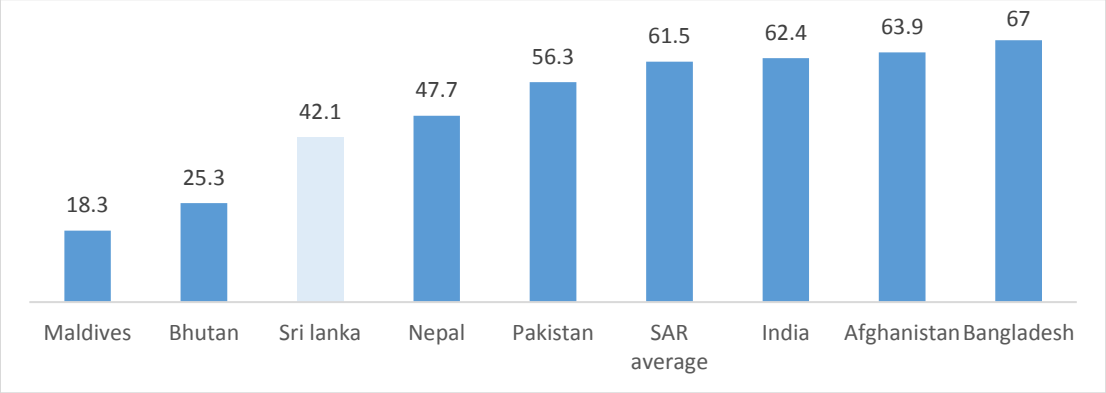
- The major component of health expenditure associated with accessing healthcare in public facilities is medicine, followed by laboratory tests and transport costs.
- Economically well-off households pay significantly higher out-of-pocket payments than the worse-off, which reflects the fact that they receive most of their care from private facilities.
- Physiological risk factors and NCDs are associated with higher out of pocket payments.

113. **The magnitude of out-of-pocket (OOP) payments in any country is an important indicator reflecting the country's progress in achieving universal health coverage (UHC).** It is one of the three dimensions of WHO's UHC cube (WHO, 2010). Financing a health system through OOP payments can be financially catastrophic for households and can increase inequality in access to care. The poor may be forced to reduce their current consumption, deplete their assets, or borrow money in order to afford needed medical care (Russel, 2004; O'Donnell et al, 2008; and Yilma et al, 2014).[56] Alternatively, they may forgo care altogether. Because of the provision of free public care in Sri Lanka, analysts tend to underplay the potential financial risk related to OOP payments. However, according to the National Health Accounts, in 2013 OOP payments accounted for 38 percent of Sri Lanka's total health expenditure (Ministry of Health, 2016). While Sri Lanka performs better on this measure than other major countries in the region (Figure 5.1), in light of patterns of healthcare use and the increasing burden of NCDs, it seemed useful to examine the burden and distribution of OOP spending in the Western province. This chapter examines the magnitude and composition of OOP payments (including fees, drugs, and transportation

[56] There are two kinds of financial risk associated with seeking care: (i) out-of-pocket payments and (ii) forgone income (for example, Wagstaff, 2007 and Yilma et al, 2014). While the former relates to expenses for consultation, diagnosis, drugs and transport, the latter is a result of a drop in the labor supply and/or productivity of the sick member and his or her caregivers. The sum of these two factors equals the total cost of seeking healthcare for the household.

costs) and their distribution across socioeconomic groups. It also highlights the potential consequences of the increasing burden of NCDs for OOP payments.

Figure 5.1. Out-of-pocket Payments as a Percentage of Total Health Expenditures



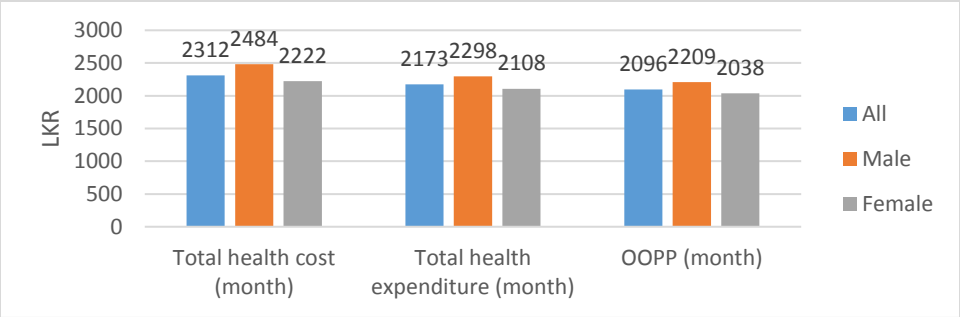
Source: World Development Indicators (2014)

5.1. Health Costs and Out-of-pocket Payments: Magnitude and Composition

114. **The total cost of seeking healthcare in the province is modest and its main component is health expenditure rather than forgone income.** The average total health cost (health expenditure plus forgone income) among those who sought care is LKR2,312, which is roughly 5 percent of Sri Lanka's monthly per capita Gross Domestic Product (GDP) (Figure 5.2).[57] On average, forgone income constituted only 4 percent of this total cost, the rest being total health expenditure (an average of LKR2,173). Perhaps reflecting differences in labor force participation or wage differences, the share of forgone income in total cost is higher for men than women (Annex Table A23).[58]

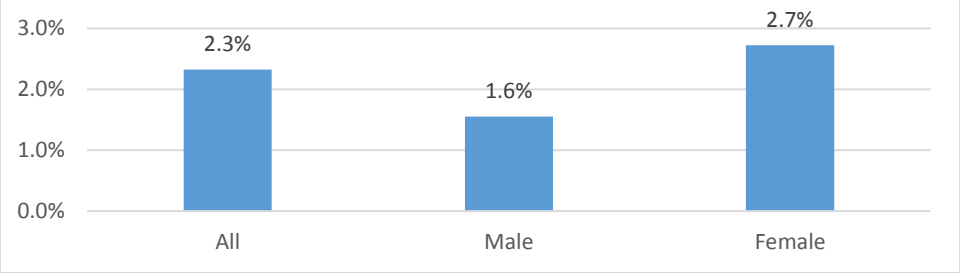
[57] This is based on Sri Lanka's annual per capital GDP in 2015 of LKR533,398 (World Development Indicators, 2015).
[58] This proportion is also significantly higher among rural residents (4.7 percent versus 3.2 percent in urban areas). Rural residents are less likely to have sick leave arrangements because they work in the informal sector or are self-employed, meaning that any days lost to illness require them to forgo income.

Figure 5.2. Health Costs, Health Expenditures, and OOP Payments for All Who Received Care



115. **There is very little effective insurance coverage outside the free public care.** The data show that only about 3 percent of individuals had some of their health expenses reimbursed by insurers, the government, or someone else, suggesting that there is very little effective insurance coverage outside the free public care system. As a result, the average share of reimbursement in total health expenditures is very small (2.3 percent).[59]

Figure 5.3. Share of Reimbursements in Total Health Expenditure



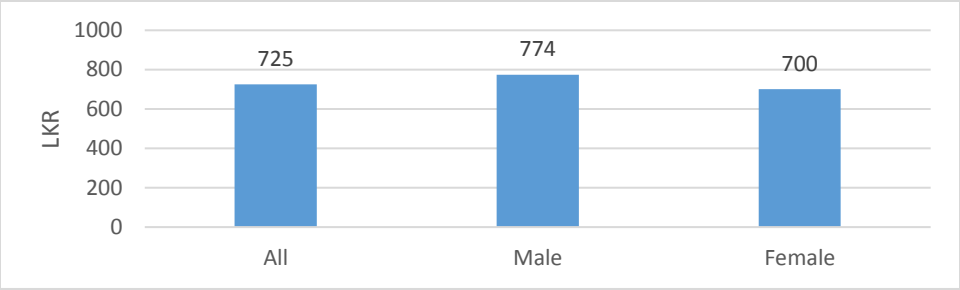
116. **The amounts of OOP payments actually paid by healthcare users (in other words, net of reimbursement) in the Western province are small by international standards.** More than one-third of individuals paid for either outpatient or inpatient care,[60] but the average OOP payment for all individuals is only LKR725 (Figure 5.4). Even when considering only those who used healthcare, the average monthly OOP payment actually paid is LKR2,096, which is small by international standards (only 4.7 percent of the country's per capita GDP).[61]

[59] This is significantly higher among women (2.7 percent) than men (1.6 percent). The share is very small irrespective of the source of healthcare (public or private) or type of care (outpatient or inpatient).

[60] A recent study by Kumara and Samaratunge (2016) reported that 65 percent of households in Sri Lanka incur OOP payments. However, this is not directly comparable to our finding as our study is at the individual level.

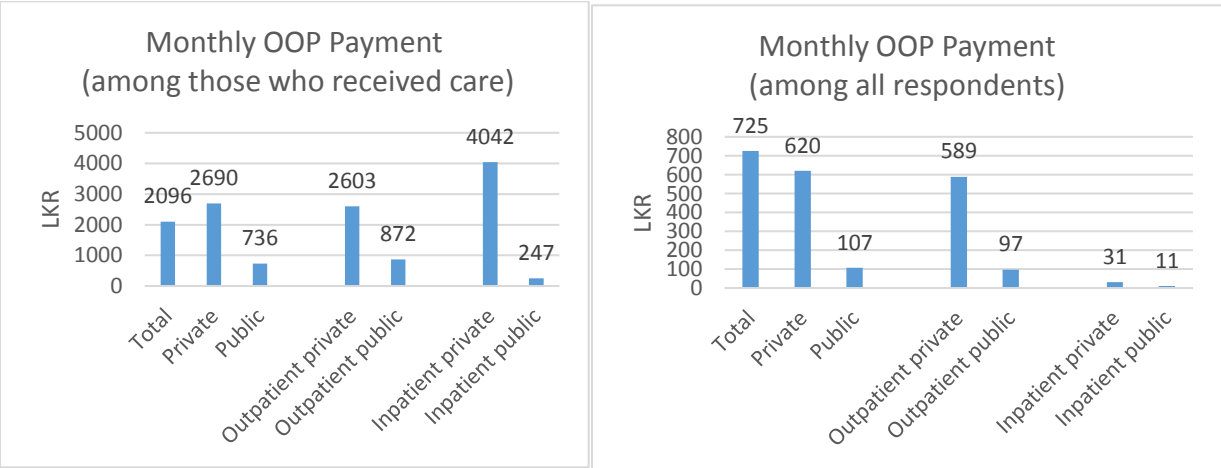
[61] Although difficult to compare since our analyses are at the individual level, the health share in household consumption expenditure that is often considered catastrophic is 10 percent or above.

Figure 5.4. OOP Spending Among Entire Sample



117. **Public facilities in Sri Lanka provide services for free.** However, given that patients are sometimes directed to private facilities for laboratory tests and medicines, seeking care from public facilities can involve some costs. Figure 5.5 shows OOP payments categorized by private or public care and by inpatient or outpatient care. The average OOP spending in private facilities is much higher than OOP payments associated with care in public facilities both for outpatient and inpatient services. However, why are people having to incur OOP payments in a free public care system? In the case of public outpatient care, the major reason is the cost of transport to get to the facility. As many as 85 percent of those who sought public outpatient care incurred some transport cost. More interesting, however, is the fact that 21 percent and 48 percent of public outpatient care users spent some amount on laboratory services and medicine respectively. The unavailability of certain medicines and laboratory services in public facilities means that users must incur some OOP expenses to acquire them privately, but the amounts involved are small.

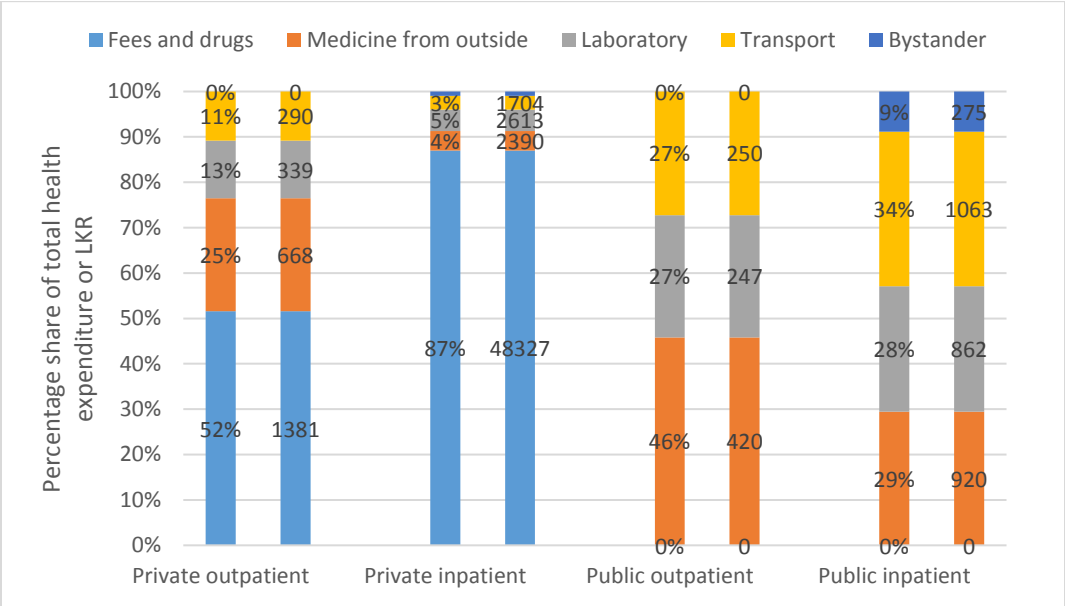
Figure 5.5. OOP Spending by Type and Source of Care



118. **The composition of total health expenditure suggests that the largest share of health expenditure in public facilities is payment for medicines and laboratory tests, followed by transport costs (Figure 5.6).** For public outpatient care, the average expenditure on medicines and laboratory tests amounts to 73 percent of the average total health expenditure while expenditure on transport is equal to 27 percent of the average total health expenditure. For public inpatient care, the average expenditure on

medicines and laboratory tests amounts to 57 percent of the average total health expenditure while expenditure on transport constitutes 34 percent of the average total health expenditure. The remaining nine percent is related to payments for caregivers/bystanders during hospitalization. In private facilities, the major share of health expenditure is spent on consultation fees and drugs within the facility, particularly for inpatient care.

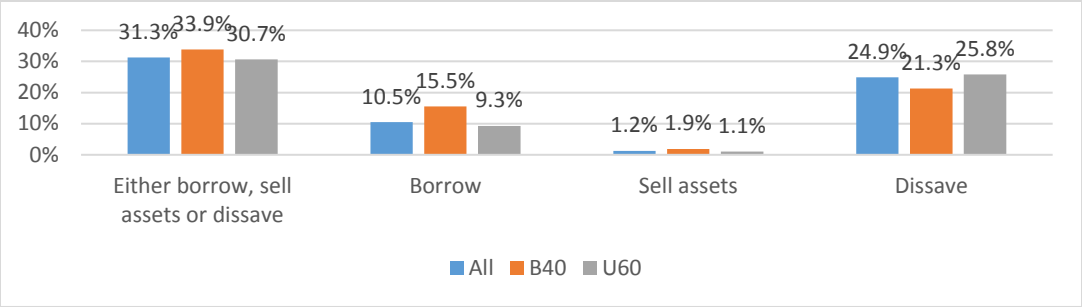
Figure 5.6. Composition of Health Expenditures by Type and Source of Care



119. **In order to understand how people pay for healthcare, the questionnaire asked respondents if they had to borrow money from formal or informal sources, mortgage their jewelry, sell any assets, or mobilize their savings.** To simplify, we combined the first three actions related to borrowing, which resulted in three ways to finance OOP payment - borrowing money, selling assets, and drawing on savings. Some households may use a combination of these actions to finance health care, while others might be able to finance it from their current income.

120. **Although OOP spending in the province appears to be low, it can lead households, especially those in the B40, to resort to undesirable coping responses.** Approximately one-third of the individuals who sought care had to rely on such traditional coping responses (31 percent) (Figure 5.7). The most common of these was running down savings (25 percent), while selling assets was rare. Running down savings may not be a costly coping response if it does not affect the productive capacity of the household, in which case it would be akin to relying on current income in terms of its welfare consequences (at least in as far as it does not lead to a decline in basic consumption). However, 11 percent of the respondents had to resort to borrowing, with significantly more of the B40 (15.5 percent) having to do so than the U60 (9.3 percent) (p-value<0.01). The B40 are also less likely to run down their savings (21 percent versus 26 percent) (p-value<0.1), reflecting their constrained ability to rely on buffer stock. Using these traditional coping responses to pay OOP may be to the detriment of the individual's long-run welfare, especially among the B40 who may find it difficult to pay back their debt.

