

Draft Report

Technical Review Report

**2019-2020 Sri Lankan Food Based Dietary Guide Lines
Evidence Review**

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Part 1

Executive Summary

The Food Based Dietary Guidelines Technical Review Committee (FBDGs-TRC) for 2019-2020 was appointed with terms of reference (ToR) by the Ministry of Health, Nutrition and Indigenous Medicine (MoH). The committee was assigned with the task of assessing the evidence base guiding to revise and upscale Food Based Dietary Guidelines for Sri Lankans. This review for this purpose was done for the first time in Sri Lanka.

In up scaling and revision of FBDGs for Sri Lankans in 2019-2020, the importance of integrating evidence from multiple sources, technical review, field findings and diet modeling was given due consideration. The goal of technical review was to assess the evidences which will be used to make technical recommendations in the formulation of dietary guidance for Sri Lankans.

The report addresses the following objectives;

- To describe food and nutrient intake of Sri Lankan population
- To describe the nutritional status and nutrient deficient health problems of the Sri Lankan population
- To assess the prevalence of diet related chronic diseases of Sri Lankans
- To describe the degree of policies and programmes operation and their impacts on the health and nutrition of Sri Lankans
- To describe the social, environmental effects on personal behavior regarding food choices and nutritional outcomes of the population in Sri Lanka

Sri Lankan Context

The Sri Lankan economy is based mainly on agriculture, services and to a lesser extent light industry. Agriculture earns about 10% GDP and employs 38% percent of the workforce. About 77% of the population lives in the rural sector The workforce of the country is 64.2% represented by age group 15-59 y. Women only form 33% of the workforce. Percentage of children under 5 years has decreased whereas the elderly population has increased during 1981 to 2016..

Risk factors and problems associated with diet

The calorie gap between the non poor and poor remains parallel in all provinces between 2012 and 2016. The gap is approximately 700 Kcal. The gap between the desirable average calorie intake of 2000 Kcal/person/day and the actual calorie intake of the poor is 591 Kcal. The non poor exceed the desirable level by just over 200 Kcal. Therefore affordable diets needs to be closely examined when providing technical recommendations .

The increase in population of the elderly and the increased dependency ratio of 20% on the younger age groups should be strongly considered when deciding on guidelines. The burden for nourishing the elderly will rest on the young and older adults. This could compromise both the nutrition status of the younger and the old in the same family.

The working mode transition has bearing on lesser active lifestyles which need to be given due attention. Even those who remain in farming use an increasing level of technology and are less active than before.

The prevalence of NCDs and metabolic diseases are highest among the age group beyond 30 years. They are the busiest people and due attention should be given on achieving healthy diets despite less time availability for food preparation.

Raised blood pressure among the 30 to 44 year age group of both sexes double when reaching the next age group of 45 to 59 years. This pattern continues to the next age group of 60 to 69 years. Raised blood glucose level and cholesterol level also show significantly increasing trends in the age groups 45 to 59 years.

Low birth weight is persisting at a higher rate while short stature and thinness of women exist in a considerable rate. Nutritional problems of children (<5y) such as stunting, wasting, underweight are major health problems in spite of many years sacrificed with several interventional programs. Both children and adults face diet related non communicable diseases and overweight and obesity is leading among others. It is crucial to develop the national food data bases and conduct periodic dietary exposure surveys.

Micronutrient deficiencies exist considerably among Sri Lankans. One third of vulnerable groups (pregnant, infants, young children etc) are iron deficient.

Food consumption, dietary patterns, nutrients intake

Majority of the Sri Lankan diet comprises of rice. Sri Lankan adults consume proportionately more carbohydrates exceeding recommended level of energy. Large gaps are found in the consumption of fruit, roots, tubers and vegetables with 95% of the population not consuming

the required 5 vegetables and fruits. Sugar and starch are over consumed. The variety of food in the diet is not adequate for different age groups. Vitamin A, iron, folate and vitamin B₁₂ intakes were well below the recommendations. Food from animal sources/protein consumption is relatively low in absolute terms, though there is a trend of increasing amounts over the years. Dairy products are under consumed. Though protein rich food consumption has increased according to some publications, it does not meet recommendations of 20% of total energy. It is shown that the consumption of local beans and peas is low, while pulses are high. The main pulse is dhal which is imported. Starch, added sugar and sodium consumption is higher than the recommendation. Current dietary intakes of Sri Lankans show a vast variation from recommendations. There are gaps in consumption of protein rich food and fat in rural areas and estates excluding women in urban areas. The proportion of expenditure on total food as a share of income has decreased and shows a greater degree of stabilized consumption.

The evidence presented shows that optimum infant feeding excluding exclusive breastfeeding (EBF) is practiced up to 23 months. It is evident that EBF at most covers 5 months of age. Therefore it is arguable that breast feeding parameters are satisfied up to 6 months of age in Sri Lanka.

There seems to be an improvement in the number of children under 5 consuming a diverse diet over the past 10 years. However most recent assessments show that two thirds of children under 5 years of age receive food from the minimum required number of food groups including iron rich food and Vitamin A. There is still a difference in dietary diversity among urban children vs the rural and plantation area. Much of the evidence shows that the diet of young children in the plantations is the worst in its low diversity.

Policy and food related programme Review

There are many policies, strategies, programs, protocols and guidelines with some relationship to food and nutrition. Fourteen policies which would have some relationship to the food and nutrition and health have been reviewed. Key word analysis has been done with regard to objectives of these policies to improve the food environment. A second question has been examined with regard to impact of these policies.

Of 14 Policies analyzed, 9 show their explicit intent to improve either food production or nutrition. However not more than 2 policies have had been subjected to review or impact assessment. The balance remaining 5 policies may have implicit references to nutrition and food.

Most of the Plans are drawn up within the Policy to implement nutrition and health related activities. However healthy eating is rarely mentioned even as part of programs. There are many programs listed as part of plans and policies with regard to nutrition. However only one programme deals with the food based approach and this is the previous food based dietary guidelines.

Food-related habits, physical activity and other behaviors

Food related and other behavior patterns are important determinants for positive health outcomes. It is obvious that other behaviors such as tobacco and alcohol use can exert detrimental effects on the health of individuals. Physical inactivity can lead to increase the prevalence of overweight and obesity of populations leading to other non-communicable diseases. Nationally representative published data is not available for meal patterns of individuals and food preparation methods and storage at household levels.

School feeding programs have continued for many decades as is well documented. Though the objective of school feeding is not for nutrition improvement, it effects improved attention span, attendance and retention in school. The basis for these programs is the fact the children attend school without eating breakfast, which is a pattern among a large number of children and their families.

Food Environment and Settings

People in rural agricultural areas get obtain food partly from home gardens and farms in addition to market sources. Main source of food supply of people in urban and semi urban areas is the market. Food commonly consumed outside home are bread, cakes, rolls, *Wade*, pastries and vegetable roti by different population segments. Guidelines have been developed and disseminated to establish and upgrade the workplace canteens. The limited evidence is available for assessing the impact of canteen guidelines in promoting health among students in Sri Lanka. School based approaches such as school canteen policy and school nutrition programmes are in practice but limited published evidence is available on assessment of the implementation of School Canteen Guidelines. There is also limited published evidence available on impact assessment of policies that affect the dietary intake, quality, behaviours and/or preferences of students, or on their weight status in Sri Lanka. The food environment and its influence on food consumption patterns and dietary quality needs in depth study and analysis, which should be accurately documented and freely available.

Conclusions

Sri Lanka is currently facing a demographic, epidemiological and nutrition transition. Undernutrition problems as well as nutrition related chronic diseases are public health concerns in Sri Lanka. The current food and nutrient intake of Sri Lankans show that the food choices should be changed to improve the quality of nutrient intake. Policies and programmes related to food and nutrition should be periodically assessed to determine the impact. Behavioural changes must be taken place with right attitudes while enhancing collaborative efforts in the delivery of food based dietary guidelines to support healthy eating, and active life to improve nutrition and health situation of Sri Lankans.

Part 2

Chapter 1

Background

Healthy diets are shown to be the foundation of a productive life of longevity free from illness. Malnutrition, namely macro nutrient deficiencies and excess as well as micro nutrient deficiencies result in less than optimum growth on the one hand and overweight and obesity. A number of diet related metabolic diseases such as cardio vascular diseases, diabetes, hypertension and cancer, among others are deleterious outcomes which have become the major causes of mortality.

A healthy diet is defined as adequate, comprising sufficient food for a healthy life;

- diverse, containing a variety of foods, including plenty of fruits and vegetables, legumes and whole grains;

- low in food components of public health concern: sugars and salt consumed in moderation (with all salt iodised) and fats being unsaturated rather than saturated or trans-fats.

Additionally, according to the World Health Organization (WHO), the hallmarks of a healthy diet are abundant, diverse plant foods, limited or no highly processed foods such as sugar-sweetened beverages and processed meats and appropriate consumption of other nutritious foods aligned with dietary needs for life stage (WHO, 2015). High-quality diets also need to be safe so they do not cause food-borne disease (FAO 2016).

Food Based Dietary Guidelines (FBDGs) are formulated as short and easy to understand messages for the population based on scientifically sound recommendations for an optimum diet. Over 100 countries have prepared and gone through several revisions of their FBDGs. The purpose of FBDGs are several; for policy making, industries to reformulate food products and to correct food related behavior. FAO/WHO recommends country specific FBDGs to improve healthy eating habits and lifestyles of people in a country. The intended audience of dietary guidelines is general population and recommendations are provided for different groups.

Sri Lankan FBDGs include 17 messages;

- 1. Eat a variety of foods every day.**
- 2. Eat cereal-based foods three times a day.**
- 3. Eat plenty of vegetables and fruits.**
- 4. Eat pulses, fish, dried fish, eggs, poultry and lean meat.**
- 5. Consume milk or milk products daily.**
- 6. Consume moderate amounts of fats.**
- 7. Limit salt intake and use only iodized salt.**
- 8. Consume less sugar, sweets or sweetened drinks.**
- 9. Drink plenty of water.**
- 10. Maintain a healthy body weight through a balanced food intake and regular physical activity.**
- 11. Eat additional food during pregnancy and lactation.**
- 12. Exclusively breastfeed for 6 months.**
- 13. Start complementary feeding at the completion of 6 months.**
- 14. Children and adolescents should take an adequate and nutritious diet.**
- 15. The elderly should eat foods with high nutritional value.**
- 16. Eat clean and safe foods.**
- 17. Eat naturally occurring foods in preference to processed foods.**

FBDGs for Sri Lankans were first published in 2002. A revised version was launched in 2011 followed by another revision in 2016. All three versions are fairly detailed and meant for practitioners rather than the general public as found out through structured discussions with the community. The FBDGs for Sri Lankans were developed by the Nutrition Division of the Ministry of Health. Consultations were obtained from officers of several government ministries, university academics, members of nutrition related associations, international and national non-governmental organizations, consumer organizations, World Health Organization and UNICEF.

What is new in up scaling and revision of FBDGs for Sri Lankans in 2019-2020?

Evidences were integrated from multiple sources which include technical review, field findings and diet modeling.

Developing or revising FBDGs should include several factors. These include food related behavior, current nutrient intake and dietary patterns, contribution of diet to health outcomes, food security and safety (Figure part 2.1). It is important to emphasize that the present situation of nutrient intake (quantity as well as quality) is to be corrected through FBDGs to achieve (Figure part 2.2) a diet providing the correct amount of nutrients.

In the process of development of FBDGs, a technical review on evidence, is one of the most important steps as specified in a number of global documents. This includes the White Paper on improving methodology to develop FBDGs and incorporating sustainability considerations, FAO, 2018 However in previous processes of preparing FBDGs for Sri Lankans, evidence review documents have not been produced in consultation with a group of technical experts.

Therefore in up scaling and revision of FBDGs for Sri Lankans in 2019-2020, the importance of integrating evidence from multiple sources, namely; technical review, field findings and diet modeling (Figure Part 2.3) was given due consideration.

