

Case study for Sri Lanka

The costs of diet-related chronic diseases are large and growing in Sri Lanka, although there are a number of important differences from the PRC. Table 15 summarizes the major costs. Sri Lanka has successfully reduced the incidence of communicable diseases. Diet-related chronic diseases caused 18.3% of all deaths in Sri Lanka in the mid-1990s (table 16). It is, however, possible that the relatively weak system in Sri Lanka for reporting cause of death understates the proportions of death from these chronic diseases.

Diet-related chronic diseases, including obesity, are less prevalent in Sri Lanka than in India. However, data from India, the nearest neighboring country with adequate data is used here to project future rates of overweight and obesity in Sri Lanka. The National Nutrition Monitoring Bureau (NNMB), New Delhi has made representative surveys of the rural regions of poorer states in India and a large-scale survey has been conducted in urban squatter areas [89]. The rural surveys were conducted in eight states, mainly in southern India; with its less energy-dense, vegetarian diets, less diet-related chronic diseases, and probably less obesity. For 1975 to 1976, 1988 to 1990, and 1996 to 1997, respectively, the totals for overweight persons were 2.3, 2.6, and 3.8% for men and 3.4, 4.1, and 6.0% for women. For comparison, the large-scale, urban squatter survey* showed that 11.6% of women aged 12 to 47 were overweight. The rural sample sizes were very large: over 30,000 in 1996 to 1997. Data are available, but for women of child-bearing age from only two years. These data [71] show that there was a 5.0% increase in the prevalence of obesity per 10-year period for women, extrapolating trends from 1989 to 1994. In order to make projections for Sri Lanka, it was assumed that increases in overweight and obesity would be the same as those measured in India, although from a lower base.

* Tian H. Chronic disease intervention project cost-effectiveness evaluation from 1991–96 in Tianjin city. Tianjin, PRC: Tianjin Municipal-Academic Station, September 1999 (mimeo.) (In Chinese).

In Sri Lanka in 1995, the hospital costs for diet-related chronic diseases were estimated as US\$12.6 million and accounted for about 10.2% of estimated public hospital expenditures and 16.7% of all hospital expenditures: equivalent to 0.1% of GDP. These data were obtained from detailed estimates for the National Hospital for Sri Lanka, which represented one-third of total public health expenditures, and an estimated 20.3% of total hospital expenditures** (table 17). Hospitals provided the large majority of care for these chronic diseases.

Public hospital costs in Sri Lanka are markedly lower than those in the PRC, due to a lower average length of stay. The two countries have similar GDPs. In Sri Lanka, the average in a public hospital, even for chronic diseases, is only six days and its average cost is about US\$90. Inpatients in public hospitals pay, on average, an additional cost of about US\$25 per stay, largely for drugs. The cost per day for treatment of chronic diseases in a public hospital in Sri Lanka is about 75% of that for the PRC in terms of public expenditure. However, the total costs per patient for the two countries are probably similar if the patient's out-of-pocket expenditures are included. Private hospital costs per patient in Sri Lanka are at least 2.5 times those of public hospitals. Patients tend to favor private hospitals, particularly for the treatment of chronic diseases.

Productivity losses due to premature mortality (i.e., lost work output) were estimated as US\$27 million, about 0.2% of GDP. It was assumed that 60% of those aged 18 and over are in the labor market. The average annual wage was taken as US\$375. It was assumed that an adult death from a diet-related chronic disease would result, on average, in 10 years loss of productivity. It was also assumed that real wages would increase at 1% per annum, and that future wages could be discounted at 12% per year. It was concluded that a

** Tudawe I. The Cost of diet-related chronic disease in Sri Lanka. Colombo: Hector Kobbukedawa Agricultural Research and Training Institute. Asian Development Bank, Manila, 2000. Draft.

TABLE 15. Costs of major diet-related chronic diseases and projected adult deaths from these diseases in 2025 in Sri Lanka

1997 estimates	
Number of deaths annually	19,847 (18.3% of all deaths)
Hospital costs	US\$12.6 million (16.7% of hospital costs; 0.1% of GDP)
Productivity losses due to premature death	US\$29 million (0.2% of GDP)
Total monetary cost	US\$41.6 million (0.3% of GDP)
2025 prediction	
Number of adult deaths	38,477 (20.9% of all deaths)

Source: Authors' calculations, based on tables 16 and 17. See text for assumptions.