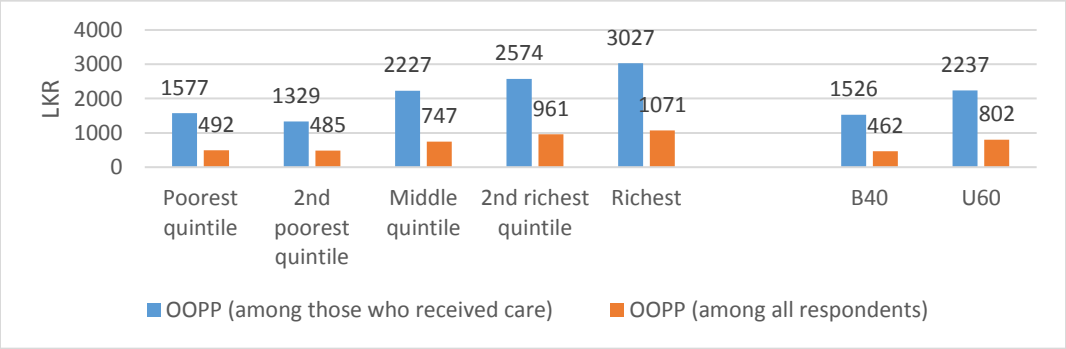
Figure 5.7. Sources of Finance for Healthcare



5.2. Factors Associated with OOP Spending

121. **Out-of-pocket payments are significantly higher among the economically better-off, reflecting higher utilization of services at private health facilities.** The U60 incur 74 percent higher OOP payments than the B40 (Figure 5.8 and Annex Table A24). This difference is partly driven by the higher rate of healthcare use among the U60. However, even among those who receive care, the U60 incur 46 percent higher OOP payments than the B40. The main reason for this is the source of care. As shown in the previous chapter, the better-off are more likely to seek care from private health providers. The positive association of OOP spending with economic status holds even after controlling for differences in risk factors and the socio-cultural determinants of healthcare use (Annex Table A25) (Box 5.1). The B40 spend 52 percent less than the U60 on healthcare.[62,63,64]

Figure 5.8. OOP Payments by Households' Economic Status



[62] i.e. in Annex Table A25, exp(0.422)-1 = .525

[63] The two-part models also show that the B40 are about 5 percentage points less likely to incur OOP payment and given some spending, they spent 29 percent less.

[64] Similarly, those from households with poor living conditions and households that use unclean sources of fuel spend 16 percent and 25 percent less respectively. Moreover, individuals in households headed by a person who has completed at least an A/L level of education spend 42 percent more than those headed by less educated individuals. Qualitatively similar results have been reported by Kumara and Samaratunge (2016).

Box 5.1. Estimation technique for OOP Payments

A feature of the outcome variable is that 65 percent of the observations have zero values as these individuals did not spend anything on healthcare. With so many individuals reporting no medical expenditure, substantial inconsistency could arise from adding an arbitrary constant to these zero values before taking logs and estimating least squares (Santos Silva and Tenreyro, 2006). A commonly used estimator for medical expenditures (Jones, 2011) is a generalized linear model in which outcome variables are specified as an exponential function of covariates, and this is estimated by Gamma and Poisson Pseudo Maximum Likelihood. The Poisson Pseudo Maximum Likelihood estimator weights all observations equally and hence may be more sensitive to outliers, whereas the former (GPML) is more robust as it gives less weight to observations with a large conditional mean. Here we present the interpretation of estimates from the GPML (column 1 of Annex Table A25) estimator.

The analyses also make reference to estimates from a two-part model, where the probability of facing some OOP spending is modelled first and a separate OLS model is estimated for the log of the positive part of the OOP payment distribution.

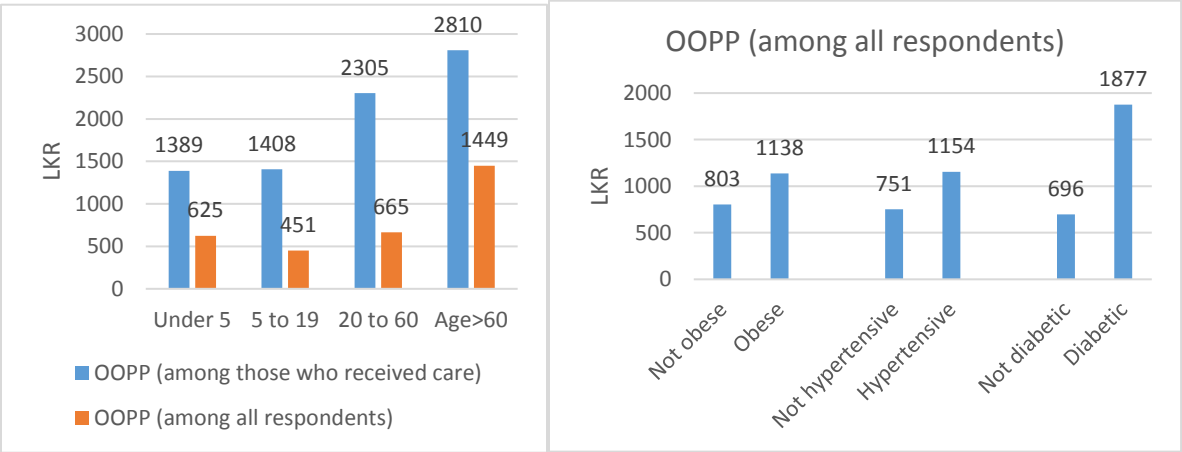
Specification:

A set of individual and household-level characteristics and risk factors are included in the regression. These include: (i) measures of ability to pay (consumption quintiles or whether the individual belongs to the B40 households, whether the head of the household has completed at least an A/L level of education, whether they have poor living conditions, and whether the household uses unclean sources of fuel); (ii) non-modifiable risk factors (sex, age, and age squared); (iii) environmental risk factors at the household level (whether anyone in the household works in hazardous work environments and whether they have unhealthy way of disposing of garbage); and (iv) socio-cultural and infrastructural factors that could determine health-seeking behavior (indicators for ethnicity, district, and sector of residence). When analyzing the adult sample, the regression also includes a sixth variable, namely, physiological risk factors (dummy variables for being underweight, overweight, obese, or hypertensive) and a dummy for having diabetes.

122. **OOP payments are higher among adults, especially among those with physiological risk factors (obesity and hypertension) and diabetes.** Average OOP payments are higher among adults and the elderly than among children and adolescents (Figure 5.9). Obese adults (those with a BMI of 30 and over) have 42 percent higher OOP payments than those who are not. Similarly, hypertensive adults spend 54 percent more out of pocket than non-hypertensive adults. Furthermore, diabetic adults spend 170 percent more out of pocket than those who are not diabetic. Even among those who received care, out-of-pocket spending was significantly higher (by 23 percent) among diabetic adults than those who are not diabetic, indicating that the difference is due both to differences in healthcare use and to differences in the costs of care. These costs may be higher for diabetes patients, who might require more treatment and costlier services. Taking differences in economic status and other individual characteristics into account does not change these differences. The regression analysis shows that, while there is no difference in

spending between those who are underweight and normal weight, those who are overweight and obese spend 23 percent and 53 percent respectively more than those who have a normal BMI (Annex Table A26). Moreover, hypertensive individuals spend 19 percent more on healthcare from out-of-pocket than those who are not hypertensive, while diabetics spend as much as 101 percent more than those who do not have diabetes.[65]

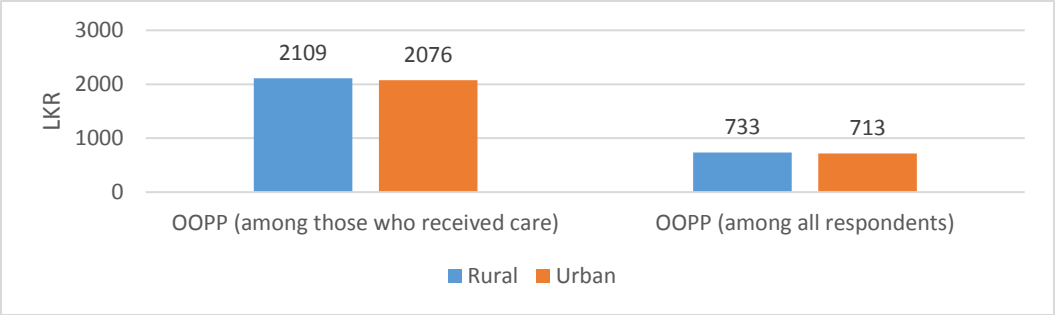
Figure 5.9. OOP Payment by Age, Physiological Risk Factors, and Diabetes



123. **On average, there is no significant difference in spending between rural and urban parts of the province** (Figure 5.10). The absence of significant rural-urban difference in OOP payment in the Western province contrasts with the national average where OOP payments are substantially higher in urban areas than in rural areas according to the 2012/13 HIES.[66] For the Western province, the HIES data also show that OOP spending is similar in rural (LKR2,340) and urban areas (LKR2,494).[67] It is important to note that the HIES figures are at the household level (and hence much higher than our survey data at the individual level). As mentioned earlier, the data do not allow for a valid household-level analysis because our survey collected detailed health spending data only for a selection of individuals in the household. Looking at a sub-sample of households (14 percent) for which the survey collected spending data for all household members, no significant difference can be seen in the out-of-pocket payments of rural (LKR2,889) and urban residents (LKR2,524). The lack of rural-urban difference in OOP payments in the province may be attributable to the possibility that the rural areas in the province are either not as rural as elsewhere in Sri Lanka or that these rural residents live close enough to Colombo that they can use urban services and this is reflected in their spending.

[65] This association could be anticipated because we identified diabetics from households' own health records, which means that these individuals have been diagnosed and have, therefore, used and paid for healthcare.
[66] LKR2,211 (urban) vs LKR1,433 (rural). These figures are at the household level and not restricted to those who utilized care.
[67] The HIES 2012/13 data show that the incidence of catastrophic expenditure is higher in rural areas (12 percent versus 9 percent at the 10 percent threshold). This is true not only in the Western province but also nationally. Unfortunately, a valid estimate of catastrophic expenditure cannot be computed here as the survey instrument and sample design were not designed for this task.

Figure 5. 10. OOP Payments by Urban or Rural Location



Summary

124. **In sum, while the amount of out-of-pocket payments paid in the Western province is modest and is borne based on ability to pay, the increasing burden of NCDs may pose a threat to the financial protection of households in the province in the future.** In light of the increasing prevalence of NCDs and of physiological risk factors that are associated with higher spending, containing OOP spending may require both reducing the prevalence of these risk factors and removing the quality constraints that drive people away from public care, especially for routine conditions.

125. **Most of the spending in the province is incurred when seeking private care, but part of it is also** associated with the unavailability of laboratory tests and medications in public facilities, forcing patients to use private laboratories and pharmacies. This problem will need to be addressed to ensure that Sri Lanka can maintain its good record in financial protection.

Chapter 6. An Overview of the Health System of Sri Lanka

126. **The previous four chapters examined the prevalence of NCDs and risk factors in the Western province and the factors associated with health-seeking behavior and out-of-pocket health spending.** In part, health-seeking behavior and out-of-pocket health spending are a reflection of the country's health system. The lack of awareness among individuals, especially adult men, about their health conditions and the inability to manage diagnosed chronic conditions may indicate that the health system is failing to identify, treat, and follow up with NCD patients. This chapter highlights how Sri Lanka's health system is organized, with the aim of identifying: (i) better ways to address the increasing burden of NCDs and (ii) aspects of the health system, which have been effective for maternal and child health, but are not contributing to improvements in NCD health outcomes.

127. **The health system of Sri Lanka consists of both a public and a private sector, with the public sector being the primary source of care.** The public health system provides services free of charge and is funded by general tax revenues that are managed by the Ministry of Health or its nine provincial counterparts. The public health system consists of two parallel networks providing preventive health services and curative health services. The system provides nearly 100 percent of the country's preventive services, as much as 90 percent of inpatient services, and 50 percent of outpatient services. Over the last three decades, the private sector has increased its role in providing health services, primarily curative outpatient services in urban and suburban areas.

128. **The private sector in Sri Lanka includes a range of providers that operate mostly in urban areas.** These include private hospitals providing outpatient and inpatient services, general practitioners, laboratory and diagnostic facilities, physiotherapy and rehabilitation services, ambulance services, home nursing care services, pharmacies and pharmaceutical companies. Most of the private hospital beds are located in the Western province and a few in other major cities**.** The bulk of private healthcare services are delivered by four providers based primarily in Colombo: Nawaloka, Asiri Hospital Holdings, Lanka Hospitals, and Durdans. As of 2011, the private sector's share in total number of hospitals and hospital beds was 17 and 6 percent, respectively. Of the 4210 private hospital beds in the same year, 50 percent were in Colombo (Rannan-Eliya et al. 2012).

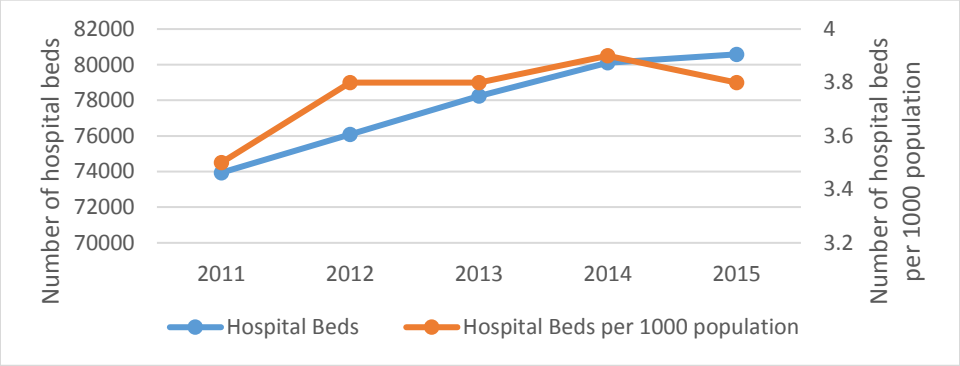
129. **The public sector has most of the country's health manpower and inpatient facilities.** The public health sector employs more than 90 percent of all doctors and nurses, constituting nearly 120,000 staff across the country (Department of Census and Statistics, 2013). There are 87 medical officers, 202 nurses, and 42 midwives per 100,000 population (Ministry of Health, 2015) (Table 6.1). Approximately 3.8 hospital beds are available per 1,000 population in the public sector (approximately 80,581 beds) (Figure 6.1). One of the limitations of the public health system is that outpatient services are open only until mid-afternoon (except emergency care, which is available 24/7). This inconvenience makes some people seek outpatient care in private facilities despite the cost. Other than this, geographic access to public health services does not appear to pose challenges. It is estimated that every Sri Lankan is, on average, no more than 1.4 kilometers away from a basic health clinic and 4.8 kilometers from a public health care facility.