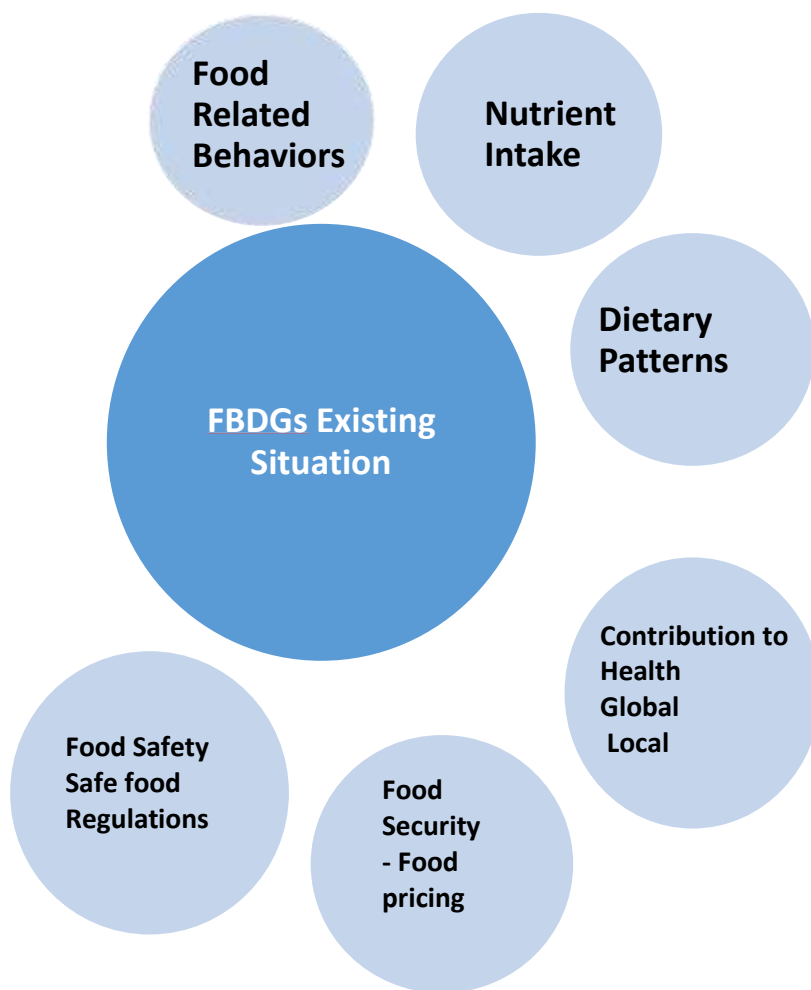


Figure Part 2.1 Factors associated with development of FBDGs



Figure Part 2.2 Present dietary intake vs ideal diet

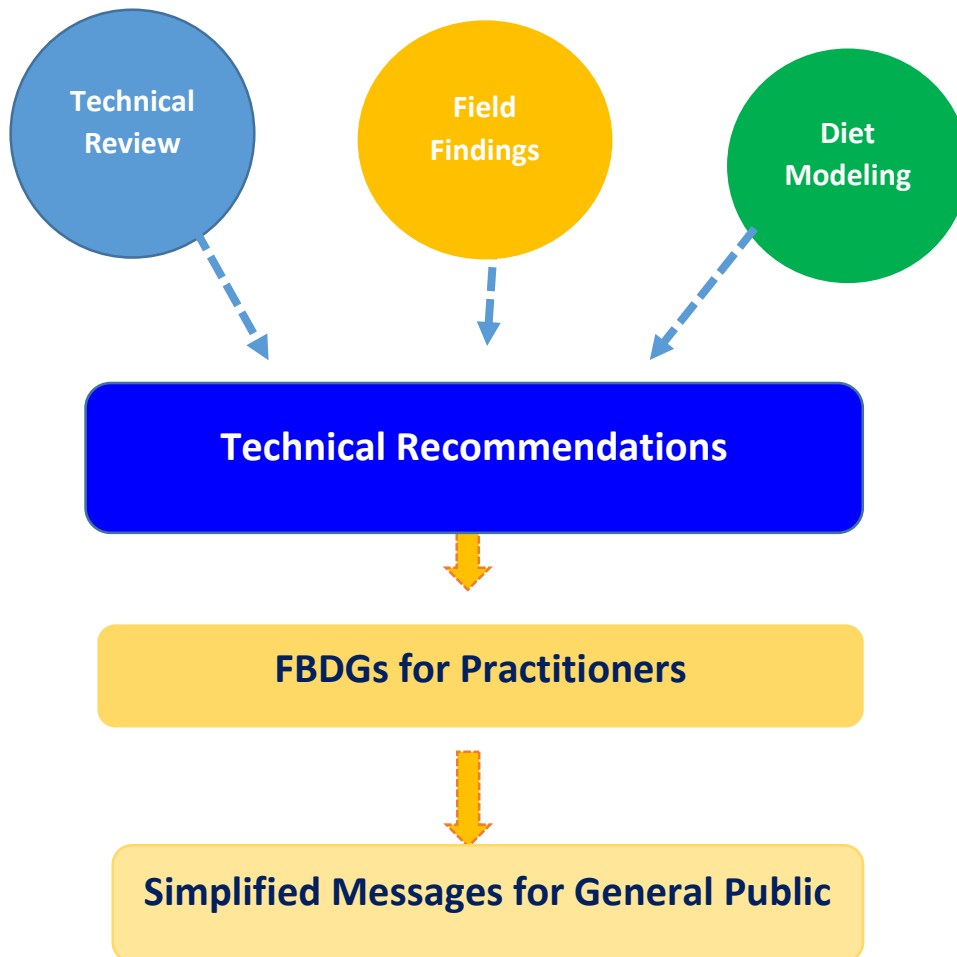


Figure Part 2.3 Conceptualization of FBDGs for Sri Lankans 2019-2020

The Technical Working Group (TWG) reviewed published research and reports, policies and programmes to address a number of review questions. These are presented in separate Chapters 1 to 5 in part 4 of the report..

Part 3

Methodology

Ministry of Health , Nutrition and Indigenous Medicine appointed the Technical working group comprising of nationally recognized experts in health and nutrition to review the scientific evidence under the guidance of the consultancy received from the Nutrition Society of Sri Lanka.

In the first meeting different areas to be addressed were agreed. Science based questions were used to gather relevant information in the review process. The TWG agreed to review available published high quality literature which included research publications and reports for 10 years back starting from 2019 and in the event of lack of any recent information last 15 -20 years were considered. List of evidence documents were selected. Information were extracted and data were described and synthesized. When local evidences were not available appropriate global evidence were used.

For all topics and questions conclusions and analysis statements were made. Research gaps and limitations were identified and future research directions and recommendations were indicated.

Part 4

Evidence Base

This section was comprised of five chapters. Each chapter presents evidence data base, integration of data to analyze the situation and a summary.

Chapter 1 examines risk factors and nutrition problems associated with diet. It discusses the nutrients of public health concern, nutrition problems across age groups, gender, ethnicity, geography, regions, sectors, education and socio economic strata of the population.

Chapter 2 reviews food consumption and dietary patterns, nutrient intake, sustainability of diet, availability, access, and safety.

Chapter 3 considers policies, strategies and food related programs that are relevant to ensure healthy eating and positive health outcomes of the population

Chapter 4 assesses behavior, food related habits and physical activity levels and their relation to positive health outcomes

Chapter 5 discusses food environment and settings that facilitates healthy eating and positive health outcomes

Chapter 1

Risk factors and problems associated with diet

1.1 Introduction

A balanced diet is the foundation of an individual's health status of different stages of the lifespan. Good nutrition ensures normal growth as allowed by the genetic predisposition to full potential growth and development of the person. Successful pregnancy outcomes ensures a healthy start to life and the progression to a healthy life course if all other factors are enabling this status. This includes the maintenance of healthy body weight, healthy aging, reduced risk for non - communicable diseases, productivity and promotion of overall health and wellness. Diet of an individual is composed of a wide variety of foods and beverages. Optimal nutrition is a result of many optimal dietary patterns. The dietary pattern that leads to optimal nutrition and health is based on the biological needs and preferences of the individual in addition to availability, accessibility and personal, socio cultural and environmental factors.

1.2 List of questions

Demographic profile

1. What is the demographic profile of the Sri Lankan population? (age, gender, race/ethnicity, income, geography/region, urban/rural, education & literacy levels, household composition and culture, religion etc. of population)

Nutrition problems

2. What are the nutrition problems of public health significance in Sri Lanka ?

Distribution of nutrition problems

3. Which age groups/different population groups are affected by the nutrition problems of public health significance?

Relationship between food nutrients and health outcomes

4. What are the main diet-related diseases? (include magnitude and severity, costs, trends if available) [i.e. the current rates of nutrition-related health outcomes, e.g. incidence of and mortality from cancer, prevalence of cardiovascular disease (CVD) etc. iron-deficiency anaemia, diarrhea etc.]

Expert recommendations

5. What expert recommendations are found in the literature (whom to target & what aspects to address, to improve the nutrition status of people in the country?)

1.3 Demographic profile

Question 1. What is the demographic profile of the Sri Lankan population? (age, gender, race/ethnicity, income, geography/region, urban/rural, education & literacy levels, household composition and culture, religion etc. of population)

Evidence

Sri Lanka is an island with a multiethnic and multi religious population (DHS 2016). The population density is 338 persons/Sq Km. Almost three quarter of Sri Lankans are Sinhala (74.9%) and Buddhists (70.1%), while other ethnic groups consists of Sri Lankan Tamils (11.2%), Tamils of Indian origin (4.1%), Muslims (9.3%), Burghers and a few others (0.5%) (DHS 2016).

It is an upper middle income country with a GDP per capita of USD 4102 (World Bank 2018). The country's population is 21.7 Mn. The sex ratio is 89 men to 100 women. The Human Development Index is 0.766 with a global rank of 73. It is the highest among the countries in the South East Asia region. The HDI integrates three basic determinants of human development, namely life expectancy at birth, mean years of schooling and gross national income per capita (World Bank 2018).

The Sri Lankan economy is based mainly on agriculture, services and to a lesser extent light industry. Agriculture earns about 10% GDP and employs 38% percent of the workforce. The majority of rural people depend on rice production (Table 1.1). The majority of the population (77%) lives in the rural sector followed by urban (18.2%) and estate (4.4 %) sectors (Figure 1.1). The workforce of the country is 64.2% represented by age group 15-59 y. Women only form 33% of the workforce.

Percentage of children under 5 years has decreased whereas the elderly population has increased during 1981 to 2016 (Table 1.1). Next to the service sector the majority of the workforce engage in agriculture and related work (Table 1.2).

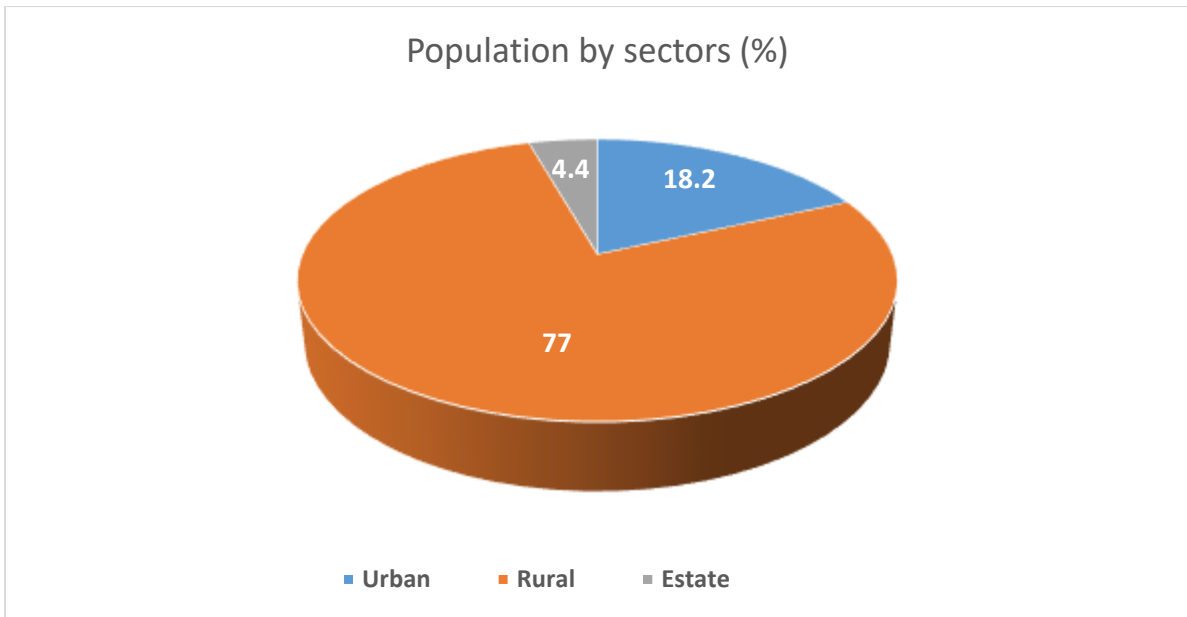


Figure 1.1 Population by sectors

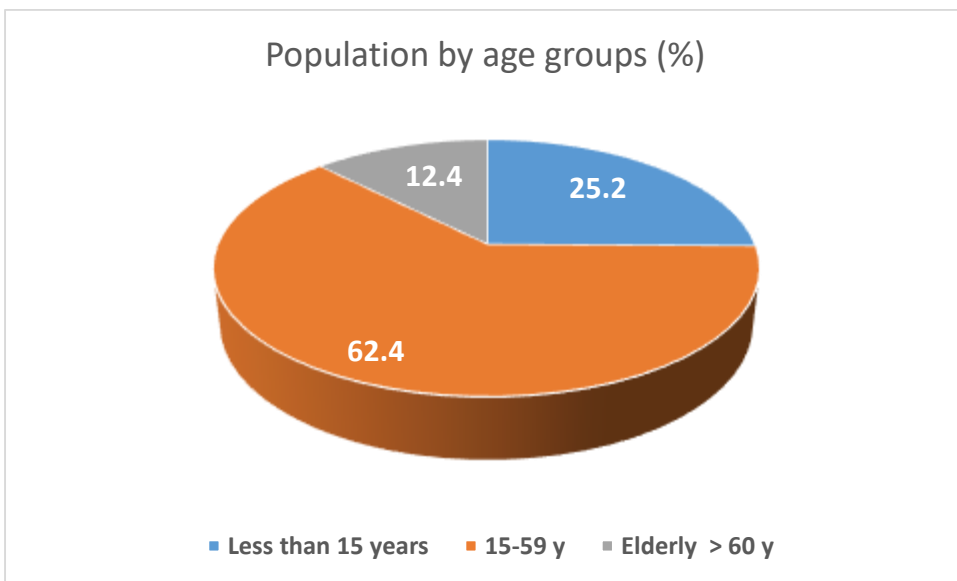


Figure 1.2 Population by age groups

Table 1.1 Trend of population by age groups (DHS 2016)

Age group	Census 1981	DHS 1993	DHS 2000	DHS 2006-07	Census 2012	DHS 2016
Children under 5 years	12.5	9.0	7.9	8.8	8.6	8.0
Children under 15 years	35.2	30.3	25.8	25.9	25.2	25.3
Women of Reproductive age (15-49 years)	52.2	53.0	54.6	51.8	51.0	47.8
Working age population	60.5	63.5	67.1	66.5	66.9	64.5
Elderly population (65 years and over)	4.3	6.1	7.2	7.5	7.9	10.1
Ratio of persons under 15 to those of age 15-64 (%)	58.2	47.8	38.3	39.0	37.7	39.22
Ratio of persons 65 and over to those age 15-64 (%)	7.2	9.6	10.7	11.3	11.8	15.7

Table 1.2 Economic sectors in Sri Lanka

Economic sector	Contribution to GDP	Percent of workforce	Description
Agriculture	10	38	Both cash crops and food crops grow Rice is the major crop
Manufacturing industries	34	17	Textiles, ceramics, petroleum products, fertilizers and cement
Service sector	56	45	Tourism, banking, finance, related to manufacturing and retail trade

Source DHS , 2016

Table 1.3 Household population (%) by age sex and place of residence

Age	Urban			Rural			Estate			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Age												
<5	8.7	6.7	7.7	8.8	7.4	8.1	8.8	7.9	8.3	8.8	7.3	8.0
5-9	8.7	7.2	7.9	9.4	8.4	8.9	11.3	9.3	10.2	9.4	8.2	8.8
10-14	8.8	7.8	8.3	9.0	8.1	8.5	10.3	9.9	10.1	9.1	8.1	8.5
Dependency age groups												
0-14	26.2	21.7	23.8	27.3	23.9	25.5	30.4	27.1	28.7	27.2	23.6	25.3
15-64	64.3	67.0	65.7	63.5	65.2	64.4	62.3	62.8	62.5	63.6	65.4	64.5
65+	9.6	11.3	10.5	9.2	10.9	10.1	7.3	10.1	8.8	9.2	10.9	10.1
Child and adult population												
0-17	30.6	26.1	28.2	32.3	28.4	30.2	35.8	31.9	33.7	32.2	28.2	30.1
18+	69.4	73.9	71.8	67.7	71.6	69.8	64.2	68.1	66.3	67.8	71.8	69.9

Source (DHS 2016)