GDP = gross domestic product.

premature death from diet-related chronic diseases, which results in 10 years lost work, is valued at 6.6 times the annual wage, when appropriately discounted. When added to the hospital costs, this suggests that the total economic cost of diet-related chronic diseases is about 0.3% GDP per year. This underestimates the true costs, however, because data are lacking on morbidity associated with these diseases and associated productivity losses. Although these costs are an order of magnitude lower than those estimated [92] for childhood undernutrition in South Asia, they are large and important enough to be of policy significance.

The case has been made [93] that programs focusing on chronic diseases tend to redistribute resources away from the poor. There is evidence for this, but the links from LBW and stunting to chronic diseases suggest that there are complementarities in programming for both undernutrition and overnutrition. Moreover, there is evidence for a marked shift toward the poor in the burden of diet-related chronic diseases [30, 94].

In 2025, diet-related chronic diseases in Sri Lanka are projected to increase modestly, so as to account for 20.9% of all deaths. There is not enough information to project the associated hospital costs, but these are likely to grow. As the population ages and as more funds go to the hospital system, the resources used to treat diseases such as CVD and cancers are likely to rise quite dramatically.

In 1995, more than 20% of cancers in Sri Lanka were attributable to inadequate fruit and vegetable intake (tables 18–20). CVD was nearly 16% attributable to saturated fat intake, with diabetes almost as important a contributing factor. Almost 10% each of diabetes, stroke, and hypertension were attributable to overweight. Diabetes is almost as important as a contributory factor for stroke.

TABLE 16. Data and assumption for calculating the costs of diet related chronic diseases in Sri Lanka in 1995, and projections for 2025

Category	1995	2025
Nutrition and diet-related factors		
Overweight and obesity, men	3.8% ^a	16% ^a
Overweight and obesity, women	6.0% ^a	20% ^a
Saturated fat	9.8% ^b	12% ^b
Fruit and vegetable intake (g/day per capita)	215	215
Low birthweight (30 years ago)	25% ^c	22% ^d
Stunting (30 years ago)	35% ^e	24% ^f
Morbidity		
Hypertension, men and women combined	16.2% ^a	18.6% ^a
Diabetes	3.7% ^a	10.1% ^a
Mortality (per 100,000, men and women combined)		
Ischemic heart disease (IHD)	39.8	58.7
Stroke	26.5	37.6
Other cardiovascular diseases (CVD)	101.6	137.6
Cancers	28.6	50.6
All causes	562.4	735.5
Other variables		
Population size (million)	18.1	25.1
Urban population	22.7% ^f	42.6% ^f

a. Percentage of adult population

b. Percentage of diet by weight

c. Percentage of all births in 1965

d. Percentage of all births in 1995

e. Percentage of adult population

f. Percentage of total percentage.

Sources: Obesity, Fourth National Health and Nutrition Survey, cited by Tudawe I (unpublished draft 2000). The cost of diet-related disease in Sri Lanka, Colombo: Hector Kobbukedawa Agricultural Research and Training Institute (Unpublished draft for Asian Development Bank, Manila, 2000); diet, Central Bank surveys; LBW [85]; stunting [23]; morbidity [26]; mortality, Registrar General's statistics, based on death certificates; population, [gopher://gopher.undp.org:70/00/ungophers/popin/wdtrends/urban](http://gopher.undp.org:70/00/ungophers/popin/wdtrends/urban);

Bases for predictions: overweight, assumes a percentage point increase similar to that for India (see text); saturated fat, based on 1995 intake, and assuming that increase will not continue much above the existing high rate for urban India; fruit and vegetable intake, assumes that the current decline will stabilize; hypertension, assumes that rural rate will approach current Indian rural rate, and that the urban rate will approach the current Indian urban rate, weighted by urban and rural population shares for 2025; mortality, uses trend increases as for India from a baseline scenario [47] applied to data for Sri Lanka for the 1990s (for India, the increases were 15.8% per decade for CVD, 14% per decade for cerebrovascular disease, 11.8% for other cardiovascular disease, 25% per decade for cancers and 11.4% per decade for noncommunicable diseases plus injuries, with all % increases calculated on the base year 1995) rates; population: see above; LBW and stunting, uses levels 30 years previously (to estimate the childhood conditions of current adults), i.e., actual 1995 levels are used for 2025, and estimated 1965 levels are used for 1995, estimated levels for 1965 are assumed similar to rates for 1971 which are the earliest available data.