Table 6.1. Key Health Personnel in Sri Lanka, 2015

	Total	Rate per 100,000 population
Medical Officers	18,243	87
Dental Surgeons	1,340	6.4
Assistant Medical Officers	936	4.5
Nurses	42,420	202.3
Public Health Nursing Sisters	290	1.4
Public Health Inspectors	1,604	7.7
Public Health Midwives	6,041	28.8
Hospital Midwives	2,765	13.2

Source: Annual Health Bulletin 2015, Annex Table 9 (Ministry of Health, 2015)

Figure 6.1 Hospital Beds in Sri Lanka, 2015

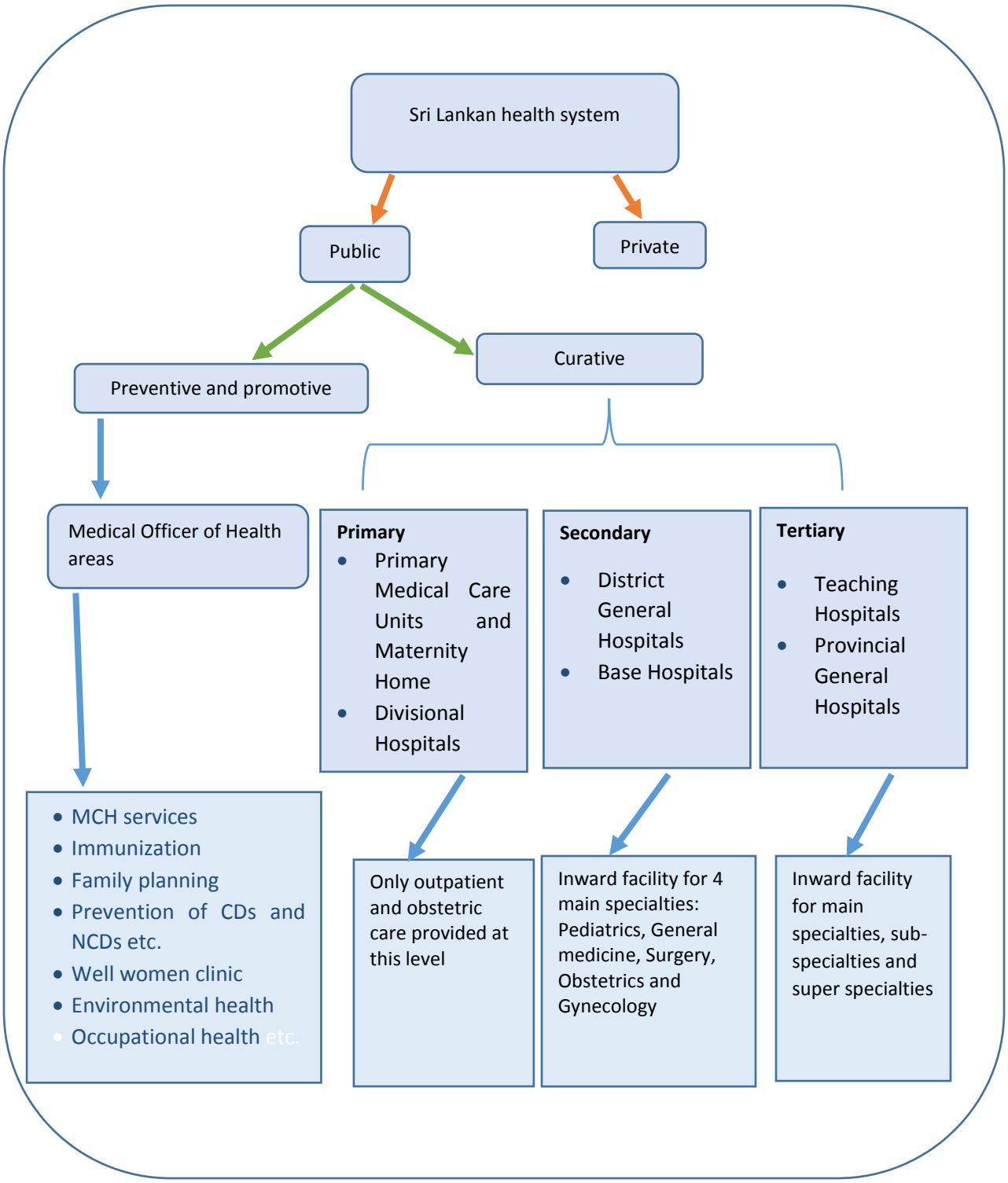


Source: Annual Health Bulletin 2015 (Ministry of Health, 2015)

130. **The private sector is largely staffed by off-duty public sector doctors.** Private involvement in the country's healthcare sector began in the 1980s when government-educated and employed doctors were also permitted to consult privately on their own time. In 2011, only 700 medical officers worked fulltime in the private sector. Of the 16,500 medical officers in the public sector, close to thirty percent worked part-time in private hospitals (Rannan-Eliya et al. 2012).

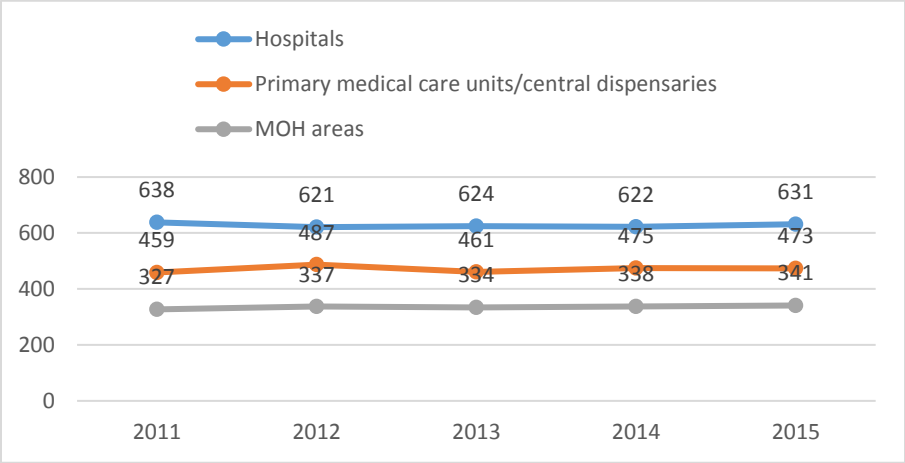
131. **Preventive and curative health services in the public sector are organized through two parallel channels:** (i) community health services focused on promotive and preventive care and (ii) curative services ranging from non-specialized care at the primary level to specialized care at hospitals. Figure 6.2 shows this clear separation between preventive and curative service provision at the local level. At a higher level, all preventive services and primary and secondary-level curative services are the responsibility of nine Provincial Directors of Health Services (PDHS) and 26 Regional Directors of Health Services (RDHS), whereas tertiary hospitals are the responsibility of the central Ministry of Health.

Figure 6. 2. Organization of Sri Lanka's Health System



132. **Preventive community health services are provided through a network of 341 health unit areas across the country (Figure 6.3).** Each area is led by a Medical Officer of Health (MOH) whose field team (which includes a public health nursing sister, a public health inspector, a supervising public health midwife, and a second public health midwife) provides preventive and promotive services on maternal and child health, including the implementation of an expanded program of immunization, nutrition, family planning, and the prevention and control of communicable diseases. The key responsibilities of the MOH also include creating awareness of healthy lifestyles and referring patients for NCD screening. While this cadre of professionals are largely responsible for Sri Lanka's impressive MCH outcomes, so far they have not been able to repeat the success for NCDs. It may be necessary to reorient the focus of these community health services to give NCDs more attention. All services provided by the MOH are free of charge and are provided at either the patient's house or in the field clinics by field health staff under the direct supervision of the MOH of the area.

Figure 6.3. Numbers of Preventive and Curative Government Healthcare Facilities 2011-2015



133. **Public curative services are provided by a network of 1,104 government institutions ranging from primary medical care units to teaching hospitals (which only provide specialized care), but there is no effective referral system.** All curative services are provided at three levels: (i) the primary level (in primary medical care units and divisional hospitals); (ii) the secondary level (in district general hospitals and base hospitals); and (iii) the tertiary level (teaching and special hospitals and provincial general hospitals). According to the Annual Health Bulletin 2015 (Ministry of Health, 2015), there are 631 non-specialist and specialist public hospitals in Sri Lanka (Table 6.2). The primary-level institutions are non-specialist hospitals, while the secondary and tertiary-level hospitals provide specialized care. The level of the institution determines the type of service that it provides. The primary-level facilities are staffed by one or more medical officer with a basic degree and provide only outpatient care and/or obstetric care. Secondary-level care institutions have in-ward facilities for the four main specialties (pediatrics, general medicine, surgery, and obstetrics and gynecology). Tertiary care institutions have in-ward facilities for most sub-specialties and for super-specialties in addition to the main specialties. These services are accessible to the population with no restrictions in the absence of an effective referral system.

Table 6.2 Number of Hospitals by Type

	Number		Number
Teaching Hospital	16	Divisional Hospital	482
Provincial General Hospital	3	Maternity Homes	14
District General Hospital	20	Other Hospitals	25
Base Hospital	71		
Total number of Hospitals			631

134. **The health system allows patients to bypass lower levels of care even for conditions that do not require specialist care, so, despite long waiting times, most patients seek care directly from secondary and tertiary hospitals**. This leads to an under-use of the primary care institutions and overcrowding at secondary and tertiary care institutions. In 2012, outpatient clinic visits were divided roughly equally across the primary, secondary, and tertiary-level facilities in the health system, whereas, ideally, 70 to 80 percent of all care should have been delivered at the primary care level, 10 to 15 percent at the secondary level, and the remaining (most advanced) cases treated at the tertiary level.

135. **The curative side of the public health system is not well suited to dealing with the overwhelming burden of non-communicable diseases.** The key feature of the public health system is its commitment to free care at all levels, and it has achieved 100 percent coverage of key MCH services such as antenatal care, institutional deliveries, and immunizations. However, this kind of care is episodic and curative rather than the continuous and integrated care across all levels of care that is required for chronic NCDs (Table 6.3). The primary level facilities do not routinely initiate and coordinate NCD care. In the current system, NCD patients cannot be tracked as they receive care from many different facilities at different times. Tracking these patients is further complicated by the fact that the health information system is

136. **Doctor-patient familiarity is impeded by the lack of a primary care model in Sri Lanka and a culture of self-referral.** One of the reasons why people prefer private over public care is the fact that they cannot choose between doctors in public facilities but are assigned to whomever is available when they reach the front of the queue. Given that NCDs require long-term integrated care, a strong doctor-patient relationship is crucial to the effectiveness of the treatment. Introducing a primary care model based on family physicians would make it possible for such relationships to be built and would enable patients to become partners in managing their health. It would also shift the focus of the health system from illness episodes to the health needs of the whole family. This is particularly important in Sri Lanka where adult men tend to not use preventive health services. If a family physician was familiar with patterns and differences between individuals in the same family, he or she would be able to provide effective counseling on lifestyles, which are risk factors for NCDs.

Table 6.3. The Ideal Approach to Chronic NCD Care

Conventional approach to ambulatory medical care	Ideal approach to addressing chronic NCDs care
• Focus on illness and curing the sick • Episodic curative care/discrete interventions • Responsibility limited to giving advice during consultation • Users are recipients of health/ medical interventions • Disjointed care provided by fragmented "stand-alone" facilities and programs.	• Focus on the overall health needs of the family • Comprehensive, continuous, and person-centered care • Responsibility for health throughout the lifecycle • Making people partners in managing their health • Integrated delivery of care with strong communication between levels of providers.

137. **There is a pressing need in Sri Lanka for a strong primary healthcare system focused on chronic conditions with a service delivery approach that seeks to improve the quality of care for patients by ensuring that services are coordinated and tailored to their needs.** The current system has a strong MCH service base but only a weak system of community-based care. The Ministry of Health recently introduced healthy lifestyle centers in an attempt to address NCDs, but they are not yet being widely used by the population. An individual with a medical condition needs a continuum of care and services. People with NCDs can experience obstacles at various stages of care, including getting a diagnosis, being directed to care, initiating and adhering to treatment. All of these stages affect the desired outcome, which is disease control. The "cascade of care" (diagnosis, link to proper care, adherence to needed care, and the achievement of disease control) would be improved by the development of a strong primary healthcare system for NCDs and by improvements in the paper-based health information system to facilitate the tracking of patients referred to higher-level facilities.

Chapter 7. Conclusion and Recommendations

7.1. Summary and Conclusion

138. **This study examined the prevalence and distribution of NCDs and associated physiological and behavioral risk factors among adults.** It also examined patterns of health service use and out-of-pocket payments and their association with NCDs. The findings show that the most common NCDs (diagnosed) posing a threat to healthy adult life in the province include hypertension, diabetes, cataracts, ischemic heart disease and asthma. The less educated appear to have a higher burden of NCDs, but there is no systematic difference by economic status. More concerning is the fact that the onset of these conditions is early, suggesting that young adults live with health conditions for a substantial part of their lives. A special inquiry into two physiological risk factors (obesity and hypertension) for various NCDs revealed substantial concerns.

139. **First, more than one in four adults (26 percent) are hypertensive, but as many as 70 percent of them are unaware of their status.** This lack of awareness is common across both genders, all places of residence, and all socioeconomic groups but is more extensive among some groups than others. Despite having a higher probability of being hypertensive, men are less likely to be aware of their hypertensive status, suggesting that use of preventive care differs by gender. While hypertension does not seem to be associated with socioeconomic status, the poorest and richest quintiles are more likely to be aware of their conditions than the middle 60 percent. While hypertension does not seem to be associated with socioeconomic status, the poorest and richest quintiles are more likely to be aware of their conditions than the middle 60 percent. As expected, groups that are less aware of their status are those that have the least contact with the health system (as suggested by the low utilization of outpatient care). Men and relatively younger people also seem to have the lowest rates of preventive care utilization.

140. **Second, the prevalence of general obesity in the province (15 percent) is substantially higher than the average for Sri Lanka (6 percent).** Combined with the prevalence of abdominal obesity[68] (57 percent), this poses a significant risk for NCDs. Obesity disproportionately affects women and adults between 30 and 60 years of age. Although the rate of obesity is the highest among the richest quintile, it is alarmingly high even among the poor. Consistent with evidence from other countries, obesity in the province was found to be significantly associated with the risk of hypertension and diabetes.

141. **Moreover, taking public health actions solely based on BMI-based risk classifications excludes a large proportion of adults, especially women, who are at a substantial risk of metabolic complications.** Waist circumference appears to predict the risk of diabetes better than BMI-based obesity. A significant proportion of people in the normal BMI weight category is at risk of complications related to abdominal obesity (Figure ES3). Given that the health risk of a given level of body fat in the Asian population is much higher than in other regions, policymakers need to give this issue a considerable amount of attention.

[68] Abdominal obesity is based on waist-circumference.

142. **Behavioral risk factors such as smoking, betel chewing, and harmful alcohol consumption are generally not very widespread, but their concentration among older men and lower socioeconomic groups should be of concern for policymakers.** The clustering of these risk factors among these vulnerable groups may exacerbate the existing economic disadvantages for such groups. Furthermore, the risk of hypertension is higher among those who practice these habits, which suggests that the potential health benefits of expanding preventive counseling services, especially to men, are large.[69]

143. **Environmental risk factors, particularly indoor air pollution, also increase the vulnerability of lower socioeconomic groups and those living in the rural parts of the province**. About 47 percent of households in the Western province use unclean sources of fuel (43 percent use biomass and 4 percent use kerosene). Our readings of indoor air pollution in 50 households showed levels of pollution that were substantially higher than WHO's interim target-1. Indoor air pollution is a greater risk factor for the health of poorer households, as they are more likely to depend on biomass for fuel and to have no functional chimney. Almost one-third of households in the poorest quintile cook with biomass but have no functional chimney, compared to only 4 percent of households in the richest quintile. Children from households that primarily use unclean sources of fuel are about 2 percentage points more likely (than children from households that use clean sources of fuel) to have symptoms of wheezing and whistling in the chest.

144. **The poorer populations tend to use public facilities, while private facilities are largely used by the better-off, mainly for reasons of convenience and shorter waiting times**. Among those who used some outpatient or inpatient care, the probability of choosing private care rather than public care is higher for the better-off, the better educated, and the elderly. Analysis of health-seeking behavior suggests that much of this preference is driven by differences in waiting times and the soft skills of health providers between public and private providers of care rather than by any major differences in infrastructure, amenities, or perceived clinical quality. Quantitative data, however, also show that individuals prefer to use public facilities for more serious healthcare concerns.

145. **The data also revealed that a high proportion of people seeking care bypass primary care facilities in favor of higher-level services.** This is particularly true for adult preventive services but is rarer for preventive MCH services. Consumers also often bypass primary care facilities for curative needs that could be met at the primary level. For example, 63 percent of respondents reported that they would go to a secondary facility for curative care for chronic conditions, while only 23 percent responded that they would seek care from primary facilities. Furthermore, a significant proportion of households did not know where they could seek care for adult preventive health services, such as counseling on nutrition. This an issue on which policymakers need to focus.

146. **Out-of-pocket (OOP) payments are modest given Sri Lanka's per capita income, but ensuring this does not escalate will require public health actions to control NCDs**. Most out-of-pocket spending in the province is for private care, but part of it is likely due to the unavailability of laboratory tests and medications in public facilities, forcing patients to use private laboratories and pharmacies. Considering the increasing prevalence of NCDs and physiological risk factors that are associated with higher healthcare use and spending, containing OOP spending will require reducing the prevalence of these risk factors and

[69] Partly because age and these lifestyles are correlated, this association vanishes in a multivariate regression.

removing the quality constraints that drive people away from public care, especially for routine conditions. Early diagnoses and management of risk factors can reduce an otherwise costly treatment of NCDs (both for individuals and the government).

147. **The curative side of the public health system is not well suited to deal with the overwhelming burden of non-communicable diseases**. Primary level facilities provide facility based episodic NCD care, and they do not routinely initiate or coordinate such care. A culture of self-referral and lack of an effective gatekeeping mechanism produce discontinuity in client information between providers and constrain the doctor-patient relationship. The ability to choose doctors appears to be an important factor driving patients to utilize private facilities. Given that NCDs require long-term integrated care, however, a strong doctor-patient relationship is crucial for the effectiveness of treatment. In the current system, NCD patients cannot be tracked as they receive care from different facilities at different times, oftentimes resulting in lack of continuity of care. Tracking these patients is further complicated by the absence of an electronic health information system.

7.2. Recommendations

148. **While the analyses were based on the Western province, recommendations are made for the country as a whole**. There are two reasons for this. First, the focus on the Western province is a strategic one. Given the rate of urbanization and the relative homogeneity and size of the country, it can be argued that other provinces will follow the trends exhibited by the Western province. As other provinces urbanize and their socio-economic conditions and life styles change, they will be faced with similar challenges that the Western province is facing now. Therefore, reorienting the health system in anticipation of these challenges could lead to prevention of risk factors and early detection, which would result in significant health gains nationwide. Second, several of the recommendations are systemic and institutional, and therefore would apply to the whole country.