Table 1.4: Trends of changing economic parameters of households

Variable	Unit									
		1985/86	1990/91	1995/96	2002	2005	2006/07	2009/10	2012/13	2016
Mean household income per month	Rs.	2,012	3,549	6,476	12,803	20,048	26,286	36,451	45,878	62,237
Median household income per month	Rs.	1,322	2,547	3,793	8,482	13,617	16,735	23,746	30,814	43,511
Mean per capita income per month	Rs.	395	724	1,439	3,056	4,896	6,463	9,104	11,819	16,377
Income receivers mean income per month	Rs.	941	1,819	3,367	6,959	10,563	14,457	20,427	25,963	33,894
No. of income receivers per household	No.	2.0	2.0	1.8	1.8	1.9	1.8	1.8	1.8	1.8
Household size	No.	5.1	4.9	4.5	4.2	4.1	4.1	4.0	3.9	3.8
Monetary income per month per household	Rs.	1,334	2,963	5,264	10,386	17,089	22,616	31,209	39,300	52,979
Non-monetary income per month per household	Rs.	678	586	1,212	2,419	2,959	3,670	5,242	6,578	9,257
Mean household expenditure per month	Rs.	2,079	3,905	6,525	13,147	19,151	22,952	31,331	41,444	54,999
Expenditure on food and drink	Rs.	1,198	2,377	3,552	5,848	7,593	8,641	13,267	15,651	19,114
Expenditure on non-food items	Rs.	802	1,384	2,753	6,993	11,079	13,819	17,399	25,088	34,826
Expenditure on liquor, narcotic drugs and tobacco	Rs.	79	79	219	306	479	492	665	705	1,056
Food ratio	%	57.6	57.6	54.4	44.5	39.6	37.6	42.3	37.8	34.8
Poverty head count ratio	%	–	–	28.8	22.7	–	15.2	8.9	6.7	4.1

Source : Central Bank of Sri Lanka ,2018

Sri Lanka has achieved better economic status (Tables 1.4 to 1.6; Figure 1.3). Life expectancy at birth for both male and female is 72 and 78.6, years respectively. Neonatal mortality rate is 5.3 (per 1,000 live births), Infant mortality rate is 8.5 (per 1,000 live births), Under-five mortality rate is 10.1 (per 1,000 live births) and the maternal mortality rate is 25.7 (per 100,000 live births) respectively (2014-2015).

Table 1.5 Average monthly household expenditure on selected food/non-food items

Expenditure group	HIES survey period								
	1985/86	1990/91	1995/96	2002	2005	2006/07	2009/10	2012/13	2016
Average monthly expenditure (Rs.)									
Food expenditure									
Rice	306	610	752	1,052	1,051	1,197	2,298	2,134	2,452
Wheat flour	31	35	39	72	94	97	189	210	185
Bread	64	107	158	254	273	303	426	462	464
Condiments	119	252	353	532	687	803	1,029	1,416	1,881
Pulses	44	115	130	185	259	304	547	552	693
Vegetables	120	235	296	464	617	727	1,006	1,279	1,530
Coconuts	71	130	244	426	429	473	738	962	1,096
Meat	31	80	156	188	337	366	517	669	918
Fish	71	137	233	371	647	744	1,163	1,430	1,820
Dried fish	48	101	162	219	290	348	492	656	773
Milk & milk products	52	122	254	489	748	754	1,038	1,389	1,562
Eggs	11	27	39	47	78	85	134	160	205
Fruits	15	32	62	212	296	294	386	461	612
Sugar	76	155	184	193	248	315	452	459	418
Other foods & drinks	151	239	490	1,144	1,539	1,831	2,672	3,412	4,505
Total	1,198	2,383	3,552	5,848	7,593	8,641	13,267	15,651	19,114

Source : Central Bank of Sri Lanka ,2018

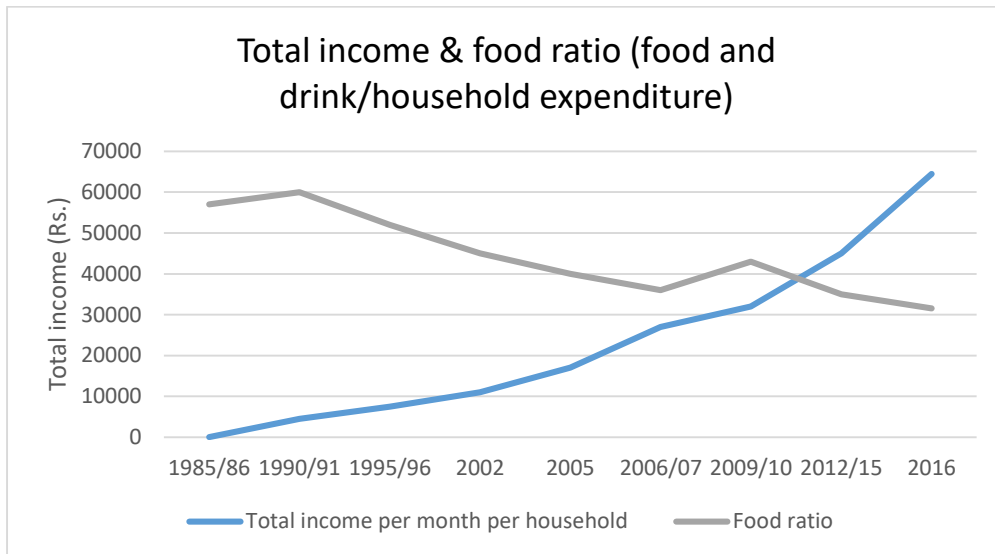


Figure 1.3 Total income and food ratio

Source: Central Bank of Sri Lanka, 2018

Table 1.6 Daily average dietary energy consumption per person by poverty status, sector and province 2012/13 and 2016

Sector/Province	2012/13				2016			
	Poor households (P)	Non-poor households (NP)	All households	Gap in Calories P vs NP	Poor households (P)	Non-poor households (NP)	All households	Gap in Calories P vs NP
Sri Lanka	1,530	2,153	2,111	623	1,445	2,123	2,095	678
Sector								
Urban	1,243	1,915	1,901	672	1,222	1,947	1,933	725
Rural	1,539	2,197	2,147	658	1,454	2,152	2,122	698
Estate	1,646	2,388	2,307	742	1,550	2,322	2,254	772
Province								
Western	1,176	1,975	1,958	799	1,195	1,967	1,954	772
Central	1,523	2,246	2,198	723	1,471	2,167	2,129	696
Southern	1,443	2,214	2,155	771	1,379	2,141	2,118	762
Northern	1,545	2,219	2,146	674	1,624	2,225	2,179	601
Eastern	1,453	2,152	2,075	699	1,423	2,099	2,050	676
North-Western	1,501	2,197	2,155	696	1,386	2,164	2,143	778
North-Central	1,553	2,254	2,203	701	1,429	2,275	2,247	846
Uva	1,783	2,404	2,308	621	1,703	2,360	2,318	657
Sabaragamuwa	1,675	2,209	2,162	534	1,420	2,178	2,127	758

Source: Central Bank of Sri Lanka, 2018

Figure 2.1 Percentage of Households with improved source of drinking water by residence

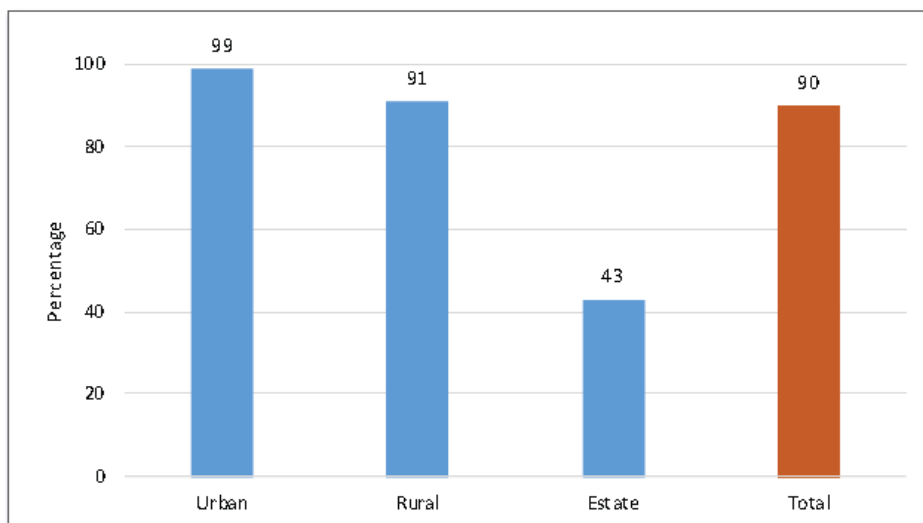


Figure 2.2 Percentage of Households with improved, not shared, sanitation facilities by sector

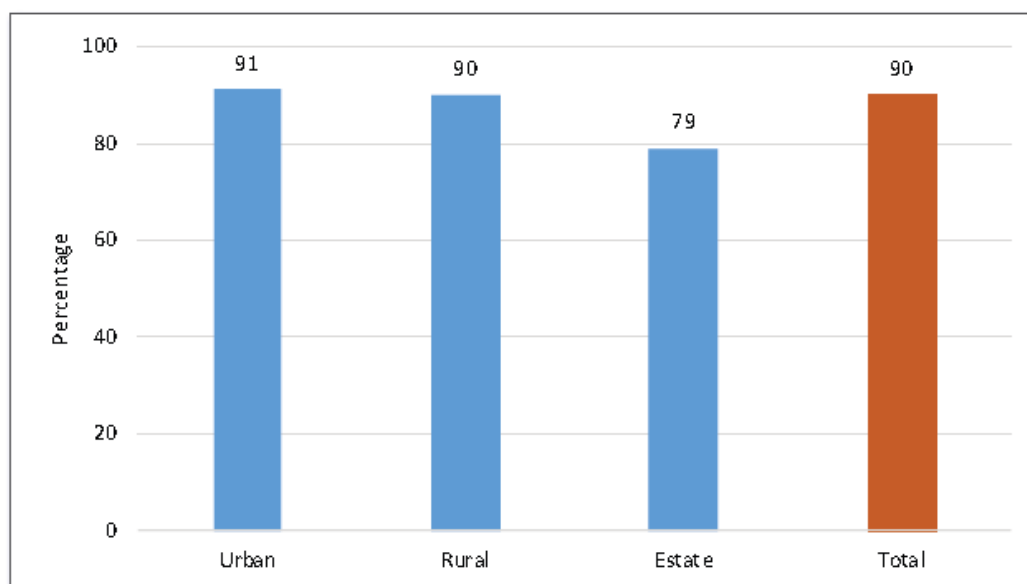
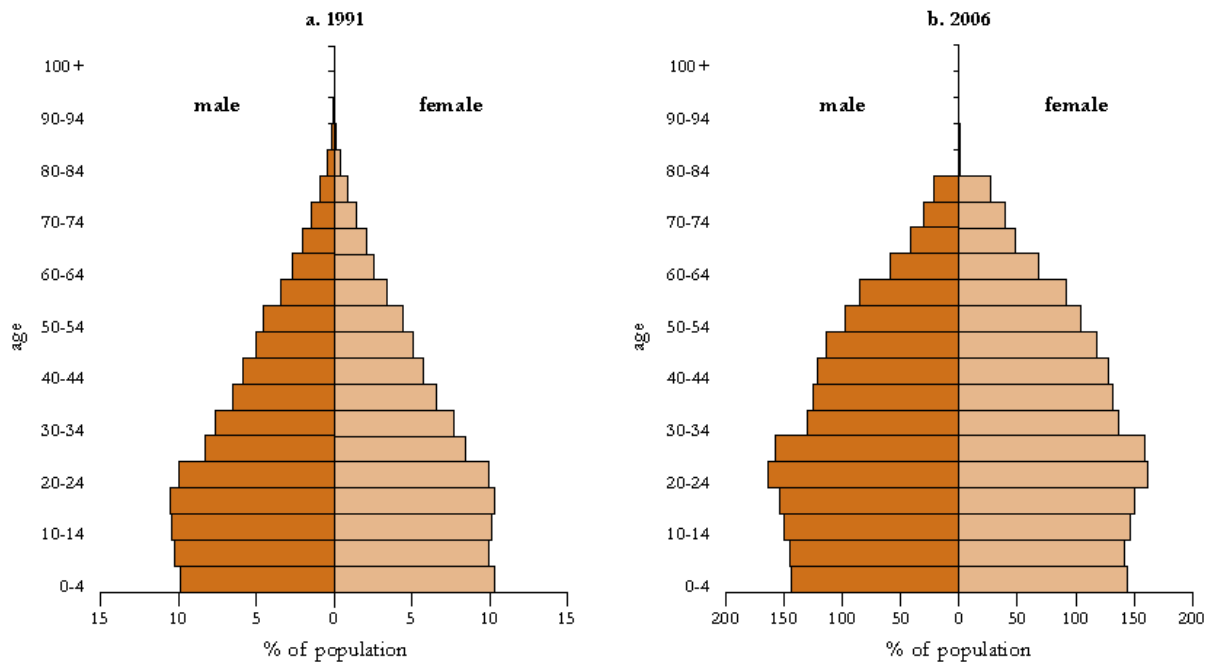


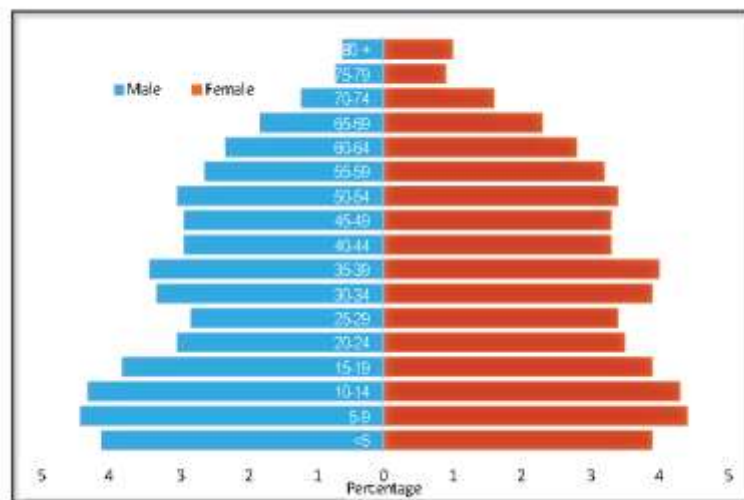
Figure 1.4 availability of drinking water source and sanitation facilities

Figures 1.4 show that all people in Sri Lanka do not have a source of drinking water and sanitation facilities which are important provisions to ensure good health and wellbeing .