TABLE 17. Data and assumptions used to estimate the costs for diet-related chronic diseases in Sri Lanka in 1995

Data category	Value	Data Source
Total annual cost, National Hospital of Sri Lanka (NHSL)	SLRe 946.268 /-	NHSL records
NHSL expenditures as % of expenditures at all public hospitals	34%	NHSL records
Public hospital patients as % of all hospital patients	80%	Tudawe I. (personal communication, 1 March 2000)
Proportion of all inpatients suffering from diet-related chronic diseases who are treated at NHSL	10.2%	Date from Tudawe ^a assuming that the proportions for diagnosed and undiagnosed patients are similar
% of all diet-related disease patients who are treated at public hospitals as % of all those for all diet-related disease patients	60%	[90]
Relative cost of private over public hospital treatment per patient	2.5 times	[90]
Public hospital expenditure on diet-related chronic disease as % of that for all hospitals	37.5%	Calculated from above
Public hospital expenditure on all disease as % of that for all hospitals	61.5%	Calculated from above
Average cost per inpatient/day	SLRe 865/-	Estimated from 1997 NHSL records
Average cost per chronic disease patient/day	SLRe 865/-	An NHSL "Bed-head ticket" survey for first quarter of 1999 suggested that these costs were, on average, similar to those for all patients: data from Tudawe ^a
Average length of stay, all patients	6 days	1999 NHSL records
Average length of stay, diet-related chronic disease patients	6 days	NHSL "Bed-head ticket" survey for the first quarter of 1999
Average daily wage	SLRe 81/-	Marga Institute; Pereira M, personal communication, 1 March 2000
Average annual wage	US\$375 per year	Based on average daily wage above
Proportion of adults in the labor market	60%	Data for 1993 [91]

Sources: ref. 90, 91.

a. Tudawe I. The cost of diet-related chronic disease in Sri Lanka. Colombo: Hector Kobbukedawa Agricultural Research and Training Institute. Asian Development Bank, Manila, 2000. Draft. US\$1.00 = SLRe 59.7/- (2000).

Among childhood factors, LBW is most important. It accounts for 18.4% of the PAR for diabetes. Stunting is less of a concern. This reflects in part that stunting levels in Sri Lanka are only marginally higher than LBW levels, because of relatively good breastfeeding practices in Sri Lanka. However, Sri Lanka, and South Asia in general, face the problem of low maternal BMI, which limits progress against LBW.

For diabetes, the combinations of LBW and diets high in saturated fats and added sugar, and possibly greater genetic predisposition, give great cause for concern, especially for projections to 2025 (table 16). With little progress on LBW and increases predicted in saturated fat intake, the prevalence of diabetes in Sri Lanka is predicted to increase dramatically: by a factor of 2.7 [76]. Diabetes also contributes strongly

to other chronic diseases. In Sri Lanka in 2025, it is estimated that diet-related factors (saturated fat intake) will account for almost 40% of CVD. Diabetes will contribute about 29% to CVD. Overweight will account for about 24% of diabetes and 27% of hypertension. Diabetes will account for almost 18% of stroke cases. LBW will remain the most important childhood factor for all four conditions (CVD, stroke, diabetes, hypertension) and its importance will grow compared to 1995.

It appears that the costs of diet-related chronic diseases in Sri Lanka are less important than in the PRC; and at this time less important than current problems related to undernutrition in Sri Lanka. However, the costs of these diseases in Sri Lanka are appreciable and will increase substantially. These costs

TABLE 18. Estimated contributions of diet-related and childhood factors to chronic diseases in Sri Lanka in 1995

Disease	Key factor	PAR (share of condition attributable to this factor)
Diet-related factors		
Cancers	Fruit and vegetable intake	22.7% ^a
CVD	Saturated fat intake	15.6%
CVD	Diabetes	12.9%
Diabetes	Overweight	8.5%
Stroke	Hypertension	8.9%
Stroke	Diabetes	7.5%
Hypertension	Overweight	8.9%
Childhood factors		
CVD	LBW	2.4% (via diabetes)
Stroke	LBW	1.4% (via diabetes)
Diabetes	LBW	18.4% (direct effect)
Hypertension	LBW	7.0% (direct effect)

Source: based on table 17.

a. Estimates for cancers are from ref. 40, and represent the proportion of all cancer deaths preventable by changes in diet, exercise, and alcohol consumption. This represents an average from all cancers. Some cancers are more preventable than others by diet, especially by fruit and vegetable intake.

This table picks out the most important diet-related pathway for each of the outcomes. If overlap between different pathways is not 100%, then these are underestimates of dietary effects on chronic diseases.