149. **A multi-pronged approach, consisting of multi-sectoral preventive interventions, health system** reorientation and strengthening, and a targeted approach aimed at those most vulnerable to NCDs and NCD risk-factors, is required to address the challenges posed by the behavioral, physiological, and environmental risk factors for NCDs, as identified in this study. Vulnerable populations include men, people with multiple risk factors and the poor (who suffer more from smoking, betel chewing, indoors pollution, etc.).

150. **Even though the health sector bears most of the burden of prevention and treatment of NCDs, most interventions that could create health promoting environments lie outside the health sector.** Acknowledging this, Sri Lanka has recently approved a National Multi-sectoral Action Plan for the prevention and control of NCDs (2016-2020) focusing on the following four strategic areas: i) leadership, advocacy, and partnership; ii) health promotion and risk reduction; iii) reorientation of the health system for early detection and management of NCDs and risk factors; and iv) surveillance, monitoring and evaluation, and research. The recommendations listed below are consistent with this Action Plan and are based on the findings presented in this study.

A. Interventions to control risk factors and prevent the onset of NCDs

I. **Introducing and expanding population-based interventions**: Population-based interventions such as community-wide campaigns and national NCD literacy campaigns together with regulations and corporate social responsibility can effectively reduce the trend in unhealthy aging population. Such interventions are key as primary prevention of NCDs and are affordable even in low income settings. They do not require health system strengthening and have low cost of implementation. These interventions address not only those already suffering from NCDs but also those who are the most exposed to NCD risk factors. It should be noted that most of the recommended policies require a multi-sectoral approach. The Lancet NCD Action Group and the NCD Alliance propose the delivery of five priority interventions based on their health effects, cost effectiveness, low cost of implementation and political and financial feasibility (Beaglehole et al. 2011). Among these five set of interventions, four are population-based, namely:

a) **Reduce unhealthy diet and promote physical activity**: through mass-media campaigns, fiscal measures (food taxes and subsidies), food labelling and marketing restrictions to reduce unhealthy diet (such as saturated and trans-fat, and sugar in sweetened drinks). Fiscal measures could be used not only to discourage the consumption of unhealthy diet but also to promote the consumption of fruits and vegetables. Global experience has shown that fiscal policies can be an important instrument to curb consumption of unhealthy foods (Table 7.1). The empirical evidence suggests that fiscal policy interventions are most effective for sugar-sweetened beverage taxes, reducing consumption by 20-50 percent, and fruit and vegetable subsidies, increasing consumption by 10-30 percent. Combining the two policies could also potentially reduce substitution with unhealthy foods. Prior to implementing such policies, however, several important questions need to be answered regarding the type and structure of taxes to use, which products to tax, implications for revenue generation, and the distributional consequences of such policies (particularly for the poor and other vulnerable groups). In addition, such policies are often met with strong opposition from the private sector, and the government should be prepared to address this. In many countries, civil society involvement has been critical in the adoption and implementation of necessary legislation. It should be noted that Sri Lanka has already taken some steps to address these issues.

Table 7.1. Effectiveness of fiscal policies on diet

	Food/beverage taxes	Nutrient-focused taxes	Subsidies
Effect on consumption	Strongest evidence for SSB taxes – reduce consumption by same percentage as tax rate.	Reduce consumption of target but may increase consumption of non-target nutrients; may apply to core foods; better if paired with subsidy.	Subsidies increase healthy food intake. Strongest evidence for fruit and vegetable subsidies.
Effects on body weight/disease outcomes	Substitution will affect total calorie intake. Most effective to target sugar-sweetened beverages. Limited evidence for disease outcomes.	Disease outcome affected by substitution – nutrient profile taxes less likely to have unintended effects than single nutrient-based taxes.	Subsidies may also increase total calorie intake and body weight. Very likely to reduce dietary NCD risk factors.
Differential effects	May be most effective for low-income populations; may have greater effect on those who consume most.	May be more likely to have regressive effects as more likely to apply to core foods.	Mixed socioeconomic status effects for population subsidies, may benefit wealthy. Targeted low-income subsidies effective.

Source: World Health Organization (2016). Fiscal Policies for Diet and Prevention of Non-Communicable Diseases

Countries that have already introduced diet-related fiscal policies include Ecuador, Mexico, Thailand, and Hungary. Others, such as Colombia and the Philippines, are in the process of adopting such policies. In Hungary, the introduction of a public health product tax (PHPT) resulted in 26-32% of consumers decreasing the intake of products subject to PHPT. While price increases were the primary reason for behavior change, a significant share of consumers (26-32 percent depending on food categories) indicated that they reduced consumption as a result of higher health consciousness. Importantly, the policy was particularly effective among individuals most at risk, as consumers with poor self-reported health status were twice as likely to decrease consumption of foods subject to PHPT than those of good health. In addition, the policy had an impact on the food industry. Almost 40 percent of manufactures reformulated their products, 30 percent completely removed unfavorable ingredients, and 70 percent reduced the number of unfavorable components in the product.

Table 7.2. Examples of taxes on drinks and foods in other countries

Country	Year	Foods Taxed	Tax Rate
Denmark	2011	Products with more than 2.3% of saturated fat: meat, dairy products, animal fats, and oils	Kr16/kg (£1.76; €2.15; $2.84) of saturated fat
Fiji	2006	Soft drinks	5% on imported drinks
Finland	2011	Soft drinks and confectionery	Soft drinks €0.075/L (£0.06; $0.10); confectionery €0.75/kg
France*	2012	SSBs and artificially sweetened beverages	€0.11/1.5L
French Polynesia*	2002	Sweetened drinks, confectionery, and ice-cream	60 francs/L (£0.41; €0.55; $0.66) for imported drinks
Hungary*	2011	Foods high in sugar, fat or salt, and sugary drinks	10 forint (£0.03; €0.04; $0.05) per item
Mexico	2014	Non-dairy SSBs and high energy dense foods (EDF)	SSBs: 1 peso/L EDFs: ad valorem tax of 8% for a defined list of non-essential foods containing ≥275 calories/100g
Nauru	2007	Sugar, confectionery, carbonated drinks, cordial, and flavored milks	30% import levy
Norway	1981	Sugar, chocolate, and sugary drinks	Variable
Samoa	1984	Soft drinks	0.40 tala/L (£0.11; €0.14; $0.18)
South Africa	Proposed for implementation in 2017	SSBs (exemptions: pure fruit juices and milk-based drinks)	Each gram above a threshold of 4g/100ml is taxed at R0.021/gram
United Kingdom*	Proposed for implementation in 2018	SSBs (exemptions: pure fruit juices and milk-based drinks)	24p/L if sugar content >8gr/100ml; 18p/L if sugar content of 5-8 gr/100ml
United States	Various	Sugar-sweetened soft drinks in 23 states (SSSDs and other foods in 35 states)	1-8%

Source: Landon (2012) and Hagenaars et al (2017).

*At least a portion of revenues is earmarked for health.

A number of countries have already introduced mandatory front-of-package labels, including the United Kingdom, Ecuador, Chile, Mexico. In 2012, Chile passed legislation (Law 20.606 on Food Nutritional Composition and Food Marketing) aimed to reduce consumption of unhealthy foods in order to address the growing obesity epidemic in the

country. Specifically, the law restricted food marketing to children under 14 years of age, regulated school food environment, and required front of package warning labels (Figure 7.1). The Ministry of Health established thresholds for calories, saturated fat, sodium, and sugar (decreasing them at 24 months and 36 months after implementation). Foods that exceeded these cutoff values had to be labeled accordingly. Focus groups were conducted to determine which labels would be most effective and recognizable, particularly for children. Unlike the commonly used traffic light front-of-pack labeling, Chile chose a black sticker to convey the information. While front-of-package (FOP) labels have been found to be more effective than mandated nutritional information (Becker et al., 2015), the design of the labels also appears to be important. A recent study found that the black warning labels can be more effective in influencing children's choice as compared to the traffic light warnings (Arrua et al., 2017).

Figure 7.1. Chile's Front of Package Warning Food Labeling

Source: Ministry of Health Chile (2017). Translation (from left to right): 1) high in calories, 2) high in saturated fat, 3) high in sodium, 4) high in sugar.

b) **Reduce consumption of dietary salt:** through mass-media campaigns and voluntary action by food industry to reduce salt content of processed foods. Sri Lanka could use innovative public health campaigns to inform households about the health risks of dietary salt they put in the food they prepare at home. Also, the government can nudge the private sector to change industry norms with regards to salt and fat content of processed foods as it is inevitable that consumption of processed foods will increase with urbanization. A number of countries have already introduced policies to reduce salt consumption (Table 7.3). Recognizing the difficulty of establishing strict regulation on salt use and high costs associated with enforcement, in 2002 the United Kingdom decided to implement voluntary targets of salt reduction for a range of processed foods. The government collaborated with industry representatives to establish a set of guidelines and specific targets for salt reduction. As a result, salt intake fell from 9.5 grams in 2005 to 8.1 grams per day in 2009. The success of the program has been largely achieved as a result of an effective partnership approach with the industry, with the government showing a keen interest in understanding the technical barriers that producers face (He et al., 2014). Similarly, Kuwait also introduced voluntary targets by targeting one of the main sources of sodium in the country – bread. The Ministry of Health was able to

negotiate with the local producer, responsible for more than 80% of bread production in Kuwait, to reduce the amount of salt by 10% (WHO, 2016c). Working together with universities, research institutions, and associations representing the baking and food industries, the Federal Ministry of Health in Argentina introduced nutritional guidelines for salt consumption, a coordinated national plan for salt reduction, and a law reducing access to salt shakers in restaurants (Meiro-Lorenzo et al., 2011). Understanding the potential constraints, South Africa's government gave the industry three years to make the necessary changes in order to meet the newly stipulated legislation regarding salt levels.

c) In addition to legislation, communication campaigns could also be effective at **reducing sodium consumption**. The communication for behavioral impact (COMBI) approach promoted by the WHO uses multiple communication channels to encourage schools, communities, health service providers, and local authorities to take action to reduce salt consumption. China's Shandong Ministry of Health Action on Salt Reduction and Hypertension (or SMASH) initiative is a good example of this multifaceted approach. Working together with restaurants, SMASH developed sodium standards for Shandong cuisines, produced lower salt menus, and conducted communication activities to raise awareness about recommended salt levels. A mid-term evaluation showed a decline in salt consumption from 12.5 grams per day in 2011 to 11.6 grams per day in 2013 among adults 18-69 (WHO, 2016c).

Table 7.3. Examples of countries with legislation on salt reduction

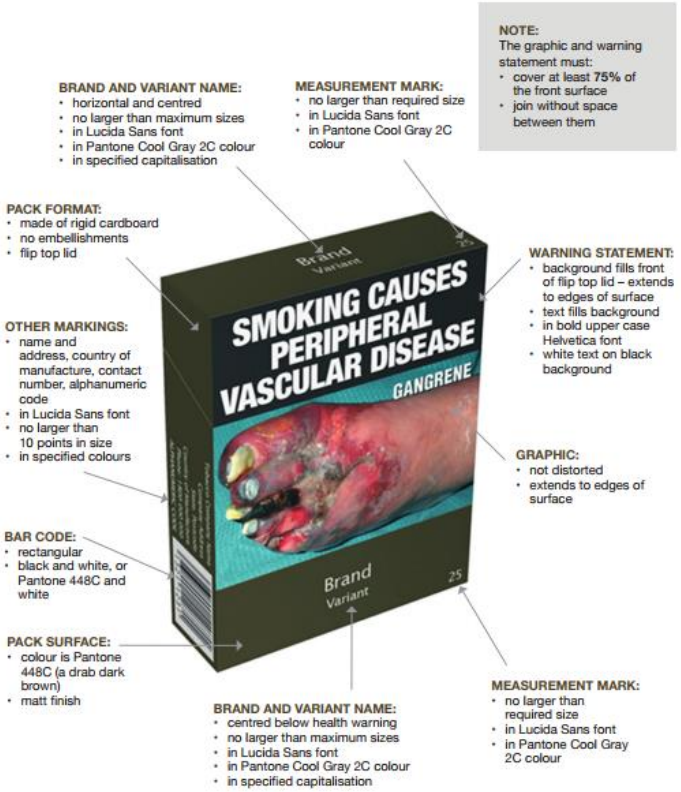
Mandatory salt targets	Argentina (most foods), Belgium (bread), Bulgaria (bread, milk products, meat products and lutenica), Greece (bread, tomato products), Hungary (bread), Netherlands (bread), Paraguay (bread), Portugal (bread), South Africa (most foods)
Taxation on high salt foods	Fiji (tax on MSG), Hungary, Portugal
Regulation on Front of Pack Labeling	Chile, Ecuador, Finland, Indonesia, Korea (on children's foods), Mexico, Portugal, Thailand (on 5 snack food categories)
Standards for salt as part of procurement policies in public institution settings	Argentina, Brazil, Bulgaria, Cook Islands, Costa Rica, Estonia, Finland, France, Greece, Hungary, Israel, South Korea, Kuwait, Latvia, Lithuania, Malaysia, Mexico, Romania, Slovenia, Spain, Sweden, USA, and UK

Source: Trieu et al. (2015)

d) **Control tobacco use** through accelerated implementation of the WHO Framework Convention on Tobacco Control. It is to be noted that Sri Lanka already has a robust tobacco taxation policy but it could benefit from other complimentary interventions such as prohibiting illicit trade of tobacco products and banning point of sale display and all other forms of advertising. Regulating the content and emissions of tobacco products could further reduce the health damage caused by the use of tobacco. In April 2017, Sri Lanka was selected to receive technical support under the WHO FCTC 2030 project aimed

at strengthening the Framework Convention on Tobacco Control (FCTC) measures. While Sri Lanka has already made significant progress in implementing tobacco control measures, additional steps could be taken to strengthen FCTC implementation. Specifically, increasing the excise tax rate from the existing 63 percent to the WHO-recommended level of 75 percent could further reduce the prevalence of smoking and deter the young population from initiating smoking. While countries often fail to raise tobacco taxes due to their perceived regressivity, a number of recent studies have found that tobacco taxes can indeed be pro-poor policies (Verguet et al., 2015, Postolovska et al., 2017, World Bank, 2017). Not only do they avert premature mortality, but they also improve financial risk protection by reducing the burden of tobacco-related diseases and associated out-of-pocket expenditures. Prohibiting smoking in restaurants and other public spaces is also important and will require not only regulation but also significant enforcement to be effective. In addition, the availability of cessation services and help-lines could assist current smokers to stop smoking. The introduction of plain packaging as has been done in Australia could also significantly reduce the attractiveness and appeal of tobacco products. Studies have also shown that plain packaging increases the salience of health warnings on cigarette packs and leads to further reductions in the prevalence of smoking than large health warnings alone (Borland et al., 2013).

Figure 7.2. Example of plain packaging for tobacco products



Source: WHO (2016). Plain packaging of tobacco products

e) **Reduce harmful alcohol consumption**: through tax increase, banning advertisements and restricting access. Enforcement of the National Alcohol Policy and establishment of mechanisms to reduce the production and sale of illicit alcohol would also help.

II. Targeted campaigns promoting healthy behavior: To maximize impact, customize campaign messages for different target groups and use tailored platform to communicate messages.

a) **Campaigns on behavioral risk factors:** The relatively high prevalence of smoking, excessive alcohol use, and betel chewing among the socio-economically disadvantaged, men and the elderly suggest that these groups of people may not fully appreciate the health risks of such lifestyle choices. Campaign message with hard-hitting evidence on health effects of these lifestyle related risk factors such as smoking could be designed such that they are appealing to these groups of population. The platform used for such campaigns could also be tailored to these population groups. In addition, to deter early initiation of unhealthy behavior, Sri Lanka could design and implement school health programs. There are a few notable examples of such campaigns in other countries. In 2008, Australia launched the Measure-Up campaign aimed at reducing the prevalence of non-communicable disease by raising awareness between waist measurement, physical activity, healthy eating, and obesity risk among adults. The focus was on waist circumference as an indicator of an unhealthy lifestyle. Qualitative research prior to the introduction of the campaign found that this was a compelling, credible and easy to understand message. The campaign resulted in high unprompted and prompted awareness (38 percent and 89 percent, respectively), but there were no significant changes in reported consumption of fruits and vegetables or physical activity (King et al., 2013). Brazil was able to achieve higher levels of physical activity through a community based program - the Academia da Cidade program (ACP). The ACP provides free supervised leisure-time physical activity sessions, nutrition education, and health monitoring (including blood pressure measurements, anthropometric and nutritional assessments) in Recife, Brazil. The city identifies public spaces, such as parks, beaches, and recreation centers, and conducts the necessary renovations to ensure that the space can be used for ACP. Physical education teachers are paid for the by the city government (Simoes et al., 2013).

b) **Campaigns on utilization of preventive check-ups and counseling services:** Campaigns that motivate people to have regular preventive check-ups and counseling services should especially target young adult men who are found to forgo such health services. This would help to delay the onset of NCDs and provide early treatment. It is, however, important to ensure that the elderly are not left behind, as they continue to be the most vulnerable due to their age and high prevalence of NCDs and behavioral risk factors. This is particularly important considering Sri Lanka's rapid aging of the population and the implications this will have on future healthcare costs. The private sector could also play an important role in raising awareness about healthy behaviors and increasing uptake of

services. In the United Arab Emirates, for example, the Ministry of Health formed a public private partnership with Bin Sina Pharmacy in an effort to combat the rising rates of obesity and diabetes. Bin Sina provides health examinations, assistance, and advice on cholesterol, blood pressures, diabetes, and obesity to everyone who visits their outlets at a subsidized price. Almost 28,000 people participated in the first year of the program, of whom 27% were diagnosed with high levels of cholesterol (Meiro-Lorenzo et al., 2011).

c) **Campaigns on healthy weight**: Campaigns on the health benefits of maintaining a healthy weight and how to achieve it should target women and younger adults who are at a higher risk of being overweight. This effort should raise awareness not only about the BMI-based risk of body fat but also about the health risks of abdominal obesity. These campaigns could involve messages on healthy foods and food based dietary guidelines, unhealthy diet (both for food prepared at home and purchased processed foods), and the health benefits of physical activity. The "Agita Sao Paulo" program in Brazil encourages citizens to adopt an active lifestyle by doing at least 30 minutes of moderate physical activity per day. It targets three main groups: students, workers, and the elderly. The program is known for its multi-sectoral approach, broad use of partnerships, and simple messaging, and has been replicated in other parts of Brazil and the region (Meiro-Lorenza et al., 2011). Worksite interventions to address nutrition and physical activity have also been found to be moderately effective (Anderson et al., 2010). Table 7.4 presents a list of strategies that have been found to be effective in changing individual behaviors.