Source: Ranann-Eliya & Sikurajapathy (2009)

Figure 2.3: Population Pyramid



Source: (DHS 2016)

Figure 1.5 Population trends

The population pyramid depicts that Sri Lankan population consisted of higher presence of females in age groups 20 and over compared to males. Further a trend towards declining fertility and low mortality and increasing older age can be observed in Sri Lanka population according to the pyramid in 2016 (Figure 1.5). In 1991 base is broad showing high percentage of children in the population. Year 2016 pyramid show a growing number of elderly population. For the Sri Lankan population the child dependency ratio declined from 58 to 39 while the old-age dependency ratio has gone up from 7 to 16 during the period of 1981 to 2016 (DHS 2016).

1.4 Nutrition problems

Question 2. What are the nutrition problems of public health significance in Sri Lanka ?

Distribution of nutrition problems

Question 3. Which age groups/different population groups are affected by the nutrition problems of public health significance?

Conclusion

Sri Lanka is facing triple burden of malnutrition. Non communicable diseases are increasing predominating overweight and obesity among all age groups. Cardiovascular risk and diabetes are leading diseases among others. In addition, coexisting of under nutrition coupled with micronutrient deficiencies of infants, children and women is also common place in low income communities.

Evidence

Available published information that cover representative population on nutrition problems of public health significance due to lack of adequate amount of nutrients in Sri Lanka are focused on child and women malnutrition, and micronutrient deficiencies.

Under nutrition of children

Low birth weight (LBW) is defined as the weight less than 2.5 kilograms at the birth and infants with low birth weight have a higher risk for early childhood death and low intellectual

development and poor academic performances. Accumulating evidences on long term consequences of low birth weight show the risk of having several non- communicable diseases at later adulthood.

Current prevalence of low birth weight is 15.7 % (DHS, 2016). Compared to the prevalence in 2006/07 (16%) this indicator has remained relatively constant. Table 1.6 shows variations of prevalence of LBW with other characteristics.

Table 1.6 Low birth Weight by sector and other characteristics

	Low birth weight (%)
Children born to young mothers (< 20 y)	21.7
Urban	12.7
Rural	15.7
Estate	25.4
Mothers with no education	31.8
Mothers who did not complete primary School (grade 1-5)	24.3
Lowest wealth quintile	21.3
Highest wealth quintile	9.1

Source: DHS 2016

Protein energy under nutrition of children

Protein energy under nutrition of children are depicted by stunting, underweight and wasting. Current prevalence of stunting, wasting and underweight of children below 5 years are 17.3, 15.1 and 20.5 % respectively (Table 1.7).

The Prevalence of stunting, among children aged 6-12 y are 11.5%, (severe 1.6%). Prevalence of thinness, overweight and obesity are 30.2, 6.1 and 2.9%, respectively (Jayatissa et al, 2016).

Table 1.7 Prevalence (%) of under nutrition among children below 5 years

	Severe stunted Percentage below -3SD	Stunted Percentage below -2SD	Severe wasted Percentage below -3SD	Wasted Percent age below - 2SD	Severe underweight Percentage below -3SD	Underweight Percentage below -2SD
Total	4.1	17.3	3.0	15.1	4.0	20.5
Male	4.7	17.9	3.3	15.4	3.9	20.5
Female	3.6	16.6	2.7	14.7	4.1	20.5
Urban	3.6	14.7	1.6	12.9	1.9	16.4
Rural	4.0	17.0	3.2	15.6	4.2	20.8
Estate	8.8	31.7	3.7	13.4	7.6	29.7
Mothers with no education	17.5	37.6	1.6	17.9	6.9	33.9
Mothers who did not complete primary School (grade 1-5)	8.4	27.2	4.1	17.6	8.5	30.2
Lowest wealth quintile	6.2	25.2	3.6	17.3	6.9	27.6
Highest wealth quintile	2.3	11.7	1.5	10.0	2.1	12.5

Source: DHS 2016

Nutrition problems of women

Nutritional status of women influence the nutrition of children. Short stature (height below 145 cm), thinness, overweight and obesity are identified nutrition problems of ever married women in Sri Lanka (DHS, 2016). Place of residence, and wealth status can be important factors affecting nutritional status of women (Table 1.8). Women living in the estate sector and belonging to lowest wealth quintile show higher prevalence of short stature and thinness indicating nutrient inadequacies whereas those who live in urban sector and belonging to highest wealth quintile show higher prevalence of overweight and obesity compared to their counterparts.

Table 1.8 Nutrition problems of women

	Short stature (%)	Thinness (%) BMI<18.5	Overweight or obese BMI > 25
Urban	5.2	5.6	55.8
Rural	7.2	9.1	44.2
Estate	14.9	22.0	23.4
Lowest wealth quintile	10.9	16.1	33.0
Highest wealth quintile	4.1	4.1	57.1
Total	7.2	9.1	45.3

Micronutrient deficiencies

Those nutrients required in minute quantities are micronutrients and they include vitamins (A, B, C, D, E, and K), minerals (sodium, potassium, calcium, phosphorus, fluoride, iron, and zinc) and trace elements (iodine, copper, selenium, manganese, chromium, and molybdenum). Micronutrients which need to be part of the diet are essential for normal human growth and development, physiological functioning, and wellbeing. Micronutrient deficiencies can cause several negative health consequences such as poor immunity, impaired cognitive performance, stunted growth, and increased morbidity and mortality.

Iron deficiency

Table 1.9 show prevalence of iron deficiency of different age categories. Subclinical iron deficiency is a significant problem in studied populations in Sri Lanka (Table1.9). In the age category 6-12 y prevalence of anemia was determined (Jayatissa, 2016). All children who had haemoglobin levels <11.5 g/dl after adjusting for altitude was identified as being anaemic. Severe, moderate and mild anaemia were defined as haemoglobin level < 8.0, 8.0-10.9 and 11.0-11.5 g/dl, respectively. The results showed that 12.2% of children were anemic and prevalence for 6-9 y and 10-12 y were 13.5 and 8.2% respectively.

Table 1.9 Prevalence of Iron deficiency

Population	Iron deficiency prevalence (%)	Reference
Pregnant women (< 15µg /dL) N = 7500	21.8	Jayatissa et al (2017)
Infants 6-6.5 months (< 12µg /dL) N= 96	37.2	Wickramasinghe et al (2017)
Children aged 6–59 months N = 7500	33.6	Jayatissa et al (2014)
Secondary school children aged 11–19 years N= 7526	19.2	Allen et al (2017)
Girls who dropped out of school (age 15–19 years) N= 613	29.4	De Laneroll-Dias et al (2012)
Pre-school children aged 3–5 years N=	35.0	Hettiarachchi & Liyanage (2012)
Pregnant women 12 and 20 weeks gestation (< 12µg /dL) N=350	3.7	Senadeera et al (2017)
Pregnant women 12 and 20 weeks gestation (< 30µg /L) N=350	36.9	Senadeera et al (2017)
Non-lactating young women (age 19–30 years) (< 12µg /dL) N= 600	25.3	Thoradeniya et al (2006)

Iodine deficiency

Iodine deficiency, is an easily preventable deficiency and is associated with a number of adverse effects on growth and development that are collectively known as iodine deficiency disorders (IDD) (Table1.10).

Table 1.10 Findings of national iodine surveys

Year	2000	2005	2010	2016
Total goiter rate (5)	20.9	3.8	4.4	1.8
Median UI concentration ($\mu\text{g/L}$)	145.3	154.4	163.4	232.5
Subjects (%) adequate UI concentration (100-199.9 $\mu\text{g/L}$)	35.4	34.7	37.5	na
Subjects (%) more than adequate UI concentration (200-299.9 $\mu\text{g/L}$)	17.8	18.7	22.2	na
Subjects (%) Excessive UI concentration ($> 300 \mu\text{g/L}$)	16.3	16.8	14.9	29.5
Iodine deficiency ($<100 \mu\text{g/L}$)	30.6	29.9	25.5	na
Severe iodine deficiency ($< 20 \mu\text{g/L}$)	1.4	0.1	1.4	na
Mean iodine content in salt at household level (ppm)	na	28	21.2	21.2
Households (%) access to adequate iodine in salt	49.5	91.2	51.2	78.5

Source: Jayatissa et al 2005, 2006, 2012, 2016

Present total goiter rate in Sri Lanka is well below the public health cut-off of 5% , and the median UI concentrations are above the acceptable level of $100 \mu\text{g/L}$ (Table 1.10). However percentage of subjects with excessive urinary iodine concentration is 29.5% which need to be addressed. Current iodization legislation guide to maintain of iodine in salt at levels of 15 ppm and <30 ppm at the household and production levels, respectively.

Other mineral deficiencies

Limited published data show the lack of national represented studies to determine the level of other mineral deficiencies. The zinc deficiency of 6-59 months children is 5.1% (Jayatissa et al 2014). This well below the prevalence of zinc deficiency than the 20% set by the

International Zinc Nutrition Consultation Group as an indicator of the need for national intervention programs. The same survey reported a high prevalence of calcium deficiency (47.6%).

Prevalence of vitamin deficiencies

Limited published data show the prevalence of vitamin A, D, B₁₂ and folate in Sri Lanka. According to recent data higher prevalence of suboptimal vitamin A status can be seen rather than actual deficiency. Functions of Vitamin A in human body include normal functioning of the vision, maintenance of cell growth and epithelial integrity, red blood cell production, immune function and reproduction. Vitamin A requirements are high during infancy and childhood due to increased growth and development and the need to fight infections.

Table 1.11 Prevalence (%) vitamin deficiencies

Population	Vit A	Vit D	Vit B ₁₂	Folate	Reference
Pregnant women N = 7500	3.4	-	-	-	Jayatissa et al (2017)
Infants 6-6.5 months N= 96	1.1	-	-	-	Wickramasinghe et al (2017)
Children aged 6–60 months N = 900	29.3	-	-	-	Jayatissa & Gunathilaka (2006)
Girls who dropped out of school (age 15–19 years) N= 613	-	-	1.7	28.6	De Laneroll-Dias et al (2012)
Pre-school children aged 3–5 years N=248	5	25		Male 41 Female 32	Hettiarachchi & Liyanage (2012)
Preschool children 2-5 y N=340	38.2	5			Marasinghe et al (2015)
Non-lactating young women (age 19–30 years) N= 600	25.3	-	0.44	43.6	Thoradeniya et al (2006)

Review of existing published information show that lack of comprehensive national dietary exposure data limit the understanding of the level of inadequacies of micronutrients in Sri Lankan population. This is further highlighted the importance of developing national food

and nutrient database to use in dietary studies. Rather conducting fragmented individual studies for individual nutrients it is imperative to conduct holistic dietary exposure studies including analysis of nutritional biomarkers of the same group of individuals. This would allow to analyze causal relationships between dietary intake and nutrient inadequacies in depth.

1.5 Relationship between food nutrients and health outcomes

Question 4. What are the main diet-related diseases? (include magnitude and severity, costs, trends if available) [i.e. the current rates of nutrition-related health outcomes, e.g. incidence of and mortality from cancer, prevalence of cardiovascular disease (CVD)]

Diet related diseases

Sri Lanka is in an epidemiological transition and burden of diet related diseases are increasing. About 82% of deaths are due to non communicable diseases (Table 1.12). According to the recent DHS (2016) prevalence of heart diseases, diabetes, high blood pressure and cholesterol levels are notable (Table 1.13).

Table 1.12 Proportional mortality in 2016

Disease	Proportion (%)
Cardio vascular diseases	34
Cancer	14
Diabetes	9
Chronic respiratory diseases	8
Other NCDs	18
Communicable, maternal, perinatal and nutritional conditions	8
Injuries	10

Source WHO 2018 Country profile

Table 1.13 Prevalence of non communicable diseases as reported in DHS 2016

Disease	Prevalence (%)
Heart diseases	2
Diabetes	6
High blood pressure	8
High blood cholesterol level	5
Chronic kidney diseases	1

Raised blood pressure

Table 1.14 Prevalence (%) of raised blood pressure

Age group (y)	Men	Women	Both sexes
18-29	10	8.8	9.4
30-44	22.8	17.3	20.1
45-59	40.1	42	41.1
60-69	47.8	66.4	57
18-69	25.4	26.7	26.1

Source STEP survey 2015

Prevalence of blood pressure in the adults including currently those on medication was (25.4 % for males and 26.7% for females (Table 1.14). Estimated mean heart rate in the adults was 75.7 beats per minute.

Overweight and obesity

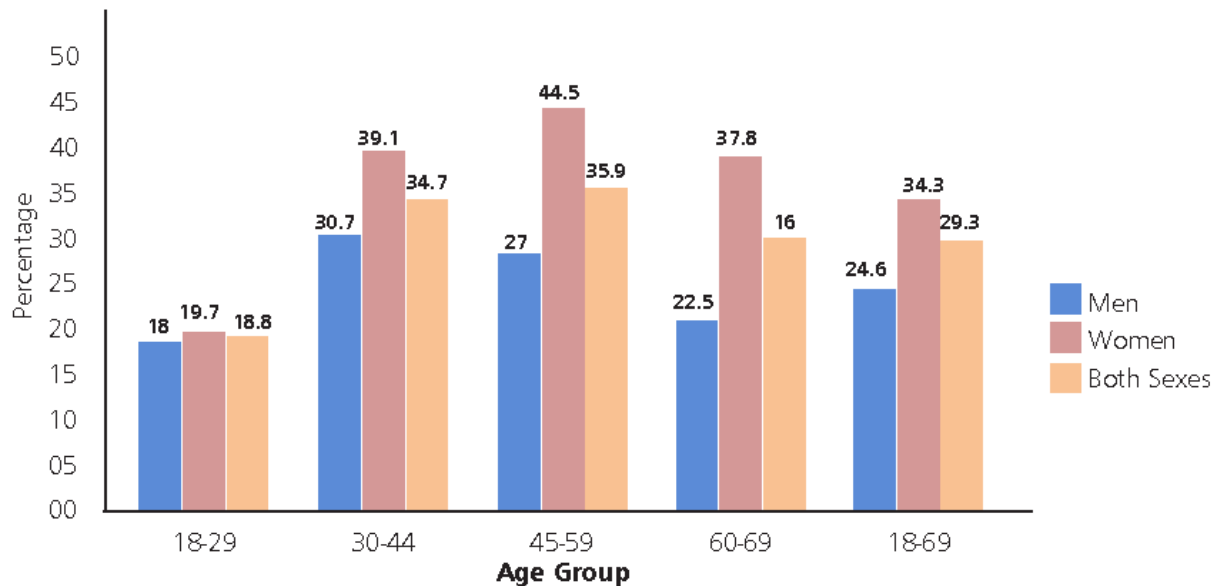


Figure 1.6 Overweight and obesity of adults

Source STEP survey 2015

Figure 1.6 presents the distribution of overweight and obesity among adults. About 29% of the adults was estimated to be overweight or obese with 24.6% men and 34.3% females.