CVD = cardiovascular disease; LBW = low birthweight; PAR = population attributable risk.

TABLE 19. Projected contributions of diet-related and childhood factors to chronic diseases in Sri Lanka in 2025

Disease	Key factor	PAR (share of condition attributable to this factor)
Diet-related factors		
Cancers	Fruit and vegetable intake	22.7% ^a
CVD	Saturated fat	39.9%
CVD	Diabetes	28.8%
Diabetes	Overweight	24.3%
Stroke	Diabetes	18.2%
Stroke	Overweight	10.0%
Hypertension	Overweight	26.5%
Childhood factors		
CVD	LBW	5.3% (via diabetes)
Stroke	LBW	3.3% (via diabetes)
Diabetes	LBW	26.4% (direct)
Hypertension	Stunting	8.6% (via overweight)
Hypertension	LBW	6.2% (direct)

Source: based on table 17.

a. Estimates for cancers are from ref. 40, and represent the proportion of all cancer deaths preventable by changes in diet, exercise, and alcohol consumption. This represents an average from all cancers. Some cancers are more preventable than others by diet, especially by fruit and vegetable intake.

This table picks out the most important diet-related pathway for each of the outcomes. If overlap between different pathways is not 100%, then these are underestimates of dietary effects on chronic diseases.

CVD = cardiovascular disease; LBW = low birthweight; PAR = population attributable risk.

are, if anything, lower than those in other countries of South Asia. Sri Lanka has made more progress against LBW than have other countries in South Asia, and against hypertension and obesity than has India. However, the pattern that we described here for Sri Lanka is likely to be broadly typical of South Asia as a whole. In Sri Lanka, as elsewhere in South Asia,

the key policy priorities for these chronic diseases are diet, especially saturated fat and added sugar intake, and physical activity. Not all Sri Lankans consume meat. Coconut milk is an important factor in saturated fat intake. In the long run, improving birthweight is important, particularly because of the association of LBW with diabetes.

TABLE 20. Pathways for calculation of population attributable risks (PARs) of dietary effects on chronic diseases: for application to existing 1995 data (and projections to 2025 in brackets) in Sri Lanka

Contribution of	To:	PAR direct effect in %	PAR indirect effect in %	Pathways for indirect effects
Childhood dietary effects				
Stunting	Overweight	55.6 (41.9)	NA	NA
LBW	Hypertension	44.8 (10.5)	NA	NA
LBW	Diabetes	33.9 (14.6)	NA	NA
Effects on CVD				
Animal fat intake	CVD	14.9 (28.3)	NA	NA
Overweight	CVD	12.2 (25.9)	NA	NA
Hypertension	CVD	20.6 (24.5)	NA	NA
Diabetes	CVD	6.5 (10.7)	NA	NA
Stunting	CVD	NA	6.8 (10.8)	Via overweight
LBW	CVD	NA	9.2 (2.6)	Via hypertension
LBW	CVD	NA	2.2 (0.3)	Via diabetes
Effects on stroke				
Hypertension	Stroke	25.2 (24.5)	NA	NA
Diabetes	Stroke	2.1 (10.7)	NA	NA
Stunting	Stroke	NA	3.4 (4.7)	Via overweight and hypertension
LBW	Stroke	NA	11.3 (2.6)	Via hypertension
LBW	Stroke	NA	0.7 (1.6)	Via diabetes
Effects on hypertension				
Overweight	Hypertension	24.0 (45.6)	NA	NA
LBW	Hypertension	44.8 (10.5)	NA	NA
Stunting	Hypertension	—	13.3 (19.1)	Via overweight
Effects on diabetes				
LBW	Diabetes	33.9 (14.6)	NA	NA
Overweight	Diabetes	22.7 (44.8)	NA	NA
Stunting	Diabetes	—	12.6 (18.8)	Via overweight
Effects on cancers				
Fruit and vegetable intake	Cancers	22.7	NA	NA

Source: calculations by the authors.

For comparison, the desired or recommended levels of nutrition-related variables are as follows: LBW, 0%; stunting, 0%; hypertension, 0%; fruit and vegetable intake, there are no Sri Lankan standards but the People's Republic of China recommends 700 g/day and the US about 750 g/day (as 5 servings) [86]; saturated fat intake, 8 to 10% of dietary calories (note that there are no standards for animal fat intake, and data were not available on saturated fat intake); overweight, 0%.

CVD = cardiovascular disease; LBW = low birthweight; NA = not applicable; PAR = population attributable risk.