B. Health system reorientation and strengthening

I. Introducing integrated and continuous care with primary care as default first contact: The study's findings of widespread risk factors, low awareness of health conditions and ineffective management of diagnosed conditions suggest that Sri Lanka's health system is not as effective at dealing with NCDs as it has been for maternal and child health. The system provides facility based episodic care, but there is no routine initiation and coordination of NCD care at the primary level. A new NCD case is typically diagnosed within an outpatient department or in the hospital during inpatient admission, and its management is usually centered around a single disease by a specialist rather than person-centered care that primary care providers could provide. Effective management of NCDs is also constrained by a culture of self-referral, which limits doctor-patient familiarity. As such, establishing an integrated NCD care system that goes beyond a facility based episodic care to reach and screen those who forgo preventive care and ensure necessary follow-up is essential. By institutionalizing primary care as the first point of contact, a more productive doctor-patient relationship can be established. The following actions are needed for the introduction of an effective and integrated chronic care model primary care service delivery:

a) **Constitute primary care teams** to enable provision of comprehensive NCD care. This requires appropriately training providers to meet complex NCD needs, including facility based health promotion and behavior change services.

b) **Regularly assess the capacity of the health system** and the pillars of health service delivery (human resource, facilities and drugs) to provide high quality integrated primary NCD care services. Evaluating existing public facilities in terms of availability of essential NCD drugs and diagnostic facilities and investing to fill these gaps would help contain OOP expenses related to NCD care.

c) **Develop referral chains** after careful geographic mapping of appropriate facilities to complete the feedback loop and ensure the continuum of care.

d) **Invest in an electronic information system** to enable the transfer of patient information between providers in the integrated delivery of care.

II. **Institutionalize primary care level opportunistic NCD screening and counseling.** Develop and implement basic health services such as screening services for blood pressure, cholesterol and diabetes, and interpersonal communication program (for improved diet and life style). Provision of life-style counseling to care seekers would enhance self-regulatory behavior. Opportunistic screening is a cost-effective way of reaching those who are less likely to seek preventive and counseling services (e.g. men).

III. **Improve soft skills of providers:** Improve communication skills of public healthcare providers through appropriate training and performance based rewards. One of the major reasons reported for choosing private over public care is the 'hostile attitude' of staff in public facilities. Unlike acute episodic care, NCD care requires continuous interaction with health care providers for which patient comfort and trust are essential. Providers could receive additional training on the importance of good communication with patients. The Institute of Medicine (IOM) identifies patient-centered care as one of the six main elements of high-quality care. Specifically, patient-centered care is defined as "respecting and responding to patients' wants, needs and preferences, so that they can make choices in their care that best fit their individual circumstances" (IOM, 2001). A recent review found that patient-centered care was positively associated with clinical effectiveness and safety consistently across a range of disease areas, study designs and settings (Doyle et al., 2013). Patient experience or responsiveness, however, is not commonly used to assess the performance of individual health providers, but several countries have included patient experience indicators in pay-for-performance schemes. The UK, for example, includes an indicator to track the length of a GP consultation (at least 10 minutes) in its Quality and Outcomes Framework (QOF) program (OECD, 2014). Brazil's Social Organizations in Health (OSS) performance scheme for hospitals includes two performance indicators on patient satisfaction: percentage of patient complaints addressed and completion of patient satisfaction surveys. Meanwhile, Turkey's performance based contracting scheme in family medicine includes an administrative system comprising 35 indicators, among which are abiding with working hours and duties, maintenance and security of health records, and ensuring patient confidentiality (World Bank, 2013). Box 7.1 provides an example of an effective integrated primary care model in Costa Rica.

Box 7.1. Costa Rica's EBAIS Primary Care Model

Costa Rica's Equipo Basico de Atencion Integral de Salud (EBAIS; or basic integrated health team) model is another prime example of an integrated primary care approach. Initiated in 1995, the program aims to ensure first contact access, comprehensiveness, continuity, and coordination of care. Each team consists of a physician, nurse, technical assistant (similar to a community health worker), a medical clerk, and a pharmacist. All providers are trained to provide all primary care (from prenatal to geriatric care), and each team member has a clearly defined role. The physician is responsible for the provision of curative and preventive care, while the nurse performs basic clinical tasks and provides health counseling. The technical assistant is responsible for health promotion activities, disease prevention, epidemiological data collection, basic sanitation services, identification of disease risk factors, and referrals. Technical assistants conduct home and community visits (e.g. churches, schools) and can also follow up with patients who miss their appointments. The medical clerk conducts patient registration and data collection, while the pharmacist is responsible for dispensing prescribed medicines. Individuals are assigned to an EBAIS team based on where they live, with the goal of 4500 patients per team. Maintaining a reasonable patient to clinician ratio, geographic empanelment ensures that individuals have access to providers and results in relatively low wait times. Data collection is a critical element, as all information (collected from both home and clinical visits) is sent to the health area administration and subsequently to the Social Security Agency (Caja Costarricense de Seguro Social or CCSS). The CCSS in turn uses the information to revise targets in the management contracts for each area. If an area fails to meet the targets, together with the CCSS it develops an action plan to improve performance. In 2014, EBAIS teams conducted 75% of all medical consultations in Costa Rica.

Source: Pesec et al. (2017)

151. **Implementing these recommendations will have economic benefits both at the micro and macro levels.** At the micro level, the prevention and early management of NCDs protects households from loss of productivity and financial risk due to high OOP payment for medical care. At the macro level, the fiscal implications of rising NCDs could be substantial. While the aging of the population will result in higher costs for public provision of health care, NCDs could reduce the tax base of the economy by affecting productivity and labor supply. Given the large societal costs of premature mortality and morbidity due to NCDs, there is a strong case for investment in prevention and management of NCDs. Yet, the question of fiscal sustainability of these reforms remains to be explored, especially if these interventions are to be financed from the existing health budget. Efficiency gains from the gate-keeper system could be one source of fiscal space to strengthen the health system and launch population-wide interventions. Notwithstanding this, proper examination of the fiscal implications of these interventions requires scrutiny. It is also worth noting that given the developmental threats that NCDs pose in aging populations, there is a case for the Ministry of Finance to allocate more resources to the health sector.

Table 7.4: Interventions on Diet and Physical Activity: Summary Results from a Systematic Review

Settings	Impacts	Examples
Policy and environment	Effective interventions	• Government regulatory policies to support a healthier composition of staple foods (e.g. replacing palm with soya oil reduces the saturated fatty acid content of the oil). • Environmental interventions targeting the built environment, policies that reduce barriers to physical activity, transport policies and policies to increase space for recreational activity. • Point-of-decision prompts to encourage using the stairs (e.g. information on the benefits of physical activity beside elevators and stairs)
	Moderately effective interventions	• Pricing strategies (fiscal policies) and point-of-purchase prompts in grocery stores, vending machines, cafeterias and restaurants to support healthier choices • Multi-targeted approaches to encourage walking and cycling to school, healthier commuting and leisure activities
Mass media	Effective interventions	Mass media campaigns promoting physical activity: with community-based, supportive activities such as programs in schools and local communities; or associated with policies to address local environmental barriers to participation
	Moderately effective interventions	• Intensive mass media campaigns using one simple message, e.g. increasing consumption of low-fat milk, or fruit and vegetables • National "health brand" or logos to assist consumers to make healthy food choices • Long-term, intensive mass media campaigns promoting healthy diets

Settings	Impacts	Examples
School settings	Effective interventions	High-intensity school-based interventions that focus on diet and/or physical activity, are comprehensive, multi-component and include: - curriculum on diet and/or physical activity taught by trained teachers - supportive school environment/policies - a physical activity program - a parental/family component - healthy food options available through school food services: cafeteria, vending machines, etc.
	Moderately effective interventions	• A focused approach, for example programs aimed at reducing sedentary behavior and increasing participation in physical activity, accompanied by supportive activities within the curriculum • A formative assessment that addresses the needs of the school and cultural contexts
Workplace	Effective interventions	Multi-component programs promoting healthy dietary habits and/or physical activity, that: - provide healthy food and beverages at the workplace facilities, e.g. in the cafeteria or vending machines - provide space for fitness or signs to encourage the use of stairs - involve workers in program planning and implementation - involve the family in interventions through self-learn programs, newsletters, festivals, etc. or - provide individual behavior change strategies and self-monitoring
Community	Effective interventions	• Diet education programs that: target high-risk groups (e.g. menopausal, pre-diabetic women); and are multi-component; • Community development campaigns with intersectoral cooperation and/or focused on a common goal (e.g. reduction in cardiovascular disease risk) • Group-based physical activity programs or classes for a homogenous group of individuals

Settings	Impacts	Examples
	Moderately effective interventions	Interventions that use an existing phone-in service to provide dietary advice - Community-wide interventions conducted as part of a national or global campaign (e.g. healthy lifestyles strategy or "Healthy Village") in a homogenous community - Programs that target low-income/low literacy populations and include diet education in the standard program - Computer/web-based interventions with interactive personalized feedback, targeting high-risk groups Supermarket tours and on-site educational programs to support the purchase of healthier foods - Walking school bus
Primary care	Effective interventions	Interventions targeting chronic NCD risk groups that: - include persons who are inactive, consume less than five servings of fruits and vegetables daily, consume a lot of dietary fat, are overweight, or have a family history of obesity, heart disease, cancer and/or type 2 diabetes and - include at least one session (health risk appraisal) with a health-care professional, with brief negotiation or discussion to decide on reasonable, attainable goals, and a follow-up consultation with trained personnel who are supported by targeted information and are linked and/or coordinated with other stakeholders such as community sports organizations or ongoing mass media physical activity campaigns
	Moderately effective interventions	• Cholesterol screening programs that provide clients with their results and follow-up education, ideally in person • Weight loss programs using health professionals with: - personal or telephone/Internet consultations over a period of at least four weeks, and - a self-help program that includes self-monitoring.

Source: WHO (2009)

Note: Evidence from a systematic review. Interventions were labelled effective if the study had a robust experimental design, sufficient sample size, and significant effects on specified outcome variables. They were also determined to be generalizable to other settings. Moderate interventions lacked one or more elements but were determined to be sufficiently robust in certain settings.

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Annex 1: Statistical Tables

Table A1. Distribution of Most Prevalent NCDs Across Socioeconomic Groups

		Self-reported NCD	Diabetes Mellitus	Hypertension	Ischemic heart disease	Asthma	Cataract	observations
Sex	Male	23.5%	**14.4%**	13.8%	**3.1%**	1.9%	6.6%	1974
	Female	22.2%	**10.9%**	14.9%	**1.6%**	2.0%	5.6%	4532
Residence	Rural	**20.2%**	**10.9%**	14.4%	1.8%	1.9%	5.8%	2148
	Urban	**25.9%**	**13.2%**	15.0%	2.3%	2.0%	5.8%	4358
Economic status	U60	22.4%	**12.3%**	14.4%	1.9%	2.0%	6.0%	5095
	B40	23.0%	**10.2%**	15.6%	2.4%	2.0%	5.0%	1411
Consumption quintiles	Poorest quintile	23.0%	9.9%	15.5%	2.2%	1.9%	**4.9%**	1518
	2nd poorest quintile	24.1%	12.7%	15.1%	1.7%	1.5%	**6.6%**	1355
	Middle quintile	20.7%	11.9%	12.4%	1.7%	2.2%	**5.6%**	1157
	2nd richest quintile	22.6%	13.1%	14.7%	1.7%	2.3%	**7.5%**	1240
	Richest	22.1%	12.1%	15.3%	2.5%	2.0%	**4.5%**	1236
Education	Low educated	**25.7%**	**12.9%**	**17.1%**	**2.2%**	2.0%	**6.8%**	4942
	Highly educated	**14.0%**	**9.2%**	**8.1%**	**1.4%**	1.8%	**3.4%**	1564
Age (10 year)	Age 20-30	**3.5%**	**0.9%**	**1.9%**	**0.2%**	**1.7%**	**0.4%**	924
	Age 30-40	**7.5%**	**4.3%**	**3.8%**	**0.3%**	**1.1%**	**0.6%**	1617
	Age 40-50	**17.8%**	**9.6%**	**9.5%**	**1.2%**	**1.4%**	**4.2%**	1246
	Age 50-60	**30.1%**	**21.3%**	**22.4%**	**2.2%**	**2.5%**	**8.0%**	868
	Age>60	**53.9%**	**24.7%**	**36.5%**	**5.9%**	**3.4%**	**16.2%**	1851
Age (elderly)	Age <60	**13.8%**	**8.3%**	**8.5%**	**0.9%**	**1.6%**	**2.9%**	4655
	Age>60	**53.9%**	**24.7%**	**36.5%**	**5.9%**	**3.4%**	**16.2%**	1851
District	Colombo	**26.2%**	**13.0%**	15.0%	**2.7%**	2.3%	**5.7%**	3915
	Gampaha	**21.2%**	**10.8%**	13.9%	**1.3%**	1.8%	**3.4%**	1585
	Kalutara	**17.4%**	**11.5%**	15.3%	**1.9%**	1.6%	**10.5%**	1006
	All	22.5%	11.9%	14.6%	2.0%	2.0%	5.8%	6506

Note: The statistically significant difference in means (p-value<0.1) between socioeconomic groups are in bold.

Table A2. Probit (Marginal Effects) for the Probability of Self-reported and Diagnosed NCDs

VARIABLES	(1) Self-reported NCD	(2) Diabetes	(3) Hypertension	(4) Ischemic heart disease	(5) Asthma	(6) Cataract
Male	-0.0315**	-0.00143	-0.0428***	0.00658**	-0.00262	-0.00986**
	(0.0134)	(0.00941)	(0.00909)	(0.00333)	(0.00399)	(0.00449)
30<age<40	0.125***	0.104***	0.0500**	-0.00501	0.00375	0.0113
	(0.0289)	(0.0292)	(0.0247)	(0.00688)	(0.00666)	(0.0180)
40<age<50	0.303***	0.230***	0.184***	0.0212	0.00737	0.111***
	(0.0307)	(0.0361)	(0.0313)	(0.0130)	(0.00782)	(0.0328)
50<age<60	0.466***	0.439***	0.399***	0.0582***	0.0127	0.198***
	(0.0307)	(0.0418)	(0.0365)	(0.0225)	(0.00944)	(0.0459)
age>60	0.626***	0.420***	0.473***	0.0753***	0.0203**	0.247***
	(0.0227)	(0.0337)	(0.0295)	(0.0208)	(0.00813)	(0.0387)
Urban	-0.000193	0.00442	-0.00654	-0.00186	-0.00908*	0.00885
	(0.0168)	(0.0116)	(0.0124)	(0.00376)	(0.00546)	(0.00641)
Education (at least completed A/L)	-0.0339**	0.00721	-0.0228**	-0.000415	-0.00284	-0.0116**
	(0.0143)	(0.0102)	(0.0105)	(0.00336)	(0.00425)	(0.00513)
Unemployed	0.0246*	0.00472	0.00758	0.00135	-0.000876	-0.00304
	(0.0140)	(0.00928)	(0.0100)	(0.00292)	(0.00428)	(0.00510)
Gampaha	-0.0522***	-0.00966	-0.0114	-0.00703**	-0.00861**	-0.00372
	(0.0161)	(0.0119)	(0.0123)	(0.00315)	(0.00427)	(0.00715)
Kalutara	-0.117***	-0.00172	-0.00840	-0.00481	-0.00859**	0.0500***
	(0.0157)	(0.0131)	(0.0139)	(0.00295)	(0.00394)	(0.0127)
B40	-0.00330	-0.0178*	0.00765	-0.00241	0.000774	-0.00675
	(0.0147)	(0.00944)	(0.0110)	(0.00266)	(0.00418)	(0.00518)
Observations	6,499	6,499	6,499	6,499	6,499	6,499

Note: Robust standard errors in parentheses. *** p<0.01. ** p<0.05. * p<0.1. The reference group is women aged 20 to 30 living in rural areas of Colombo, who have not completed an A/L level of education, are employed, and belong to the B40 households in the national consumption expenditure. Regression also controls for ethnic dummies.