A calorie gap exists between the non poor and poor parallel in all provinces between 2012 and 2016 and this gap is approximately 700 Kcal.

The gap between the desirable average calorie intake of 2000 Kcal/person/day and the actual calorie intake of the poor is 591 Kcal.

Type 2 diabetes

The impaired fasting glycaemia is plasma venous value between 110 and 126mg/dl. The raised blood glucose of the plasma venous value when more than 126mg/dl is considered diabetic.

According to STEP survey 2015;

- Mean fasting blood sugar for males and females were 81.9 and 81.4 mg/dl respectively.
- Nearly 4% of the adults were estimated to have impaired fasting glycaemia (4.4% males and 3.2% females).
- Further it was reported that 7.4% of the adults (7.3% males and 7.6% females) either had raised blood glucose or were currently on medication for diabetes (Table 1.15).

Table 1.15 Prevalence (%) of raised blood glucose

Age group (y)	Men	Women	Both sexes
18-29	2.8	2.2	2.5
30-44	6.6	5.7	6.2
45-59	12.9	12.0	12.4
60-69	10.6	18.2	14.4
18-69	7.3	7.6	7.4

Source STEP survey 2015

Cardiovascular diseases

Abnormal lipid profile with raised blood cholesterol is known to be a risk factor for cardiovascular diseases. Raised total cholesterol was defined as blood cholesterol levels ≥ 190 mg/dl. The STEP survey (2015) showed that in Sri Lanka almost one fourth of the adults (23.7%) was estimated to have the total cholesterol ≥ 190 mg/ dl (Table 1.16). This proportion was higher for females (28.4%) as compared to males (19.1%). Prevalence of high cholesterol was more in older age groups in both sexes for both cut off points, >190 mg/dL and >240 mg/dL (Table 1.17).

Table 1.16 Prevalence (%) of raised total cholesterol >190 mg/dL

Age group (y)	Men	Women	Both sexes
18-29	9.8	17.4	13.4
30-44	19.1	22.2	20.6
45-59	26.3	40.8	33.7
60-69	32.3	47.3	39.7
18-69	19.1	28.4	23.7

Source STEP survey 2015

Table 1.17 Prevalence (%) of raised total cholesterol >240 mg/dL

Age group (y)	Men	Women	Both sexes
18-29	1.5	3.8	2.6
30-44	5.7	6.7	6.1
45-59	9.6	19.7	14.7
60-69	17.9	25.8	21.8
18-69	6.5	11.3	8.9

Source STEP survey 2015

1.6 Expert recommendations

Question 5. What expert recommendations are found in the literature (whom to target & what aspects to address, to improve the nutrition status of people in the country?

Though published data in Sri Lanka is limited there is convincing literature to show a strong relationship between dietary components and health outcomes.

The evidence includes;

- sodium and increased risk of high blood pressure
- trans fatty acids and increased risk for cardiovascular disease

- Diets with higher consumption of vegetables, fruits, whole grains, low-fat dairy, and seafood, lower consumption of red and processed meats, refined grains and sugar-sweetened foods and beverages result in a lower prevalence of cardiovascular disease.

Convincing conclusions are available for following;

Alcohol:

- Alcohol intake and increased risk of liver, colorectal (men), mouth, pharynx, larynx and oesophageal cancer

Fats:

- Fatty acids intake and risk of type 2 diabetes
- Replacement of saturated fatty acids (SFA) with unsaturated fatty acids and reduced risk of cardiovascular disease

Fibre:

- Intake of single grains (beta-glucan oat fibre, barley grain products) and decreased cholesterol
- Intake of fibre and decreased risk of colorectal cancer

Meat and meat alternatives:

- Intake of standardized amounts of meat (red 100g/d and processed 50 g/d in relation to increased risk for colorectal cancer
- Association between soy protein and lowered cholesterol

Sugars:

- Intake of sugar-sweetened beverages and increased risk of adiposity in children
- Intake of added sugars and increased risk of obesity or type 2 diabetes

1.7 Chapter Summary and Analysis

Sri Lanka is currently facing a demographic, epidemiological and nutrition transition. This is compounded by an economic transition to an upper middle income country of GDP per capita income of USD 4102. This achievement can be misleading as regional disparities in income among provinces remain. This could also explain the transition. There is a rural population of

77%, with much lesser income. Supporting this argument is the fact that the calorie gap between the non poor and poor remains parallel in all provinces between 2012 and 2016. The gap is approximately 700 Kcal. On the other hand the gap between the desirable average calorie intake of 2000 Kcal/person/day and the actual calorie intake of the poor is 591 Kcal. The non poor exceed the desirable level by just over 200 Kcal. The issue of affordable diets needs to be closely examined when providing technical recommendations which would be converted to messages to the public.

As an extension of this argument it should be noted that mean and median household income as well as mean per capita income have increased by respectively 3000%, 4000% and 4800% over a period of 30 years from 1986 to 2016. This increase in income has translated into absolute expenditure for food increasing both on account of higher value food purchases and inflation. It can be concluded that more money is available for purchase of food and non food. Higher incomes also result in a mix of high value nutrients as well as processed and junk food. The ratio of expenditure on food over total income has reduced from 57% to 34.8% over this period. This shows a higher degree of food security and income. It should also be noted that increase in expenditure of food includes inflation and not necessarily a net increase in quantities of food.

The increase in population of the elderly and the increased dependency ratio of 20% on the younger age groups should be strongly considered when deciding on guidelines. With one of the largest proportions of the elderly and lack of comprehensive social security, the burden for nourishing the elderly will rest on the young and older adults. This could compromise both the nutrition status of the younger and the old in the same family.

When considering the profile of the workforce, those engaged in agricultural labour is only 38%. Those engaged in service delivery even in the rural areas is 45%. So a clear transition in engagement of labour can be seen. This has bearing on lesser active lifestyles which need to be given due attention. Even those who remain in farming use an increasing level of technology and are less active than before.

The 15 to 64 year age group comprises of two thirds of the population. Though fairly obvious it should be nevertheless highlighted that the prevalence of NCDs and metabolic diseases are highest among the age group beyond 30 years. They are the busiest people and due attention should be given on achieving healthy diets despite less time availability for food preparation.

Cognizance should be taken of the trend in overweight and obesity among women of the following age groups;

- 30 to 44 years – 39%
- 45 to 59 years – 44.5%
- 60 to 69 years – 38%

The gap in prevalence of overweight and obesity among males and females is 10% in the age group 30 to 69 years.

Raised blood pressure among the 30 to 44 year age group of both sexes double when reaching the next age group of 45 to 59 years. This pattern continues to the next age group of 60 to 69 years. Raised blood glucose level and cholesterol level also show significantly increasing trends in the age groups 45 to 59 years.

Low birth weight is persisting at a higher rate while short stature and thinness of women exist in a considerable rate. Nutritional problems of children (<5y) such as stunting, wasting, underweight are major health problems in spite of many years sacrificed with several interventional programs. Both children and adults face diet related non communicable diseases and overweight and obesity is leading among others. It is crucial to develop the national food data bases and conduct periodic dietary exposure surveys.

When considering micronutrient deficiencies among Sri Lankans, according to the many publications cited and information gathered in this review one third of vulnerable groups (pregnant, infants, young children etc) are iron deficient. A publication of the MRI is cited where calcium deficiency is 47% among the children under 5 years. The same publication states that Zn deficiency among children is only 5.1 %. This is questionable as the sources of food supplying calcium especially dairy products provide all these minerals very often the same.

1.8 Limitations

1. Lack of national dietary exposure surveys representing all age groups and physiological status such pregnant and lactating mothers
2. Nutritional biomarkers for micronutrients are not adequately determined in surveys.
3. Causal relationships have not been analyzed even with available data.
4. Exposure to toxic compounds, and food additives are not assessed nationally at any length

1.9 Future research needs

1. Need to conduct dietary exposure survey to evaluate nutrient intake and toxic matter exposure
2. Need to conduct biomarker analysis for nationally representative sample.

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Chapter 2

Part (a) Food consumption, dietary patterns, nutrients intake

2.1 Introduction

For normal growth and development and to maintain wellness throughout the life cycle humans need an array of essential macronutrients and micronutrients. Those essential nutrients need to be obtained through foods and beverages. It is necessary to understand the level of achieving of nutrients and the available and accessible, safe food sources by the Sri Lankan people in the course of revising food based dietary guidelines. Further, understanding of dietary patterns existing is important to determine critical aspects need to be changed to improve the health of people.

2.2 List of questions

Food consumption and nutrient intake

1. What are the current dietary patterns and intakes of foods and food components (including nutrients) in the country, and how do they vary with: a) age/physiological status: e.g. infants, young children, adolescent girls, pregnant/lactating women, the elderly b) gender c) socio-economic status, culturally and linguistically diverse groups? d) rural vs urban areas e) different regions (e.g. lake zone, highlands etc.) f) ethnic groups/culturally and linguistically diverse groups

2. Which foods and nutrients are lacking or too much in the diet? Of these, which present a substantial public health concern?

3. Are there any studies showing how current diets in the country vary from recommended diets

- Production data for some foods (staples), - FAO Food Balance -Sheet, Price of some foods - Import-Export food data - Household Income and Expenditure Surveys STEPS chronic disease risk factors Survey, Legislation on food premises, compliance to food standards - Food prices-types-sources portion-recommended amount-nutrient adequacy proportion of the population meet international dietary recommendations? What are the findings?

4. Which foods are commonly fortified? What are the consumption patterns and quantities consumed of these foods?
5. Which micronutrients are obtained from consumption of fortified foods and supplements? Who consumes these foods/supplements?
6. What are the current consumption patterns by food categories (i.e., foods as consumed) by the population?
7. What are the top foods contributing to energy intake by the population? (i.e. main dietary sources)
8. What are the top foods contributing to fat and protein intake by the population? (i.e. main dietary sources)
9. What are the top foods contributing to iron intake by the population? (i.e. main dietary sources)
10. What are the top foods contributing to vitamin A intake by the population? (i.e. main dietary sources)
11. What are the top foods contributing to sodium, saturated fat, and added sugars intake by the population? (i.e. main dietary sources)

Dietary patterns

12. How diets in Sri Lanka have changed in the last 10-20 years?
13. What are the trends of changing pattern of dietary consumption?
14. Are there any desirable traditional or other current food patterns and practices that could be reinforced?

Part (B) Food sustainability, availability, access, and safety

Food sustainability and availability

15. What is the overall production/availability of different foods -how much is used for people (versus animals), imported/exported?
16. How does household's own food production contribute to household diets?

17. How do food exchanges contribute to household diets?
18. How does seasonality affect household food availability?
19. What wild/underutilized foods are available? Who consumes them and when?

Access to foods

20. How do market prices/availability or market access affect household food availability?
21. What ready-to-consume products are commonly consumed? (See if these can be classified according to processed vs. ultra-processed foods*)
22. What sort of labelling do packaged foods carry? e.g. nutrition facts; ingredient lists; nutrient content and nutrient function claims; front of pack rating systems, - Consumer Price Index - Cost-of-the-diet surveys etc. (Report on what types of labelling for which foods.) Is there any legislation on this?
23. Are there any trade agreements that particularly affect the food availability in the country? Which foods or food-related goods/services are involved?
24. What are the main foods that are a) imported, b) exported?

Food safety

25. What are the main food safety related public health issues in the country? (e.g. animal borne diseases, other foodborne diseases, chemicals (naturally occurring toxins like mycotoxins; persistent organic pollutants like dioxins; heavy metals), drugs/hormones, pesticides, additives, unsafe water source etc. What are the main foods affected?
26. What expert recommendations are found in the literature regarding the above topics?

2.3 Food consumption, dietary diversity and nutrient intake

Food consumption should be measured in terms of quantity, proportionality, frequency and diversity at food group level as well as varieties of food consumed within the food group. These dimensions when measured against variables such as changing times, situation in life course, gender, age, ethnicity, geography and others provide answers to dietary patterns.

In Sri Lanka no statistically significant studies at national level have been done on the above. A dietary intake study would have contributed answers to most of the questions in this section regarding the type of food consumed and contributions to nutrient intake. The few available studies cover very small numbers, are fairly ad hoc when considering frequency and regularity. The recommended number of servings from each food category has been presented in the previous food based dietary guidelines for Sri Lankans. The recommended dietary allowances for Sri Lankans has been published by the Nutrition Department of the Medical Research Institute of Sri Lanka (Table 2. 1).

This review focused on food consumption, energy and specific nutrient intake by the Sri Lankan population with the available published studies. The impact of gender, ethnicity and culture, age/stage in life course, socio economic status, settings and environment on food and nutrient intake and food behavior pattern was reviewed.

The variation of current dietary patterns and intakes of food and food components (including nutrients) in the country with: a) age/physiological status: e.g. infants, young children, adolescent girls, pregnant/lactating women, the elderly b) gender c) socio-economic status, d) rural vs urban areas e) different regions f) ethnic groups/culturally and linguistically diverse groups ?

Conclusion

Current Sri Lankan dietary patterns and intakes of foods and nutrients are highly varied among age groups, genders, different sectors and are influenced by the socio economic factors. Adults receive proportionately 10 % more energy from carbohydrates exceeding recommended level of energy which is 60% from carbohydrates as cited in the latest Indian FBDGs. There are gaps in the consumption of protein, fruits and vegetables. Sri Lankans receive only 11% energy from protein, whereas it should be 20%. Fruit and vegetable consumption is much less than the recommended 400g/day. Variety of food in the diet is not adequate. There is a paucity of information on the dietary intake of the elderly and adolescents which are statistically significant

Findings/Evidence

The intake of macronutrients of Sri Lankans was reviewed using published studies and reports. Data published from a national dietary survey for Sri Lankan population is not available. Further published information on dietary patterns of Sri Lankan population at national level for different sectors and age groups are not available.

Table 2.1 Recommended Dietary allowance by MRI 2007

Recommended Dietary Allowances for Sri Lankans - 2007
 Department of Nutrition, Medical Research Institute, Colombo

Group	Age	Body weight kg	Energy kcal	Protein g	Calcium mg	Iron mg	Zinc mg	Selenium µg	Magnesium mg	Folate µg	Vitamin A IU	Vitamin K1 µg	Vitamin K2 µg	Biotin µg	Vitamin C mg	Vitamin E mg	Niacin mg	Thiamin mg	Riboflavin mg	Pan B12 µg	Cholesterol mg	Fiber g	Water l
Infants	0 - 6 Months	6.4	560	21	300	3	6	26	100	375	0.2	0.3	2	0.1	0.4	1.7	5	80	5	80	5	25	5
	7 - 9 "	8.3	650	19	450	4	10	54	125	400	0.3	0.4	4	0.3	0.5	1.8	6	80	10	30	10	30	10
	10-12 "	9.1	720	20	450	4	10	54	140	400	0.3	0.4	4	0.3	0.5	1.8	6	80	10	30	10	30	10
Children	1 - 2 Years	10.8	875	21	500	4	17	60	65	400	0.5	0.5	6	0.5	0.9	2	8	160	15	30	15	30	15
	2 - 4 "	14.1	1075	26	500	12	4	17	60	85	0.5	0.5	6	0.5	0.9	2	8	160	15	30	15	30	15
	4 - 6 "	17.5	1300	29	560	12	5	22	76	105	0.6	0.6	8	0.6	1.2	3	12	200	20	30	20	30	20
Young children & adolescents	6 - 9 Years	25.5	1775	36	700	16	6	21	100	100	0.9	0.9	12	1	1.8	4	20	300	25	35	25	35	25
	10 - 11 "	35.4	2250	48	1000	23	9	32	230	140	1.2	1.3	16	1.3	2.4	5	25	400	35	40	35	40	35
	12 - 15 "	50.8	2875	69	1000	30	9	32	230	100	1.2	1.3	16	1.3	2.4	5	25	400	35	40	35	40	35
	16 - 18 "	65.6	3375	85	1000	39	9	32	230	130	1.2	1.3	16	1.3	2.4	5	25	400	35	40	35	40	35
Female c	6 - 9 Years	25.2	1725	34	700	16	6	21	100	100	0.9	0.9	12	1	1.8	4	20	300	25	35	25	35	25
	10 - 11 "	36.9	2100	50	1000	22	7	26	230	150	1.1	1	16	1.2	2.4	5	25	400	35	40	35	40	35
	12 - 15 "	49.8	2400	65	1000	36(26)	7	26	230	100	1.1	1	16	1.2	2.4	5	25	400	35	40	35	40	35
Adults	16 - 18 "	56.6	2500	69	1000	39	7	26	230	110	1.1	1	16	1.2	2.4	5	25	400	35	40	35	40	35
	18 - 29.9	60	2425	57	750	22	7	34	260	120	1.2	1.3	16	1.5	2.4	5	30	400	35	40	35	40	35
	30 - 59.9	60	2375	57	750	22	7	34	260	120	1.2	1.3	16	1.5	2.4	5	30	400	35	40	35	40	35
About 60	Sedentary Moderate	29.25	57	750	22	7	34	260	120	1.2	1.3	16	1.5	2.4	5	30	400	35	40	35	40	35	
	Sedentary Moderate Heavy	33.75	57	750	22	7	34	260	120	1.2	1.3	16	1.5	2.4	5	30	400	35	40	35	40	35	
	Sedentary Moderate Heavy	33.75	57	750	22	7	34	260	120	1.2	1.3	16	1.5	2.4	5	30	400	35	40	35	40	35	
Female c	About 60	Sedentary Moderate	19.50	57	800	22	7	33	224	120	1.2	1.3	16	1.9	2.4	5	30	400	35	40	35	40	35
	Sedentary Moderate	23.50	57	800	22	7	33	224	120	1.2	1.3	16	1.9	2.4	5	30	400	35	40	35	40	35	
	Sedentary Moderate Heavy	27.50	57	800	22	7	33	224	120	1.2	1.3	16	1.9	2.4	5	30	400	35	40	35	40	35	
Pregnancy and lactation	18 - 29.9	65	2000	52	750	33	5	26	230	110	1.1	1	14	1.3	2.4	5	30	400	35	40	35	40	35
	30 - 59.9	65	2375	52	750	33	5	26	230	110	1.1	1	14	1.3	2.4	5	30	400	35	40	35	40	35
	About 60	65	2750	52	750	33	5	26	230	110	1.1	1	14	1.3	2.4	5	30	400	35	40	35	40	35
Lactating	1-6 months	65	1825	52	800	20	5	25	190	110	1.1	1	14	1.7	2.4	5	30	400	35	40	35	40	35
	6 months one-year	65	2125	52	800	20	5	25	190	110	1.1	1	14	1.7	2.4	5	30	400	35	40	35	40	35
	1-6 months	65	2350	7	750	33	7	28	230	250	1.4	1.4	18	1.9	2.6	6	30	600	55	55	55	55	
Lactating	1-6 months	65	4475	13	800	33	10	30	230	250	1.4	1.4	18	1.9	2.6	6	30	600	55	55	55	55	
	6 months one-year	65	4675	20	750	33	9	26	270	250	1.5	1.5	17	2	2.8	7	35	500	55	55	55	55	
	6 months one-year	65	4450	14	750	33	7	42	270	250	1.5	1.5	17	2	2.8	7	35	500	55	55	55	55	

Body weight of mid-pregnant female (WHO 2006 up to 5 years and WHO 1983 for others)
 Energy requirements based on FAO/WHO/UNU 2001. Energy requirements for adolescents based on moderate physical activity
 Protein requirements based on FAO/WHO/UNU 2001. Energy requirements for adolescents based on moderate physical activity
 Iron requirements based on Proceedings of International Dietary Energy Consultative Group (WHO/BCR) 1994
 Vitamin and mineral requirements based on FAO/WHO 2001. Folate requirement based on ILO 2000
 Iron requirements estimated based on different dietary iron absorption levels: 5% for adult men, children and adolescent boys; 8% for adolescent girls, adults and lactating women (size based on 0)
 ILL recommended folic acid supplement in tablet form. To be given to all pregnant women (100 mg folic acid daily requirement) given
 Iron requirements given in parentheses are for non-menstruating girls and women

- Sri Lankan men consume higher energy than that of women by about 350 kcals. Compared to urban and rural dwellers, estate workers receive least daily energy from their diet. Sri Lankan adults consume proportionally more carbohydrates (>71% of energy) and less fat (<19% of energy) and proteins (<11%) compared to those in other Asian countries (Jayawardane et al., 2014).
- Rice, wheat flour and bread are highly consumed food items in Sri Lanka (House Hold Income and Expenditure Survey (HIES), 2016). Households in rural sector showed the highest consumption of *Kekulu* rice (red and white) whereas those of urban sector consume the lowest.
- The highest consumption of Nadu rice (white) was reported from estate sector (18.5 kg) whereas the lowest consumption of nadu was from the urban sector (6.5 kg). High percentage per capita consumption of wheat flour is recorded among the estate communities (Jayathissa et al., 2014)
- The most popular types of rice in the North Central and North-Western Provinces, were parboiled and raw white.
- The average monthly household consumption of bread was 3.6 kg. Households in urban sector consumed large quantity of bread which was reported as 5.3 kg per month per household (HIES, 2016).
- Rural low income communities commonly used parboiled and long grain rice (Table 2.2).

Table 2.2 Cereal consumption

Area/setting	Consumption of rice/kg/yr	Consumption of wheat flour/kg/year	Bread kg/month
General	114.7	40.4	3.6
Rice consumption			
Paddy and Chena cultivations	128.4 - 167.1	Not given in the evidence	Not given in the evidence
Estate	111.1		
Urban			5.3

- Fiber intake of Sri Lankans is not adequate (Jayawardane et al., 2014).
- The lowest per capita fruit consumption is recorded among the urban shanty dwellers and they also show a significantly low vegetable consumption (Jayathissa et al, 2014).
- Coconut consumption among the urban shanty dwellers has been very high (Jayathissa et al., 2014).

2.4 Food consumption behavior

- Different regions and communities in the country report varying food consumption behaviors and diets are specific to the location. Food consumption pattern is different in urban shanties compared to other areas. Rice and bread, rice and gram, rice and string hoppers, rice and roti, rice and green gram or cowpea are popular among them (Jayathissa et al., 2014).
- A high percentage of Sinhalese households consumed rice for main three meals, whereas estate Tamils outside of estates and Moor communities consumed rice only for two main meals, namely lunch and dinner. A high percentage of households of estate Tamils, Moors and few urban shanties consumed rice for breakfast.
- The rice intake reduced during last 30 years in Sri Lanka (State of Economics, 2013). Household rice consumption has reduced from 46.7 to 36.3 kg from 1980/81 to 2009/10.
- Meat, fish and egg consumption has increased. This shows that the quantity of carbohydrate intake (including rice, wheat flour and bread) is reducing, while protein intake has increased slightly through the consumption of fish, meat, and eggs. The

urban sector consumed a smaller quantity of staple foods, such as rice, and a larger quantity of non-staple foods, such as meat, fish, and milk, compared to rural and estate sectors (State of Economics, 2013)

2.5 Young child feeding

- Among infants under age 6 months, overall 82% were exclusively breastfed for some period, while only 64% of those aged 4-5 months were exclusively breastfed for the total 5 months. Overall in the infant population, 62% of children aged 6-23 months met the minimum standard with respect to all three Infant and Young Child Feeding practices (SLDHS, 2016).
- Ninety eight percent of all children aged 6-23 months received breast milk or other milk or milk products during the 24-hour period before the interview and 86 percent were fed the minimum number of times in the preceding 24 hours.
- The most common problem with complementary feeding practices was inadequate number of food groups. Only 73% of children aged 6-23 months received foods from the minimum number of food groups for their age (SLDHS, 2016)
- Among children aged 24-59 months, 61% of children consumed food rich in iron and a higher percentage was observed in urban sector than in the rural or estate sectors. (70, 59 and 49%, respectively). The highest percentages of children aged 24-59 months who consumed food rich in iron are observed among older mothers (62 %), the richest household (74%) and mothers with the highest educational level (69 %).
- Ninety two percent of children aged 6-23 months consumed foods rich in vitamin A. The consumption of foods rich in vitamin A increases with wealth quintile.
- Three in five children (59 %) consumed food rich in iron. A higher percentage of children in urban areas consume food rich in iron than those in the rural or estates sector (69, 58 and 45%, respectively).
- The consumption of animal protein (other than dairy) increases with the level of education of the mother and wealth of the household. In the estate sector, the consumption of all protein sources such as milk, meat/fish/poultry/ eggs, legumes and cheese/ yogurt is lower than in urban and rural areas (SLDHS, 2016).

2.6 Maternal food intake

- Sugary foods and foods made with oil/fat/butter are most commonly consumed by the mothers in urban sector rather than rural or estate sector mothers.
- Mothers in the lowest wealth quintile have less variety in their diets than those in the highest wealth quintile, a diet that is particularly deficient in cheese/yogurt.
- The consumption of cheese/yogurt in the highest wealth quintile mothers is approximately 3 times of that of the lowest wealth quintile. The lowest percentage of milk consumption was seen in the estate communities.

Question 2. Which foods and nutrients are lacking or too much in the diet? Of these, which present a substantial public health concern?

Conclusion

Fruit and vegetable intake is very low. Vitamin A, iron, folate and vitamin B₁₂ intakes were well below the recommendations. Foods from animal sources/protein consumption is relatively low. Dairy products are under consumed. Starch, added sugar and sodium consumption is higher than the recommendation.

Evidence

- Children aged 6-23 months consume high quantities of foods made from grains (88%) and fruits and vegetables rich in vitamin A (86%). However, the consumption of food belonging to the food groups of legumes and nuts (66%), roots and tubers (58%), and meat, fish, poultry and eggs (58%) is relatively low. It was reported that consumption of sugary foods which was 34% (SLDHS, 2016) among children under the age of 3 years decreased by 27% during last 10 years.
- The consumption of food made with oil, fat and butter increased from 34% (SLDHS, 2006/07) to 42% (SLDHS, 2016 excluding Northern Province) during 2006 to 2016.
- Eighty-eight percent of mothers had eaten vitamin A rich food, and 62% had animal protein (other than dairy). Sixty-nine percent of women had legumes or legume –based food (SLDHS, 2016)

- The daily intake of fruit, and vegetable were well below national recommendations. Only 3.5% of adults consumed the recommended 5 portions of fruits and vegetables/day. Consumption of fruits among Sri Lankans is relatively low than in other developing countries and far below the level of recommendation (MRI) (Rambukwella and Samantha, 2013). Inadequate fruit consumption was common in all the income categories in selected districts in the Western Province. Limited availability of fresh and tasty fruits due to using chemicals to ripen them, high price, and seasonality were the major challenges for low consumption of fresh fruits. Family income and number of family members are major deterrents of monthly consumption of fresh fruits (Rambukwella and Samantha, 2013)
- Over a third of the population did not consume dairy products and less than 1% of adults consumed at least 2 portions/day.
- Sri Lankan adults consumed over 14 portions of starch and 3.5 portions of added sugars daily.
- Almost 70% of the participants studied exceeded the upper limit of the recommendations for starch intake (Jayawardena et al., 2012). According to food balance sheets, people consume adequate servings of cereal.
- Only 76.4%, 75.5% and 46.6% of children aged between 6-23 months in the urban, rural and estate sector, respectively met the minimum dietary diversity.
- The sodium consumption exceeds the recommendation (Jayawardane et al., 2014).

Question 3. Are there any studies showing how current diets in the country vary from recommended diets? What are adequacy proportions of the population meet international dietary recommendations? What are the findings?

Conclusion

Current dietary intakes are highly varied from the recommendations. Fruit and vegetable are under consumed whereas sugar and starch are over consumed.

Evidence

- Per capita fruit and vegetable supplies in Sri Lanka were approximately 100g and 127g per capita per day, respectively (2013). From 1961 to 2013, Sri Lankans have never met the WHO recommended minimum intake of 400g of fruits and vegetables per day, except for the year 1980.
- According to the food balance sheets, consumption of both pulses and nuts have increased over reference period. Therefore the gap between consumption and the WHO recommended level (30g per capita per day) has been narrowing over the years.
- As a percentage, energy intake from sugar was 2.3% of the total energy intake in 1961 and the proportion has increased to 10.5% in 2013. With this 4.5 times increase, per capita intake of sugar has surpassed the WHO recommend level (below 10% of energy intake from sugar) (Weerahaewa et al., 2018)

Question 4. Which foods are commonly fortified? What are the consumption patterns and quantities consumed of these foods?

Question 5. Which micronutrients are obtained from consumption of fortified foods and supplements? Who consumes these foods/supplements?

Conclusion

Published work on commonly fortified foods and their consumption pattern are limited. Available information show that vitamin A, iron and iodine are micronutrients obtained through fortified foods. Young children, school children and pregnant mothers are targeted consumers. Due to the voluntary fortification of foods and their consumption vitamin A intake can be reached to a risk level. Limited evidences show insufficiency of vitamin D and zinc deficiency among school children.