Table A3. Probit (Marginal Effects) for the Probability of Self-reported and Diagnosed NCDs

	(1) Self-reported NCD	(2) Diabetes	(3) Hypertension	(4) Ischemic heart disease	(5) Asthma	(6) Cataract
Male	-0.0316**	-0.00159	-0.0424***	0.00648**	-0.00264	-0.00993**
	(0.0134)	(0.00939)	(0.00908)	(0.00329)	(0.00398)	(0.00446)
30<age<40	0.125***	0.104***	0.0502**	-0.00514	0.00370	0.0110
	(0.0288)	(0.0291)	(0.0247)	(0.00670)	(0.00658)	(0.0178)
40<age<50	0.303***	0.230***	0.183***	0.0203	0.00724	0.110***
	(0.0306)	(0.0361)	(0.0312)	(0.0127)	(0.00771)	(0.0328)
50<age<60	0.466***	0.438***	0.396***	0.0567**	0.0124	0.199***
	(0.0307)	(0.0420)	(0.0366)	(0.0220)	(0.00933)	(0.0462)
age>60	0.625***	0.420***	0.471***	0.0736***	0.0202**	0.247***
	(0.0227)	(0.0337)	(0.0295)	(0.0205)	(0.00802)	(0.0389)
Urban	-0.000973	0.00417	-0.00941	-0.00231	-0.00924*	0.00959
	(0.0169)	(0.0117)	(0.0126)	(0.00374)	(0.00544)	(0.00638)
Education (at least completed A/L)	-0.0355**	0.00646	-0.0262**	-0.00133	-0.00348	-0.0105**
	(0.0145)	(0.0105)	(0.0108)	(0.00322)	(0.00425)	(0.00532)
Unemployed	0.0248*	0.00470	0.00877	0.00131	-0.000686	-0.00333
	(0.0141)	(0.00928)	(0.0100)	(0.00286)	(0.00426)	(0.00507)
2nd poorest quintile	0.00680	0.0253*	-0.00517	0.00454	-0.00375	0.0152*
	(0.0180)	(0.0133)	(0.0126)	(0.00420)	(0.00455)	(0.00802)
Middle quintile	0.00762	0.0222	-0.0179	0.00513	0.00358	0.00603
	(0.0189)	(0.0138)	(0.0126)	(0.00459)	(0.00585)	(0.00793)
2nd richest quintile	0.00709	0.0259*	-0.00578	-8.91e-05	-0.00173	0.0143*
	(0.0189)	(0.0143)	(0.0136)	(0.00379)	(0.00503)	(0.00855)
Richest	0.0112	0.0231	0.00949	0.00873*	0.00168	0.00212
	(0.0199)	(0.0146)	(0.0147)	(0.00505)	(0.00580)	(0.00759)
Gampaha	-0.0530***	-0.0100	-0.0134	-0.00731**	-0.00895**	-0.00295
	(0.0162)	(0.0120)	(0.0123)	(0.00305)	(0.00405)	(0.00721)
Kalutara	-0.118***	-0.00198	-0.00894	-0.00459	-0.00868**	0.0501***
	(0.0157)	(0.0131)	(0.0138)	(0.00289)	(0.00390)	(0.0127)
Observations	6,499	6,499	6,499	6,499	6,499	6,499

Note: Robust standard errors in parentheses. *** p<0.01. ** p<0.05. * p<0.1. The reference group is women aged 20 to 30 living in rural areas of Colombo, who have not completed an A/L level of education, are employed, and belong to the B40 households in the national consumption expenditure. Regression also controls for ethnic dummies.

Table A4. Distribution of Observed Hypertension

	Hypertension*		Observed hypertension status			
	Diagnosed	Observed	Normal	Pre-hypertension	Stage 1 hypertension	Stage 2 hypertension
All	14.6%	26.1%	39.7%	34.2%	17.1%	9.0%
Male	13.8%	**34.2%**	24.9%	40.8%	23.2%	11.0%
Female	14.9%	**23.3%**	44.7%	32.0%	15.0%	8.3%
Rural	14.4%	25.5%	39.4%	35.1%	16.6%	8.9%
Urban	15.0%	26.9%	40.1%	33.0%	17.7%	9.2%
U60	14.4%	26.6%	38.7%	34.8%	17.5%	9.0%
B40	15.6%	24.2%	43.5%	32.3%	15.3%	8.9%
Poorest quintile	15.5%	24.2%	44.0%	31.8%	15.4%	8.8%
2nd poorest quintile	15.1%	25.8%	39.1%	35.1%	15.7%	10.1%
Middle quintile	12.4%	27.2%	40.2%	32.6%	19.2%	8.0%
2nd richest quintile	14.7%	27.4%	34.3%	38.4%	18.9%	8.5%
Richest	15.3%	26.0%	40.2%	33.8%	16.4%	9.6%
Low educated	**17.1%**	**28.5%**	37.1%	34.4%	18.3%	10.1%
Highly educated	**8.1%**	**19.7%**	46.6%	33.8%	13.7%	5.9%
Age <60	**8.5%**	**19.4%**	46.3%	34.2%	13.7%	5.8%
Age>60	**36.5%**	**49.9%**	15.7%	34.3%	29.3%	20.6%
Colombo	15.0%	**26.8%**	39.5%	33.7%	17.9%	8.8%
Gampaha	13.9%	**19.2%**	46.3%	34.5%	12.8%	6.4%
Kalutara	15.3%	**36.8%**	28.3%	34.8%	23.0%	13.9%

Note: *Test of difference in means is reported only for the first two columns. For these columns, the figures in bold show statistically significant differences in means between categories (p-value<0.1).

Table A5. Probit for Observed Hypertension and Awareness of Being Hypertensive

	(1) Hypertensive (observed)	(2) Hypertensive (observed)	(5) Aware being hypertensive	(6) Aware being hypertensive
Obese (BMI>=30)	0.0882***	0.0883***		
	(0.0191)	(0.0191)		
Daily smoker	-0.0243	-0.0252		
	(0.0313)	(0.0312)		
Daily betel chewer	0.00792	0.00804		
	(0.0246)	(0.0246)		
Excess alcohol	0.0387	0.0394		
	(0.0427)	(0.0427)		
Male	0.0456***	0.0457***	-0.128***	-0.127***
	(0.0175)	(0.0175)	(0.0248)	(0.0248)
30<age<40	0.170***	0.170***	0.330**	0.332**
	(0.0303)	(0.0303)	(0.159)	(0.158)
40<age<50	0.370***	0.370***	0.387**	0.382**
	(0.0310)	(0.0311)	(0.150)	(0.150)
50<age<60	0.500***	0.500***	0.583***	0.578***
	(0.0292)	(0.0294)	(0.119)	(0.120)
age>60	0.566***	0.567***	0.601***	0.597***
	(0.0248)	(0.0249)	(0.0988)	(0.0989)
Urban	0.0307*	0.0317*	-0.0320	-0.0500
	(0.0179)	(0.0179)	(0.0336)	(0.0343)
Education (at least completed A/L)	-0.0124	-0.0111	-0.0188	-0.0370
	(0.0155)	(0.0159)	(0.0311)	(0.0320)
Unemployed	0.0134	0.0127	0.00170	0.00534
	(0.0150)	(0.0150)	(0.0273)	(0.0272)
2nd poorest quintile		0.00653		-0.0666**
		(0.0193)		(0.0331)
Middle quintile		0.0174		-0.118***
		(0.0206)		(0.0318)
2nd richest quintile		-0.00779		-0.0905***
		(0.0195)		(0.0344)
Richest		0.00584		0.00251
		(0.0210)		(0.0385)
Gampaha	-0.0587***	-0.0585***	-0.0329	-0.0437
	(0.0180)	(0.0181)	(0.0348)	(0.0347)
Kalutara	0.134***	0.135***	-0.0381	-0.0399
	(0.0238)	(0.0238)	(0.0347)	(0.0346)
B40	-0.00508		0.0816**	

	(0.0157)		(0.0317)	
Observations	5,796	5,796	1,782	1,782

Note: Robust standard errors in parentheses. *** p<0.01. ** p<0.05. * p<0.1.
The reference group is women who do not practice daily smoking, -daily betel chewing, or excess alcohol consumption, are aged 20 to 30, live in rural areas of Colombo, have not completed an A/L level of education, are employed, and belonging to either the B40 of households in the national consumption expenditure or the poorest quintile of households in the sample (depending on the specification). Regression also controls for ethnic dummies.

Table A6. Distribution of Obesity and Underweight Across Population Groups

	Abdominal obesity	BMI-based classification						
	WC (IDF cut-off)	Obesity	Underweight	Normal	Overweight	Obese I	Obese II	Obese III
All	57%	14.5%	9.0%	44.5%	32.0%	10.9%	2.7%	1.0%
Male	**34%**	**7.9%**	9.2%	54.9%	28.0%	6.6%	1.1%	0.2%
Female	**65%**	**16.8%**	8.9%	41.0%	33.3%	12.3%	3.2%	1.3%
Rural	56%	**12.9%**	**9.7%**	45.5%	31.9%	10.0%	2.1%	0.8%
Urban	58%	**16.9%**	**7.9%**	43.1%	32.1%	12.1%	3.5%	1.3%
U60	**58%**	14.4%	**7.9%**	45.0%	32.8%	11.1%	2.4%	0.9%
B40	**52%**	15.1%	**13.1%**	42.8%	29.0%	9.9%	3.9%	1.3%
Poorest quintile	**52%**	14.4%	**12.9%**	43.5%	29.2%	9.5%	3.6%	1.2%
2nd poorest quintile	**54%**	14.3%	**9.1%**	47.5%	29.1%	10.7%	2.7%	1.0%
Middle quintile	**56%**	13.3%	**8.6%**	45.6%	32.5%	10.3%	2.5%	0.5%
2nd richest quintile	**58%**	14.3%	**7.4%**	43.2%	35.1%	11.6%	1.9%	0.8%
Richest	**65%**	16.5%	**5.9%**	42.8%	34.8%	12.5%	2.4%	1.5%
Low educated	56%	**15.2%**	9.4%	44.0%	31.5%	11.2%	3.0%	1.0%
Highly educated	59%	**12.9%**	8.0%	45.8%	33.4%	10.0%	1.9%	0.9%
Age <60	**58%**	**16.3%**	**8.0%**	41.7%	34.0%	12.1%	3.1%	1.1%
Age>60	**54%**	**8.1%**	**12.5%**	54.6%	24.7%	6.5%	1.1%	0.6%
Colombo	**56%**	**16.0%**	8.4%	43.4%	32.2%	11.6%	3.4%	1.0%
Gampaha	**59%**	**14.3%**	8.7%	42.3%	34.7%	10.4%	2.7%	1.2%
Kalutara	**54%**	**11.9%**	10.8%	50.8%	26.6%	10.0%	1.2%	0.6%
Sri Lanka average (STEPS 2015)	**N/A**	**5.9%**	15.3%	55.4%	23.4%	N/A	N/A	N/A

Note: *Test of difference in means is reported only for the first three columns. The statistically significant differences in means between socioeconomic groups (p-value<0.1) in these three columns are reported in bold.

Table A7. Probit for Obesity and Underweight

	General obesity (BMI≥30)		Abdominal obesity (WC)		Underweight (BMI<18.5)	
	(1)	(2)	(3)	(4)	(5)	(6)
Daily smoker	-0.0996**	-0.0969**	-0.116***	-0.106***	0.162***	0.159***
	(0.0387)	(0.0391)	(0.0385)	(0.0386)	(0.0423)	(0.0420)
Daily betel chewer	-0.106***	-0.100***	-0.0737**	-0.0620**	0.00345	0.000670
	(0.0273)	(0.0279)	(0.0295)	(0.0297)	(0.0246)	(0.0243)
Excess alcohol	0.0599	0.0656	-0.0272	-0.0298	0.0556	0.0559
	(0.0684)	(0.0690)	(0.0488)	(0.0487)	(0.0468)	(0.0469)
Male	-0.151***	-0.154***	-0.316***	-0.321***	-0.0270	-0.0264
	(0.0177)	(0.0175)	(0.0168)	(0.0169)	(0.0169)	(0.0170)
30<age<40	0.139***	0.141***	0.192***	0.195***	-0.0682***	-0.0692***
	(0.0276)	(0.0276)	(0.0202)	(0.0202)	(0.0174)	(0.0173)
40<age<50	0.208***	0.203***	0.258***	0.254***	-0.0791***	-0.0791***
	(0.0315)	(0.0314)	(0.0195)	(0.0195)	(0.0174)	(0.0174)
50<age<60	0.168***	0.161***	0.287***	0.281***	-0.0735***	-0.0728***
	(0.0329)	(0.0328)	(0.0190)	(0.0192)	(0.0185)	(0.0185)
age>60	-0.0170	-0.0218	0.227***	0.221***	-0.0270	-0.0255
	(0.0256)	(0.0255)	(0.0202)	(0.0203)	(0.0188)	(0.0189)
Urban	0.0133	0.00565	0.0187	0.00327	-0.0135	-0.00899
	(0.0210)	(0.0212)	(0.0186)	(0.0187)	(0.0180)	(0.0180)
Education (at least completed A/L)	-0.0464***	-0.0614***	0.0413**	0.0159	-0.0458***	-0.0408**
	(0.0175)	(0.0176)	(0.0166)	(0.0171)	(0.0156)	(0.0161)
Unemployed	-0.00786	-0.00454	-0.0135	-0.00655	0.0228	0.0206
	(0.0182)	(0.0182)	(0.0166)	(0.0167)	(0.0160)	(0.0161)
2nd poorest quintile		-0.00973		0.0124		-0.0546***
		(0.0227)		(0.0208)		(0.0160)
Middle quintile		0.00705		0.0332		-0.0591***
		(0.0252)		(0.0220)		(0.0167)
2nd richest quintile		0.0393		0.0820***		-0.0594***
		(0.0264)		(0.0213)		(0.0175)
Richest		0.0693**		0.145***		-0.0804***
		(0.0276)		(0.0213)		(0.0170)
Gampaha	-0.00663	-0.0132	0.0377*	0.0250	0.0151	0.0190
	(0.0224)	(0.0223)	(0.0195)	(0.0197)	(0.0196)	(0.0197)
Kalutara	-0.0883***	-0.0920***	-0.000925	-0.00713	-0.000502	0.000944
	(0.0210)	(0.0207)	(0.0220)	(0.0220)	(0.0209)	(0.0209)
B40	-0.0121		-0.0637***		0.0733***	
	(0.0191)		(0.0175)		(0.0177)	

Observations	3,499	3,499	6,168	6,168	3,153	3,153

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Regression also controls for ethnic dummies.

Table A8. Correlates of Diagnosed Diabetes

VARIABLES	(1) Diagnosed diabetes	(2) Diagnosed diabetes	(3) Diagnosed diabetes	(4) Diagnosed diabetes
Hypertensive	0.0358***	0.0344***	0.0383***	0.0340***
	(0.00940)	(0.00900)	(0.00915)	(0.00928)
General obesity (BMI>=30)	0.0227*			0.00616
	(0.0123)			(0.0117)
Abdominal obesity (WC IFD cut-off)		0.0493***		0.0453***
		(0.00784)		(0.00911)
Abdominal obesity (WHR WHO cut-off)			0.0267***	0.0103
			(0.00840)	(0.00990)
B40	-0.0169*	-0.0161*	-0.0185**	-0.0152
	(0.00974)	(0.00938)	(0.00937)	(0.00971)
Male	0.00755	0.0200*	0.000838	0.0241**
	(0.0101)	(0.0106)	(0.00966)	(0.0111)
30<age<40	0.111***	0.0896***	0.0991***	0.0921***
	(0.0325)	(0.0299)	(0.0305)	(0.0313)
40<age<50	0.229***	0.202***	0.216***	0.204***
	(0.0397)	(0.0369)	(0.0376)	(0.0386)
50<age<60	0.415***	0.390***	0.406***	0.382***
	(0.0467)	(0.0449)	(0.0450)	(0.0468)
age>60	0.416***	0.387***	0.395***	0.390***
	(0.0377)	(0.0361)	(0.0363)	(0.0377)
Urban	0.00493	0.00490	0.00615	0.00410
	(0.0118)	(0.0114)	(0.0114)	(0.0117)
Education (at least completed A/L)	0.00869	0.00663	0.00843	0.00595
	(0.0106)	(0.0102)	(0.0103)	(0.0104)
Unemployed	0.00353	0.00662	0.00522	0.00521
	(0.00970)	(0.00931)	(0.00944)	(0.00960)
Gampaha	-0.000442	-0.00255	-0.00132	-0.00173
	(0.0127)	(0.0122)	(0.0123)	(0.0125)
Kalutara	0.000530	-0.00316	-0.00343	0.000913
	(0.0135)	(0.0126)	(0.0128)	(0.0133)
Observations	5,796	6,141	6,141	5,772

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Regression also controls for ethnic dummies.