Evidence

Questions 4 and 5 were answered together. Policy guidelines for fortification of food in Sri Lanka is available (Ministry of Healthcare and Nutrition , 2008). Published review based on analysis of data from two national micronutrient surveys (National Nutrition and Micronutrient Survey 2012 (NNMS) and the National Iodine Survey 2016 (NIS) market surveys, and key informant interviews and several other published reports shows that high-dose

supplementation, supplementary foods, and food fortification initiatives are strategies used to address micronutrient deficiencies (Jayathissa and Fernando, 2019). Major micronutrients provided through the said initiatives in Sri Lanka include vitamin A, iron and iodine.

- Supplementation programs are aimed at iron and vitamin A deficiencies of infants and young children (6-59 months). The beneficiaries of iron supplementation programs at the national level are pregnant women, young children aged 6–59 months, and school children.
- Multivitamin formulae are prescribed to young children aged 6–59 months at the individual level (Jayathissa and Fernando, 2019).
- A high dose of vitamin A (100,000 IU) is given through supplementation for children <5 years of age commencing at 6 months and continuing every 6 months up to 5 years. School children are given a single dose at grades 1, 4, and 7, and women are given a single dose of 200,000 IU within 2 weeks after the delivery.
- Point –of –use fortification is done through multiple micronutrient powder (MNP) for children 6–23 months of age. A daily dose of a sachet containing 15 vitamins and minerals is given starting from 6 months of age for 60 consecutive days. This is repeated at the age of 12 and 18 months.
- Thriposha, precooked cereal product is the fortified supplementary food used in Sri Lanka with 15 added vitamins and minerals targeting underweight children 6–59 months of age. A daily ration of 50 g of dry product provide two-thirds of the recommended daily allowance of vitamin A and iron for children 1–5 years.
- Mandatory salt fortification with iodide at a level of 15 ppm is aimed at the total population to increase the intake of iodine.
- Published data is not available about the food items, and substances used for voluntarily fortification. Results of a market survey indicated that margarine, powdered milk, cereals, and biscuits are fortified with vitamin A, iron, and iodine and are consumed by children aged 6–59 months (Jayathissa and Fernando, 2019).
- One published study identifies a high prevalence of zinc deficiency and to a lesser degree prevalence of vitamin A deficiency and vitamin D insufficiency, either individually or concomitantly among urban preschool children in Sri Lanka (Marasinghe et al.,2015).

Question 6. What are the current consumption patterns by food categories (i.e., foods as consumed) by the population?

Conclusion

Per capita supply of all food categories has increased in recent years indicating similar consumption trends.

Evidence

To determine the current consumption pattern by food categories by the Sri Lankan population data analysis was done using Food balance sheets from 1961 to 2017 (Sitisekera & Silva, 2019, unpublished). Data are analyzed as per capita supply of each food group.

Figure 2.1 shows the per capita supply of cereals of the Sri Lankan population. Per capita consumption of cereals has increased over the years.

Figure 2.2 shows per capita supply of starchy roots. Over the years per capita consumption of starchy roots has decreased but there is an increasing trend for cassava and products and potatoes and products during recent years.

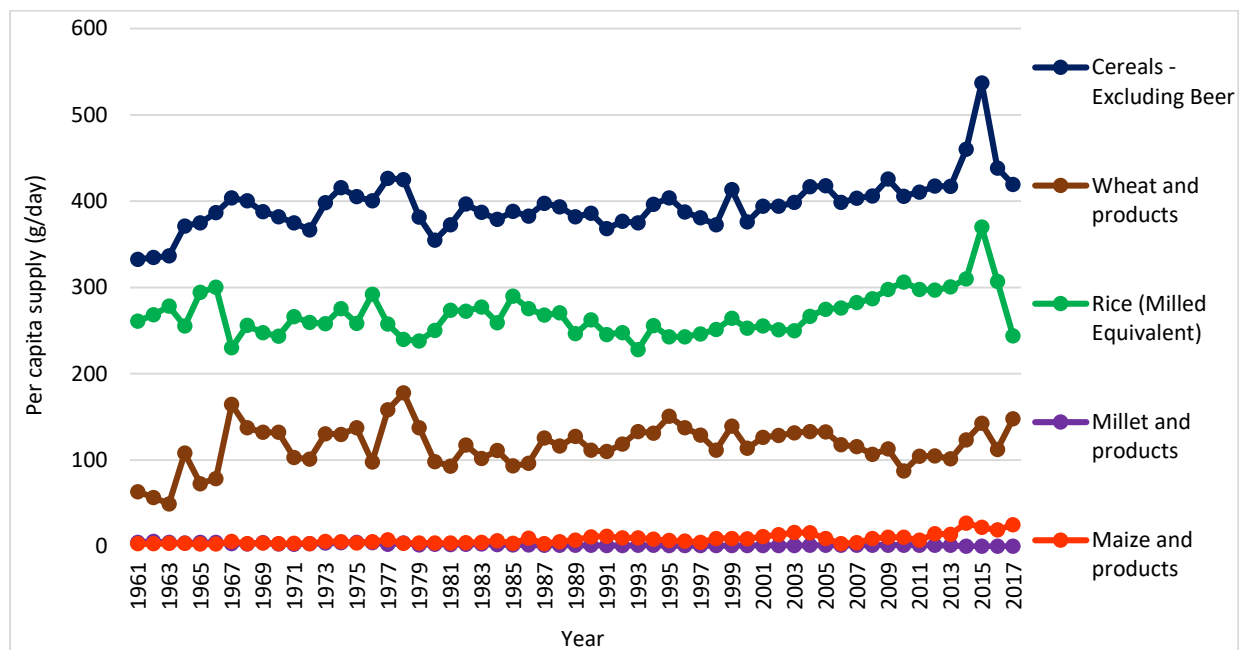


Figure 2.1 - Trends in per capita supply of cereals from 1961 to 2017

Source : Sitisekera and Silva, 2019 (unpublished report)

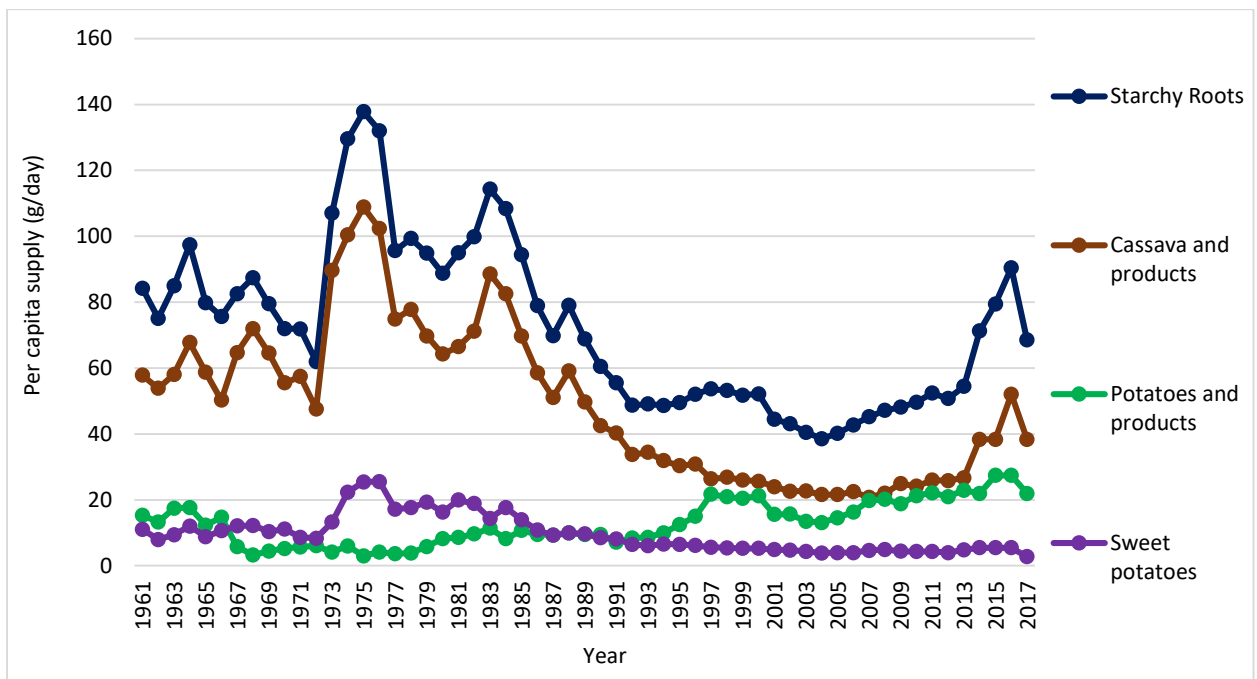


Figure 2.2 - Trends in per capita supply of starchy roots from 1961 to 2017
 Source: Sitisekara and Silva, 2019 (unpublished report)

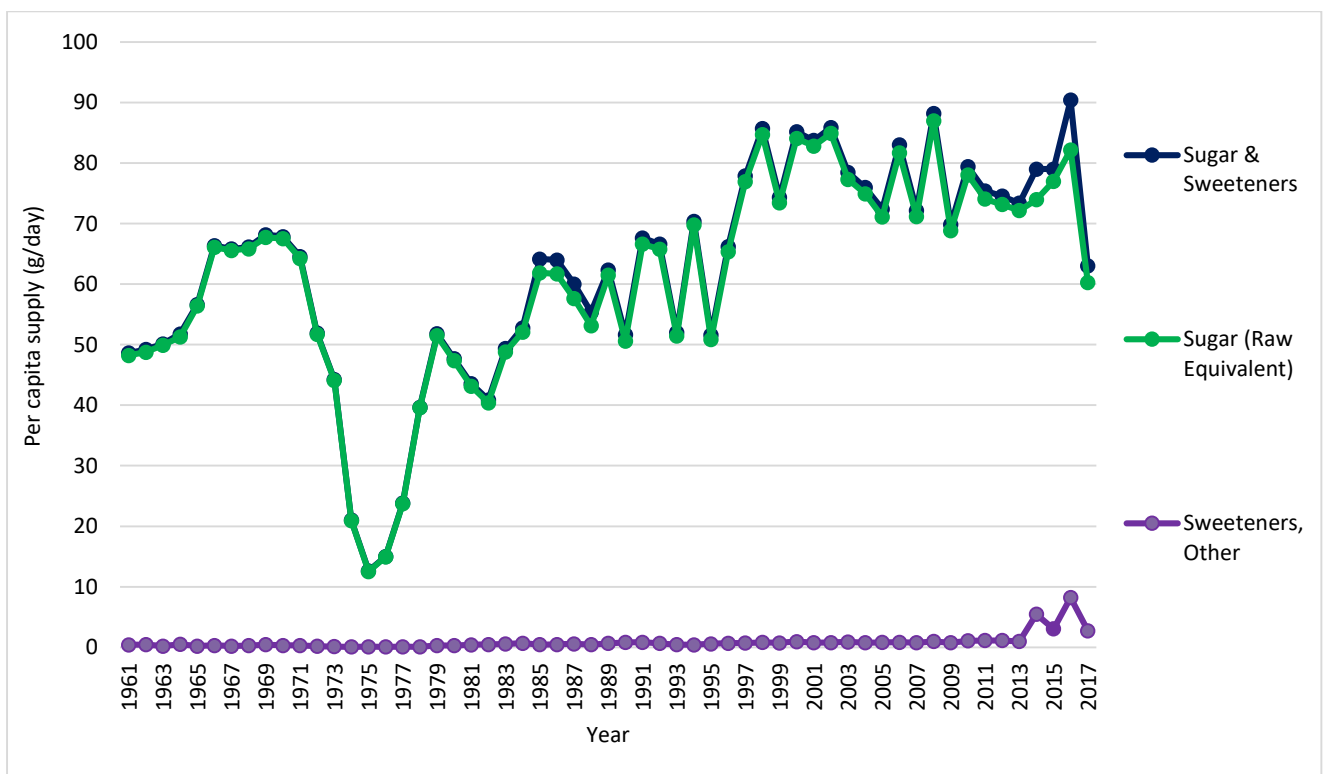


Figure 2.3 - Trends in per capita supply of sugar and sweeteners from 1961 to 2017
 Source : Sitisekara and Silva, 2019 (unpublished report)

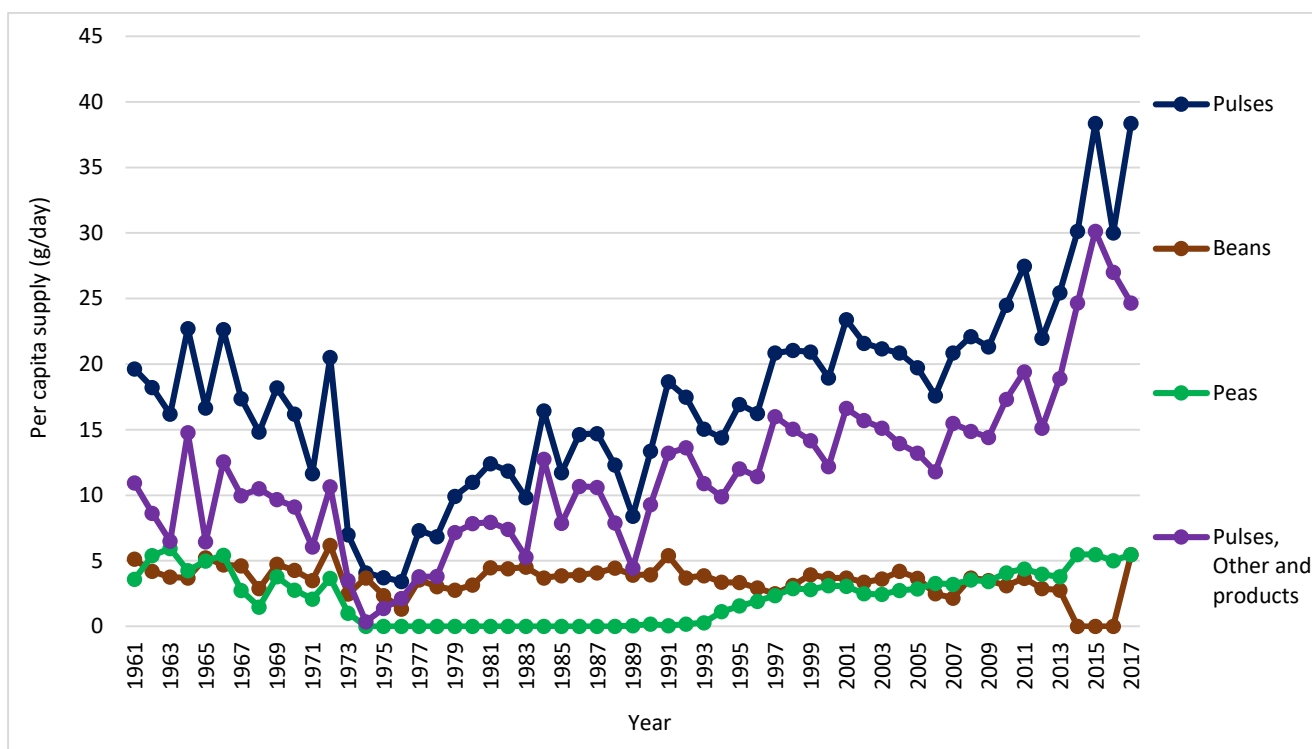


Figure 2.4 - Trends in per capita supply of pulses from 1961 to 2017

Source : Sitisekara and Silva, 2019 (unpublished report)

Figure 2.3 shows the per capita supply of sugar and sweeteners and consumption has increased over the time period considered.