Table A9. Correlates of Observed Hypertension (probit)

VARIABLES	(1) Hypertensive	(2) Hypertensive	(3) Hypertensive
Obesity (BMI≥30)	0.0882***		0.0548***
	(0.0191)		(0.0192)
Abdominal obesity (WC IFD cut-off)		0.0899***	0.0779***
		(0.0123)	(0.0133)
Smoker (daily)	-0.0243	-0.0259	-0.0197
	(0.0313)	(0.0305)	(0.0319)
Chew betel daily	0.00792	0.00643	0.0121
	(0.0246)	(0.0238)	(0.0249)
Alcohol excessive	0.0387	0.0285	0.0412
	(0.0427)	(0.0410)	(0.0429)
Male	0.0456***	0.0800***	0.0697***
	(0.0175)	(0.0180)	(0.0184)
30<age<40	0.170***	0.159***	0.158***
	(0.0303)	(0.0292)	(0.0303)
40<age<50	0.370***	0.347***	0.352***
	(0.0310)	(0.0302)	(0.0314)
50<age<60	0.500***	0.475***	0.482***
	(0.0292)	(0.0290)	(0.0301)
age>60	0.566***	0.540***	0.552***
	(0.0248)	(0.0248)	(0.0254)
Urban	0.0307*	0.0278	0.0303*
	(0.0179)	(0.0172)	(0.0179)
Education (at least completed A/L)	-0.0124	-0.0179	-0.0150
	(0.0155)	(0.0150)	(0.0155)
Unemployed	0.0134	0.0130	0.0153
	(0.0150)	(0.0147)	(0.0151)
B40	-0.00508	0.000405	-0.000340
	(0.0157)	(0.0152)	(0.0159)
Gampaha	-0.0587***	-0.0652***	-0.0612***
	(0.0180)	(0.0172)	(0.0180)
Kalutara	0.134***	0.124***	0.132***
	(0.0238)	(0.0228)	(0.0239)
Observations	5,796	6,141	5,772

Note: Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1. Regression also controls for ethnic dummies.

Table A10. Distribution of Current Smoking Among Groups (both sex)

	Current smokers	Daily smokers	Age of initiation of daily smoking
All	4.4%	3.4%	22.0
Sex			
Male	**15.7%**	**12.3%**	**22.1**
Female	**0.3%**	**0.1%**	**18.0**
Sector			
Rural	4.5%	3.3%	22.1
Urban	4.4%	3.5%	21.7
Economic status			
U60	**4.1%**	3.2%	21.7
B40	**5.6%**	4.1%	22.7
Poorest quintile	**5.7%**	**4.1%**	22.5
2nd poorest quintile	**4.9%**	**3.9%**	22.0
Middle quintile	**4.4%**	**3.3%**	21.2
2nd richest quintile	**3.8%**	**3.0%**	22.0
Richest	**3.1%**	**2.2%**	21.5
Educational status			
Low educated	**5.2%**	**4.0%**	21.9
Highly educated	**2.3%**	**1.7%**	22.3
Age groups			
Age <60	4.2%	**3.1%**	**21.1**
Age>60	5.3%	**4.2%**	**25.1**
District			
Colombo	**5.4%**	**4.2%**	22.3
Gampaha	**2.9%**	**2.0%**	20.5
Kalutara	**5.3%**	**4.2%**	22.5

Note: The statistically significant differences in means between socioeconomic groups (p-value<0.1) are reported in bold. The number of observations for the last column is 281.

Table A11. Correlates of Daily Smoking

VARIABLES	(1) Smoke daily vs not	(2) Smoke daily vs not	(3) Smoke daily vs not smoker	(4) Smoke daily vs not smoker
Male	0.118***	0.116***	0.123***	0.120***
	(0.0114)	(0.0111)	(0.0118)	(0.0116)
30<age<40	0.00310	0.00281	0.00363	0.00327
	(0.00360)	(0.00340)	(0.00365)	(0.00343)
40<age<50	0.00816*	0.00813*	0.00856*	0.00849*
	(0.00464)	(0.00454)	(0.00470)	(0.00459)
50<age<60	0.00947*	0.0103*	0.00962*	0.0104*
	(0.00556)	(0.00567)	(0.00557)	(0.00567)
age>60	0.00502	0.00518	0.00528	0.00543
	(0.00355)	(0.00346)	(0.00356)	(0.00346)
Urban	-0.00182	-0.00102	-0.00183	-0.000978
	(0.00219)	(0.00205)	(0.00219)	(0.00204)
Education (at least completed A/L)	-0.00570***	-0.00443***	-0.00567***	-0.00438***
	(0.00168)	(0.00166)	(0.00166)	(0.00163)
Unemployed	-0.000466	-0.000908	-0.000539	-0.00102
	(0.00193)	(0.00184)	(0.00191)	(0.00182)
2nd poorest quintile		-0.000842		-0.000940
		(0.00184)		(0.00179)
Middle quintile		-0.00314**		-0.00314**
		(0.00158)		(0.00155)
2nd richest quintile		-0.00573***		-0.00578***
		(0.00168)		(0.00166)
Richest		-0.00596***		-0.00597***
		(0.00173)		(0.00171)
Gampaha	-0.00754***	-0.00710***	-0.00746***	-0.00698***
	(0.00198)	(0.00190)	(0.00197)	(0.00188)
Kalutara	-0.000920	-0.000478	-0.000827	-0.000341
	(0.00212)	(0.00209)	(0.00212)	(0.00210)
B40	0.00504**		0.00517**	
	(0.00233)		(0.00234)	
Pseudo R2	0.2864	0.2929	0.2945	0.3015
Observations	6,499	6,499	6,420	6,420

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Regression also controls for ethnic dummies.

Table A12. Socioeconomic and Demographic Correlates of Excessive Drinking

	(1) Excess drinker	(2) Excess drinker
Male	0.0227***	0.0227***
	(0.00463)	(0.00462)
30<age<40	0.00132	0.00114
	(0.00550)	(0.00544)
40<age<50	0.00842	0.00857
	(0.00719)	(0.00720)
50<age<60	0.0173*	0.0177*
	(0.0100)	(0.0100)
age>60	0.0299***	0.0299***
	(0.00976)	(0.00968)
Urban	-0.00758**	-0.00736**
	(0.00369)	(0.00373)
Education (at least completed A/L)	-0.00217	-0.00168
	(0.00277)	(0.00294)
Unemployed	-0.00604**	-0.00608**
	(0.00262)	(0.00261)
2nd poorest quintile		-0.00425
		(0.00264)
Middle quintile		-0.00743***
		(0.00228)
2nd richest quintile		-0.00616**
		(0.00248)
Richest		-0.00769***
		(0.00245)
Gampaha	-0.00103	-0.000846
	(0.00311)	(0.00313)
Kalutara	0.00310	0.00296
	(0.00395)	(0.00392)
B40	0.0101***	
	(0.00372)	
Pseudo R2	0.1252	0.1254
Observations	6,499	6,499

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Regression also controls for ethnic dummies.

Table A 13. Distribution of Betel Chewing

	Ever chew betel	Daily chew betel
All	21.3%	6.5%
Female	**15.5%**	**2.7%**
Male	**37.4%**	**17.0%**
Rural	**25.7%**	**8.3%**
Urban	**15.0%**	**4.0%**
U60	**20.4%**	**5.5%**
B40	**24.7%**	**10.3%**
Poorest quintile	**24.8%**	**9.9%**
2nd poorest quintile	**22.0%**	**7.2%**
Middle quintile	**21.1%**	**6.6%**
2nd richest quintile	**21.8%**	**5.4%**
Richest	**15.8%**	**2.7%**
Low educated	**23.5%**	**8.2%**
Highly educated	**15.4%**	**2.1%**
Age <60	**17.9%**	**4.6%**
Age>60	**33.6%**	**13.3%**
Colombo	**21.7%**	6.5%
Gampaha	**17.4%**	6.3%
Kalutara	**27.8%**	7.1%

Note: The statistically significant differences in means between socioeconomic groups (p-value<0.1) are reported in bold.

Table A14. Socioeconomic and Demographic Correlates of Betel Chewing

	(1)	(2)	(3)	(4)
	Chew daily vs not	Chew daily vs not	Chew daily vs never tried	Chew daily vs never tried
Male	0.0759***	0.0739***	0.0888***	0.0863***
	(0.00880)	(0.00866)	(0.0102)	(0.0101)
30<age<40	0.0221*	0.0195*	0.0244*	0.0209*
	(0.0122)	(0.0116)	(0.0130)	(0.0123)
40<age<50	0.0358**	0.0341**	0.0397**	0.0372**
	(0.0145)	(0.0140)	(0.0157)	(0.0151)
50<age<60	0.0772***	0.0785***	0.0934***	0.0931***
	(0.0215)	(0.0215)	(0.0246)	(0.0243)
age>60	0.0772***	0.0760***	0.0944***	0.0918***
	(0.0160)	(0.0158)	(0.0186)	(0.0182)
Urban	-0.0444***	-0.0388***	-0.0615***	-0.0539***
	(0.00811)	(0.00783)	(0.0104)	(0.00997)
Education (at least completed A/L)	-0.0298***	-0.0245***	-0.0342***	-0.0286***
	(0.00406)	(0.00415)	(0.00433)	(0.00435)
Unemployed	-0.00298	-0.00418	-0.00649	-0.00798
	(0.00509)	(0.00493)	(0.00562)	(0.00546)
2nd poorest quintile		-0.0129***		-0.0135***
		(0.00469)		(0.00515)
Middle quintile		-0.0191***		-0.0214***
		(0.00424)		(0.00455)
2nd richest quintile		-0.0224***		-0.0247***
		(0.00422)		(0.00454)
Richest		-0.0367***		-0.0391***
		(0.00388)		(0.00429)
Gampaha	-0.0175***	-0.0153***	-0.0246***	-0.0219***
	(0.00500)	(0.00500)	(0.00530)	(0.00527)
Kalutara	-0.0111*	-0.0102*	-0.0114*	-0.00985
	(0.00585)	(0.00574)	(0.00651)	(0.00645)
B40	0.0354***		0.0381***	
	(0.00719)		(0.00799)	
Pseudo R2	0.1684	0.177	0.2041	0.2137
Observations	6,499	6,499	5,648	5,648

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Regression also controls for ethnic dummies.

Table A15. Households' Primary Source of Fuel

	Electricity	LPG	Kerosene	Biomass	Unclean (biomass plus kerosene)
All	1%	52%	4%	43%	47%
Rural	1%	**38%**	**2%**	**58%**	**60%**
Urban	1%	**73%**	**7%**	**19%**	**26%**
Poorest quintile	1%	**28%**	**7%**	**65%**	**72%**
2nd poorest quintile	1%	**46%**	**5%**	**47%**	**53%**
Middle quintile	2%	**50%**	**3%**	**45%**	**48%**
2nd richest quintile	1%	**59%**	**4%**	**35%**	**39%**
Richest	2%	**75%**	**1%**	**22%**	**23%**
U60	1%	**57%**	**4%**	**38%**	**42%**
B40	1%	**28%**	**7%**	**65%**	**71%**
Colombo	**1%**	**69%**	**6%**	**25%**	**31%**
Gampaha	**2%**	**45%**	**4%**	**49%**	**53%**
Kalutara	**1%**	**32%**	**2%**	**66%**	**67%**

Note: The statistically significant differences in means between socioeconomic groups (p-value<0.1) are reported in bold.

Table A16. Risky Cooking Practices

	Traditional stove use (Biomass users)	Cooking usually done in sleeping/living space (Biomass users)	Availability of functional chimney (Who cook in the building using biomass)
All	58%	7%	74%
Sector of residence			
Rural	58%	7%	76%
Urban	58%	5%	65%
Economic status			
Poorest quintile	60%	8%	**62%**
2nd poorest quintile	60%	5%	**71%**
Middle quintile	54%	7%	**79%**
2nd richest quintile	56%	7%	**84%**
Richest	61%	5%	**86%**
U60	57%	6%	**79%**
B40	61%	9%	**60%**
Poorest quintile	60%	8%	**62%**
2nd poorest quintile	60%	5%	**71%**
Middle quintile	54%	7%	**79%**
2nd richest quintile	56%	7%	**84%**
Richest	61%	5%	**86%**
Colombo	**50%**	**6%**	**66%**
Gampaha	**67%**	**2%**	**79%**
Kalutara	**52%**	**15%**	**72%**

Note: The statistically significant differences in means between socioeconomic groups (p-value<0.1) are reported in bold.

Table A17. Hygiene, Sanitation, and Working Conditions (percentage of households)

	Drinking water source: piped in to dwelling/yard	Flush toilet/pour flush toilet	Share toilet	Someone works in hazardous work places
All	49%	92%	10%	17%
Rural	**43%**	**90%**	10%	16%
Urban	**60%**	**96%**	10%	18%
U60	49%	**93%**	**9%**	**15%**
B40	52%	**87%**	**15%**	**27%**
Poorest quintile	52%	**87%**	**15%**	**27%**
2nd poorest quintile	48%	**93%**	**11%**	**20%**
Middle quintile	49%	**90%**	**10%**	**16%**
2nd richest quintile	52%	**95%**	**6%**	**13%**
Richest	47%	**95%**	**8%**	**8%**
Colombo	**66%**	**94%**	**14%**	**19%**
Gampaha	**42%**	**90%**	**8%**	**11%**
Kalutara	**32%**	**94%**	**6%**	**25%**

Note: The statistically significant differences in means between socioeconomic groups (p-value<0.1) are reported in bold.

Table A18. Correlates of Outpatient Healthcare Use (by source of care)

VARIABLES	(1) Outpatient public care	(2) Outpatient public care	(3) Outpatient private care	(4) Outpatient private care
2nd poorest quintile		0.0195*		0.0329**
		(0.0111)		(0.0158)
Middle quintile		-0.00927		0.0507***
		(0.0109)		(0.0169)
2nd richest quintile		-0.0156		0.0798***
		(0.0110)		(0.0178)
Richest		-0.0410***		0.0740***
		(0.0112)		(0.0190)
Head has >=A/L education	-0.0381***	-0.0301***	0.0378***	0.0308**
	(0.00882)	(0.00924)	(0.0126)	(0.0127)
Poor living conditions	0.0153	0.0109	-0.0302**	-0.0273**
	(0.0100)	(0.00988)	(0.0134)	(0.0135)
Unclean source of fuel	0.0376***	0.0294***	-0.0271**	-0.0220**
	(0.00868)	(0.00869)	(0.0110)	(0.0112)
Male	-0.0136**	-0.0122*	-0.0162*	-0.0174**
	(0.00634)	(0.00631)	(0.00843)	(0.00840)
Age	-0.00158***	-0.00142***	-0.00761***	-0.00773***
	(0.000470)	(0.000467)	(0.000597)	(0.000597)
Age square	4.75e-05***	4.59e-05***	0.000107***	0.000108***
	(5.82e-06)	(5.78e-06)	(7.78e-06)	(7.79e-06)
Work hazard	-0.00360	-0.00637	0.0395***	0.0423***
	(0.00919)	(0.00907)	(0.0130)	(0.0131)
Unsanitary garbage disposal	0.00686	0.00621	0.00298	0.00232
	(0.0138)	(0.0136)	(0.0179)	(0.0178)
Urban	0.0233**	0.0260***	-0.00497	-0.00758
	(0.00970)	(0.00967)	(0.0143)	(0.0144)
Gampaha	-0.00235	0.00238	0.0690***	0.0662***
	(0.0105)	(0.0107)	(0.0158)	(0.0159)
Kalutara	-0.0326***	-0.0289***	0.0332*	0.0294*
	(0.0106)	(0.0106)	(0.0172)	(0.0171)
B40	0.00436		-0.0542***	
	(0.00930)		(0.0118)	
Observations	10,106	10,106	10,107	10,107

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Regression also controls for ethnic dummies.

Table A19. Correlates of Healthcare Use

VARIABLES	(1) Outpatient care	(2) Outpatient care	(3) Inpatient care	(4) Inpatient care
B40	-0.0455***		0.00172	
	(0.0141)		(0.00596)	
Head has >=A/L education	0.00417	0.00550	-0.00454	-0.00440
	(0.0140)	(0.0143)	(0.00555)	(0.00572)
Poor living conditions	-0.00710	-0.00847	-0.00517	-0.00541
	(0.0154)	(0.0154)	(0.00613)	(0.00611)
Unclean source of fuel	0.00129	-0.000176	0.00410	0.00405
	(0.0128)	(0.0130)	(0.00523)	(0.00534)
Male	-0.0316***	-0.0315***	0.00784*	0.00797*
	(0.00965)	(0.00965)	(0.00450)	(0.00451)
Age	-0.00930***	-0.00926***	-0.000954***	-0.000949***
	(0.000728)	(0.000728)	(0.000293)	(0.000293)
Age square	0.000157***	0.000156***	1.76e-05***	1.75e-05***
	(9.73e-06)	(9.72e-06)	(3.64e-06)	(3.64e-06)
Work hazard	0.0276*	0.0270*	0.0103*	0.0101
	(0.0145)	(0.0146)	(0.00614)	(0.00617)
Unsanitary garbage disposal	0.000626	-0.000379	-0.00843	-0.00835
	(0.0206)	(0.0205)	(0.00711)	(0.00710)
Urban	0.0161	0.0159	0.00186	0.00167
	(0.0161)	(0.0162)	(0.00632)	(0.00637)
Gampaha	0.0535***	0.0545***	-0.00485	-0.00504
	(0.0173)	(0.0174)	(0.00636)	(0.00635)
Kalutara	-0.0155	-0.0150	0.0263***	0.0265***
	(0.0181)	(0.0181)	(0.00933)	(0.00934)
2nd poorest quintile		0.0502***		0.00244
		(0.0173)		(0.00689)
Middle quintile		0.0336*		-0.00388
		(0.0183)		(0.00708)
2nd richest quintile		0.0516***		-0.00411
		(0.0189)		(0.00723)
Richest		0.0335*		0.000392
		(0.0203)		(0.00805)
Observations	10,107	10,107	10,107	10,107

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Regression also controls for ethnic dummies.

Table A20. Correlates of Healthcare Use (adult sample)

	(1) Outpatient care	(2) Outpatient care	(3) Inpatient care	(4) Inpatient care
B40	-0.0408**		-0.00680	
	(0.0173)		(0.00711)	
Head has >=A/L education	-0.0224	-0.0212	-0.00969	-0.00944
	(0.0171)	(0.0175)	(0.00662)	(0.00680)
Poor living conditions	-0.0364*	-0.0380**	-0.000975	-0.00150
	(0.0191)	(0.0192)	(0.00832)	(0.00816)
Unclean source of fuel	-0.0108	-0.0128	0.00448	0.00439
	(0.0158)	(0.0160)	(0.00645)	(0.00658)
Male	-0.0510***	-0.0510***	0.0122*	0.0125**
	(0.0134)	(0.0134)	(0.00630)	(0.00629)
Age	0.00669***	0.00667***	0.000205	0.000210
	(0.00247)	(0.00247)	(0.000992)	(0.000987)
Age square	-3.11e-06	-3.07e-06	4.14e-06	4.09e-06
	(2.38e-05)	(2.38e-05)	(9.26e-06)	(9.21e-06)
Underweight	-0.0177	-0.0181	-0.00295	-0.00278
	(0.0244)	(0.0244)	(0.00951)	(0.00952)
Overweight	0.0625***	0.0626***	-0.00877	-0.00825
	(0.0154)	(0.0154)	(0.00617)	(0.00615)
Obesity	0.0669***	0.0668***	0.00584	0.00608
	(0.0204)	(0.0203)	(0.00927)	(0.00922)
Hypertensive	0.0424***	0.0427***	-0.00124	-0.00127
	(0.0150)	(0.0150)	(0.00651)	(0.00650)
Diabetic	0.273***	0.273***	0.0438***	0.0435***
	(0.0211)	(0.0211)	(0.0103)	(0.0103)
Work hazard	0.0322*	0.0313*	0.0101	0.00996
	(0.0186)	(0.0186)	(0.00784)	(0.00783)
Unsanitary garbage disposal	0.0204	0.0196	0.000542	0.000369
	(0.0269)	(0.0269)	(0.00949)	(0.00941)
Urban	0.0439**	0.0438**	-0.00363	-0.00417
	(0.0195)	(0.0197)	(0.00808)	(0.00813)
Gampaha	0.0469**	0.0480**	-0.0197***	-0.0200***
	(0.0210)	(0.0211)	(0.00708)	(0.00701)
Kalutara	-0.00147	-0.000811	0.0281**	0.0284**
	(0.0228)	(0.0229)	(0.0116)	(0.0116)
2nd poorest quintile		0.0435**		0.0147
		(0.0213)		(0.0100)
Middle quintile		0.0265		0.00297

		(0.0225)		(0.00963)
2nd richest quintile		0.0475**		0.00464
		(0.0233)		(0.00982)
Richest		0.0271		0.00970
		(0.0241)		(0.0110)
Observations	5,803	5,803	5,803	5,803

Note: Robust standard errors in parentheses;
*** p<0.01, ** p<0.05, * p<0.1. Regression also controls for ethnic dummies.

Table A21. Correlates of Outpatient Healthcare Use by Source of Care (adult sample)

VARIABLES	(1) Outpatient public care	(2) Outpatient public care	(3) Outpatient private care	(4) Outpatient private care
2nd poorest quintile		0.0284**		0.00447
		(0.0144)		(0.0184)
Middle quintile		-0.00789		0.0365*
		(0.0139)		(0.0197)
2nd richest quintile		-0.00973		0.0678***
		(0.0144)		(0.0210)
Richest		-0.0493***		0.0694***
		(0.0132)		(0.0219)
Head has >=A/L education	-0.0483***	-0.0389***	0.0274*	0.0173
	(0.0104)	(0.0110)	(0.0148)	(0.0147)
Poor living conditions	-0.00573	-0.0109	-0.0306*	-0.0260
	(0.0124)	(0.0120)	(0.0157)	(0.0159)
Unclean source of fuel	0.0417***	0.0309***	-0.0391***	-0.0322**
	(0.0111)	(0.0109)	(0.0129)	(0.0133)
Male	-0.0231***	-0.0205**	-0.0176	-0.0207*
	(0.00857)	(0.00856)	(0.0112)	(0.0111)
Age	0.0112***	0.0113***	-0.00182	-0.00184
	(0.00177)	(0.00178)	(0.00194)	(0.00193)
Age square	-6.86e-05***	-6.97e-05***	4.31e-05**	4.31e-05**
	(1.63e-05)	(1.63e-05)	(1.87e-05)	(1.86e-05)
Underweight	-0.0147	-0.0165	-0.0126	-0.0108
	(0.0155)	(0.0152)	(0.0197)	(0.0198)
Overweight	0.0313***	0.0324***	0.0255**	0.0240*
	(0.0110)	(0.0110)	(0.0127)	(0.0127)
Obesity	0.0389***	0.0397***	0.0327*	0.0302*
	(0.0149)	(0.0149)	(0.0174)	(0.0172)
Hypertensive	-0.00286	-0.00263	0.0444***	0.0446***
	(0.00960)	(0.00950)	(0.0129)	(0.0129)
Diabetic	0.143***	0.142***	0.105***	0.105***
	(0.0170)	(0.0169)	(0.0184)	(0.0183)
Work hazard	0.00390	-0.000106	0.0345**	0.0389**
	(0.0123)	(0.0120)	(0.0159)	(0.0161)
Unsanitary garbage disposal	0.0101	0.00943	0.0173	0.0169
	(0.0178)	(0.0175)	(0.0224)	(0.0223)
Urban	0.0337***	0.0370***	0.0165	0.0133
	(0.0116)	(0.0114)	(0.0164)	(0.0166)
Gampaha	-0.00758	-0.00195	0.0712***	0.0676***
	(0.0127)	(0.0129)	(0.0187)	(0.0188)
Kalutara	-0.0232*	-0.0189	0.0474**	0.0427**
	(0.0137)	(0.0137)	(0.0204)	(0.0203)

B40	0.00134		-0.0414***	
	(0.0118)		(0.0142)	
Observations	5,802	5,802	5,803	5,803

Note: Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1. Regression also controls for ethnic dummies.

Table A22. Probability of Using Private Care Among Those who Used Care during the Reference Period

VARIABLES	(1) Private outpatient care	(2) Private outpatient care
2nd poorest quintile		-0.00634
		(0.0301)
Middle quintile		0.0677**
		(0.0308)
2nd richest quintile		0.125***
		(0.0290)
Richest		0.157***
		(0.0304)
Head has >=A/L education	0.124***	0.0975***
	(0.0235)	(0.0246)
Poor living conditions	-0.0967***	-0.0839***
	(0.0291)	(0.0292)
Unclean source of fuel	-0.113***	-0.0874***
	(0.0236)	(0.0242)
Male	0.00298	-0.00593
	(0.0182)	(0.0182)
Age	-0.00599***	-0.00659***
	(0.00125)	(0.00125)
Age squared	3.23e-05**	3.76e-05**
	(1.58e-05)	(1.58e-05)
Work hazard	0.0626***	0.0702***
	(0.0241)	(0.0242)
Unsanitary garbage disposal	0.0149	0.0166
	(0.0367)	(0.0362)
Urban	-0.0459	-0.0528*
	(0.0292)	(0.0295)
Gampaha	0.0967***	0.0893***
	(0.0281)	(0.0285)
Kalutara	0.127***	0.119***
	(0.0306)	(0.0308)
B40	-0.0735***	
	(0.0279)	
Observations	3,117	3,117

Note: Robust standard errors in parentheses;
*** p<0.01, ** p<0.05, * p<0.1. Regression also controls for ethnic dummies.

Table A23. Costs of Healthcare

	Those Who Used Care					All Individuals		
	Total health cost	Share of forgone income	Total health expenditure	Share of reimbursement	% incurred OOP payment	OOP payment	% incurred OOP payment	OOP payment
Male	2484	**6.1%**	2298	**1.6%**	98%	2209	34%	774
Female	2222	**3.0%**	2108	**2.7%**	98%	2038	34%	700
All	2312	4.1%	2173	2.3%	98%	2096	34%	725

Note: Costs and expenditure are reported for one month (in Sri Lankan rupees). Reimbursement was from an insurance provider, government or someone else. The figures in bold show statistically significant differences across gender.

Table A24. Distribution of OOP Spending

	Those Who Used Care		All Individuals	
	% who incurred OOP payment	OOP payment	% who incurred OOP payment	OOP payment
All	98%	2096	34%	725
Male	98%	2209	34%	774
Female	98%	2038	34%	700
Rural	97%	2109	34%	733
Urban	98%	2076	34%	713
U60	98%	**2237**	**35%**	**802**
B40	97%	**1526**	**29%**	**462**
Poorest quintile	97%	**1577**	**30%**	**492**
2nd poorest quintile	97%	**1329**	**35%**	**485**
Middle quintile	98%	**2227**	**33%**	**747**
2nd richest quintile	98%	**2574**	**37%**	**961**
Richest	98%	**3027**	**35%**	**1071**
Low educated	98%	**1931**	34%	**667**
Highly educated	98%	**2726**	34%	**945**
Under 5	**99%**	**1389**	**45%**	**625**
5 to 19	**97%**	**1408**	**31%**	**451**
20 to 60	**98%**	**2305**	**28%**	**665**
Age>60	**97%**	**2810**	**50%**	**1449**
Colombo	97%	**2210**	**32%**	733
Gampaha	98%	**1771**	**36%**	653
Kalutara	97%	**2549**	**32%**	846
Adult (sample)				
Not obese	97%	2367	33%	**803**
Obese	97%	3108	36%	**1138**
Not hypertensive	97%	2478	**29%**	**751**
Hypertensive	98%	2553	**44%**	**1154**
Not diabetic	97%	**2350**	**29%**	**696**
Diabetic	98%	**2889**	**64%**	**1877**

Note: Figures in bold show statistically significant differences across corresponding groups.

Table A25. Predictors of OOP Spending

VARIABLES	(1) GPML estimates	(2) Poisson GLM	(3) Probit (marginal effects)	(4) Log OOP spending if OOP spending>0
B40	-0.422***	-0.351***	-0.0473***	-0.345***
	(0.0985)	(0.113)	(0.0142)	(0.0711)
Head has >=A/L education	0.352***	0.318***	0.00343	0.337***
	(0.0885)	(0.0816)	(0.0141)	(0.0626)
Poor living conditions	-0.172*	-0.246**	-0.00362	-0.234***
	(0.0967)	(0.108)	(0.0153)	(0.0737)
Unclean source of fuel	-0.287***	-0.354***	0.00318	-0.361***
	(0.0796)	(0.0775)	(0.0129)	(0.0568)
Male	0.00110	0.0830	-0.0253**	0.0521
	(0.0669)	(0.0716)	(0.00995)	(0.0479)
Age	-0.0164***	-0.00748*	-0.00977***	-0.00232
	(0.00458)	(0.00389)	(0.000746)	(0.00316)
Age squared	0.000436***	0.000306***	0.000164***	0.000111***
	(6.27e-05)	(4.75e-05)	(1.01e-05)	(4.10e-05)
Work hazard	0.202**	0.204**	0.0254*	0.0568
	(0.0943)	(0.0943)	(0.0146)	(0.0662)
Unsanitary garbage disposal	0.132	0.145	-0.000428	0.0217
	(0.151)	(0.158)	(0.0205)	(0.101)
Urban	-0.120	-0.117	0.0190	-0.0178
	(0.106)	(0.105)	(0.0161)	(0.0693)
Gampaha	0.00681	-0.0776	0.0434**	0.0622
	(0.109)	(0.107)	(0.0172)	(0.0697)
Kalutara	0.182	0.117	0.00516	0.258***
	(0.118)	(0.129)	(0.0186)	(0.0859)
Constant	6.489***	6.436***		6.793***
	(0.127)	(0.122)		(0.0917)
Observations	10,094	10,094	10,094	3,518
R-squared				0.089

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Regression also controls for ethnic dummies.

Table A26. Predictors of OOP Spending (adult sample)

VARIABLES	(1) GPML estimates	(2) Poisson GLM	(3) Probit (marginal effects)	(4) Log OOP spending if OOP spending>0
B40	-0.406***	-0.284*	-0.0492***	-0.318***
	(0.140)	(0.154)	(0.0173)	(0.0936)
Head has >=A/L education	0.179	0.228**	-0.0191	0.308***
	(0.116)	(0.105)	(0.0173)	(0.0806)
Poor living conditions	-0.269**	-0.330**	-0.0259	-0.373***
	(0.136)	(0.151)	(0.0192)	(0.1000)
Unclean source of fuel	-0.303***	-0.404***	-0.00289	-0.404***
	(0.108)	(0.104)	(0.0159)	(0.0760)
Male	0.140	0.234**	-0.0439***	0.201***
	(0.104)	(0.0990)	(0.0139)	(0.0697)
Age	0.00817	0.0104	0.00559**	-0.0362***
	(0.0176)	(0.0186)	(0.00254)	(0.0120)
Age squared	0.000166	0.000137	9.10e-06	0.000392***
	(0.000161)	(0.000157)	(2.46e-05)	(0.000110)
Underweight	0.0210	-0.122	-0.0226	0.0582
	(0.162)	(0.168)	(0.0248)	(0.126)
Overweight	0.206*	0.103	0.0569***	-0.00448
	(0.106)	(0.104)	(0.0156)	(0.0720)
Obesity	0.425***	0.404***	0.0761***	0.0811
	(0.140)	(0.137)	(0.0207)	(0.100)
Hypertensive	0.177*	0.0695	0.0427***	0.0673
	(0.0994)	(0.108)	(0.0155)	(0.0713)
Diabetic	0.702***	0.600***	0.291***	0.162**
	(0.104)	(0.103)	(0.0210)	(0.0738)
Work hazard	0.378***	0.274**	0.0248	0.0668
	(0.139)	(0.121)	(0.0187)	(0.0903)
Unsanitary garbage disposal	0.404*	0.271	0.0252	0.0800
	(0.224)	(0.202)	(0.0262)	(0.130)
Urban	-0.176	-0.207	0.0448**	0.0612
	(0.146)	(0.133)	(0.0197)	(0.0900)
Gampaha	-0.147	-0.201	0.0267	0.0961
	(0.146)	(0.137)	(0.0211)	(0.0899)
Kalutara	0.149	0.0934	0.0218	0.258**

	(0.162)	(0.166)	(0.0234)	(0.105)
Constant	5.710***	5.834***		7.589***
	(0.467)	(0.500)		(0.320)
Observations	5,792	5,792	5,792	2,044
R-squared				0.096

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.
Regression also controls for ethnic dummies.