Figure 2.4 shows the per capita supply of pulses which the consumption has increased over the time.

Figure 2.5 shows per capita supply of animal based foods. Except butter and ghee population consumption of milk, meat, fish and eggs has increased.

Figure 2.6 shows the trend of change of per capita supply of fruits and vegetables. During recent years fruit and vegetable consumption seems to be increased.

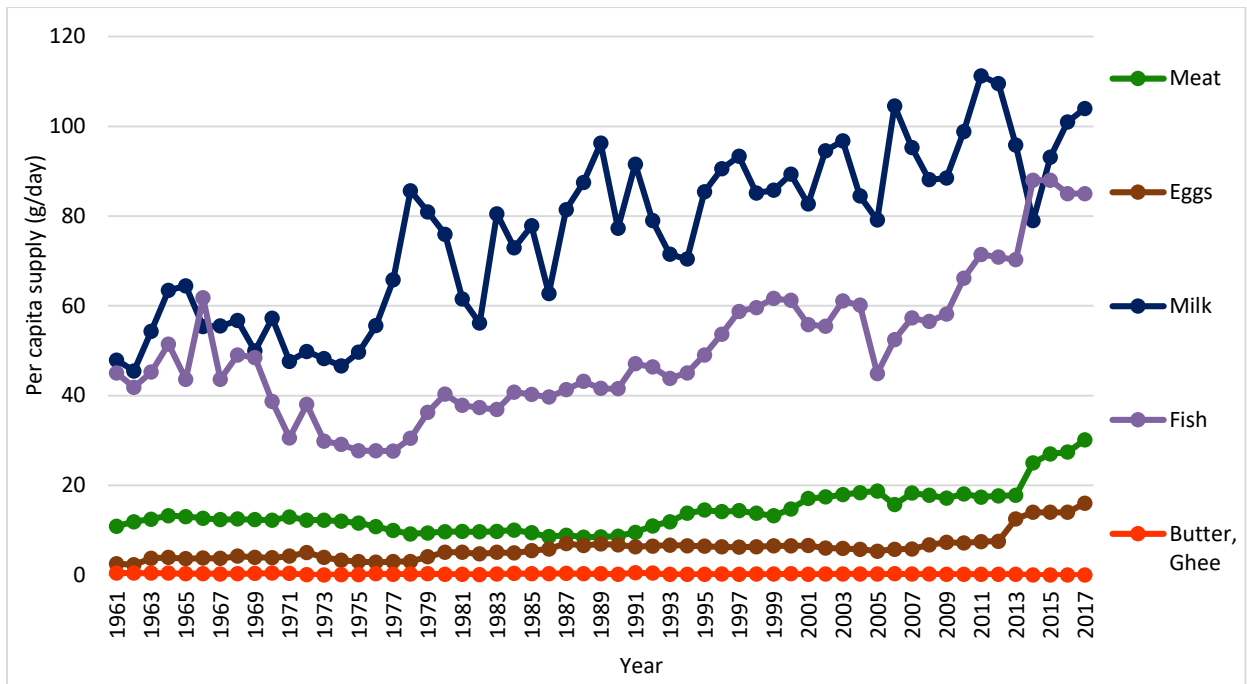


Figure 2.5 - Trends in per capita supply of animal based foods from 1961 to 2017

Source : Sitisekara and Silva, 2019 (unpublished report)

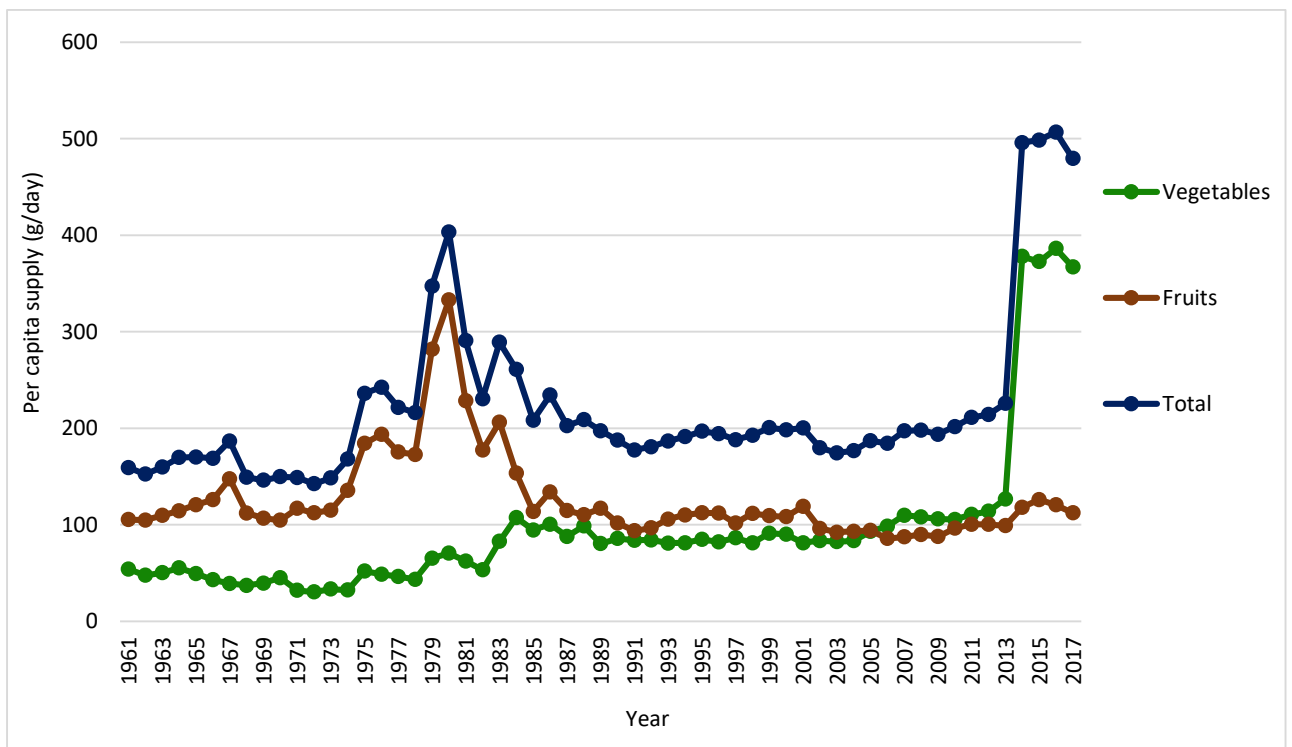


Figure 2. 6 - Trends in per capita supply of fruits and vegetables from 1961 to 2017

Source : Sitisekara and Silva, 2019 (unpublished report)

Question 7. What are the top foods contributing to energy intake by the population?

Data analysis was done using 1000*24hr recalls of (adult women) a dietary consumption survey conducted by the Wayamba University of Sri Lanka (Silva et al., 2019 unpublished data). Limited available published reviews are used for evidence review (Weerahaewa et al., 2018).

Conclusion Cereals rice and wheat in the diet provide energy as the main source.

Evidence

- Foods from cereal group give the highest contribution (923 Kcal per person/ day) to energy intake. High consumption of rice (629.83 g per day /person) and wheat flour products (31.31 g per day /person) could lead to this situation.
- Cereals are the main source of energy in Sri Lanka, accounting for little more than half of the total energy intake in the country.
- The contribution to energy from starchy tuber crops, vegetable oil, oil crops, fruits, spices and animal fat has decreased slightly through the years.
- The contribution of animal food to total energy particularly, has increased from 4.68% to 17.24% during the 1961-2013 periods. Among animal foods, more energy is derived from milk, fish and seafood.

Question 8. What are the top foods contributing to fat and protein intake by the population?

Data analysis was done using 1000*24hr recalls of (adult women) a dietary consumption survey conducted by the Wayamba University of Sri Lanka (Silva et al., 2019 unpublished data). Limited available published reviews are used for evidence review (Jayawardane et al., 2014; Weerahaewa et al., 2018).

Conclusion The main source of protein in Sri Lanka is cereals contributing more than 50%.

Evidence

- Other than the cereal group, pulses (dhal), fish, and meat (chicken) food categories also give some contribution to protein intake but it is very low compared to the cereal group.

Coconut (89.63 g per day per person) milk (67.59 g per day per person) and oil (7.26 g per day per person) give the highest contribution to fat intake.

- The main source of protein in Sri Lanka is cereals. More than half the intake comes from cereals.
- The increase in protein intake is mainly fueled by animal products. During the reference period, contribution from animal food to total protein intake has nearly doubled. Contribution from pulses also has improved marginally.
- With respect to fat supply, the daily per capita in Sri Lanka is mainly derived from oil crops which contribute nearly 56% followed by vegetable oils (18%).
- Plant sources (rice and pulses) are the main contributors of protein among Sri Lankan adults.
- The main lipid source in Sri Lankan diet is coconut milk/oil.

Question 9. What are the top foods contributing to iron intake by the population? (i.e. main dietary sources)

Data analysis was done using 1000*24hr recalls of (adult women) a dietary consumption survey conducted by the Wayamba University of Sri Lanka (Silva et al., 2019 unpublished data).

Conclusion Cereals provide the highest contribution to the iron intake.

Evidence

- The top contribution for the highest iron intake is cereals (2.15 g per day per person) followed by green leafy vegetables (*Gotukola, Mukunuwenna*) and pulses (dhal) food groups. Animal based food items gives relatively lower contribution for iron intake of the population.

Question 10. What are the top foods contributing to vitamin A intake by the population?

Data analysis was done using 1000*24hr recalls of (adult women) a dietary consumption survey conducted by the Wayamba University of Sri Lanka (Silva et al., 2019 unpublished data).

Conclusion The top foods contribute to vitamin A intake are vegetables, fruits, eggs and dried whole milk powder

Evidence

- The highest vitamin A intake comes from vegetables (beans, long beans, ladies fingers) and fruits (banana, papaya, mango, guava) followed by egg and dairy (whole milk dried powder).

Question 11. What are the top foods contributing to sodium, saturated fat, and added sugars intake by the population? (i.e. main dietary sources)

Data analysis was done using 1000*24hr recalls of (adult women) a dietary consumption survey conducted by the Wayamba University of Sri Lanka (Silva et al., 2019 unpublished data).

Conclusion Top contributor to saturated fat intake is coconut. Foods such as biscuits, cakes and soft drinks are top contributors to sugar intake. Top foods contribute to sodium intakes are (will be added).

Evidence

- The top foods contribute to the highest saturated fat intake are coconut (89.63 g per day/ person) milk (67.59 g per day/ person) and oil (7.26 g per day/ person) followed by dairy and oil products.
- The highest added sugar intake is from food items such as (biscuit, cakes, and soft drinks).
- Top foods contribute to sodium intakes are (will be added).

2.4 Dietary patterns

The evidence review was based on published studies (Wijsekera et al., 2009; Weerahewa et al., 2018), data analysis using food balance sheets and reports (Sitisekara and Silva, 2019, unpublished report).

Question 12 . How diets in Sri Lanka have changed in the last 10-20 years?

Question 13. What are the trends of changing pattern of dietary consumption?

Conclusion Per capita availability of all food groups has increased over the years. Availability of fruits, vegetables, milk, meat, fish and eggs are not adequate.

Evidence

Questions 12 and 13 were answered together.

- Per capita availability of pulses, has increased to 25g/day in 2013 compared to 1960 that recorded a consumption of 20g per capita /day which was a slight increase.
- Nut consumption has increased from 1.15g per capita/ day from 1961 to 2.84g per capita /day in 2013.
- Per capita availability of animal-sourced food has improved significantly in Sri Lanka. During the 1961-2013 period, the consumption of egg, fish, meat, and milk products has grown. Per capita fish consumption shows an increase of 45g per day in 1961 to 70g per day in 2013. In addition, per capita daily egg consumption has increased from 2.5g in 1961 to 12g in 2013. Per capita daily meat and milk consumption also risen from 11g to 18g and 48g to 96g, respectively.
- Sugar consumption by an average Sri Lankan has seen a twofold increase within five decades. In 1961 it was reported as 48.21g per capita/ day (178 Kcal/capita/day) and it has risen to 72.14g of sugar per day (266 Kcal/capita/day) in 2013.
- Per capita daily calorie supply trends in Sri Lanka during the 25-year period showed a slight decline in the share of cereals as well as in fruit and roots and tubers.

- There was a trend towards an increased supply of calories per person/ day from food groups such as pulses, and variety of non-grain vegetable products, mainly sugars, oils, vegetables and other food products (i.e. spices, tree nuts and alcoholic beverages).
- The other food group which showed an increasing trend was animal food products, which increased by 2% over the period. Calorie supply from animal food products mainly increased through *fish and milk products, rather than meat or eggs*.
- Per capita food supply trends in Sri Lanka during last 57-year period showed a slight increment in the share of cereals as well as in fruits and tree nuts.
- There was a trend towards an increased per capita supply from food groups such as pulses, and variety of non-grain vegetable products, mainly sugar, vegetable oils and vegetables.
- The other food group which showed an increasing trend was animal food products which increased by more than two fold over the period. It has mainly increased through fish and milk products, rather than meat or eggs.

Question 14. Are there any desirable traditional or other current food patterns and practices that could be reinforced?

Conclusion

The limited published evidence is available for assessing the desirable traditional or other current food patterns and practices that could be reinforced healthy dietary habits

Evidence

Published data is not available

Part (B) Food sustainability, availability, access, and safety

2.5 Food sustainability and availability

Question 15. What is the overall production/availability of different foods -how much is used for people (versus animals), imported/exported?

Conclusion

Based on information provided in Food Balance Sheet 2017, production, imports, exports and food available for consumption for foods, namely cereals, starchy roots, fish meat and eggs, pulses, fats and oils , sugars, fruits and vegetables and milk were analyzed(Figure 2.7 to 2.14).

Evidence

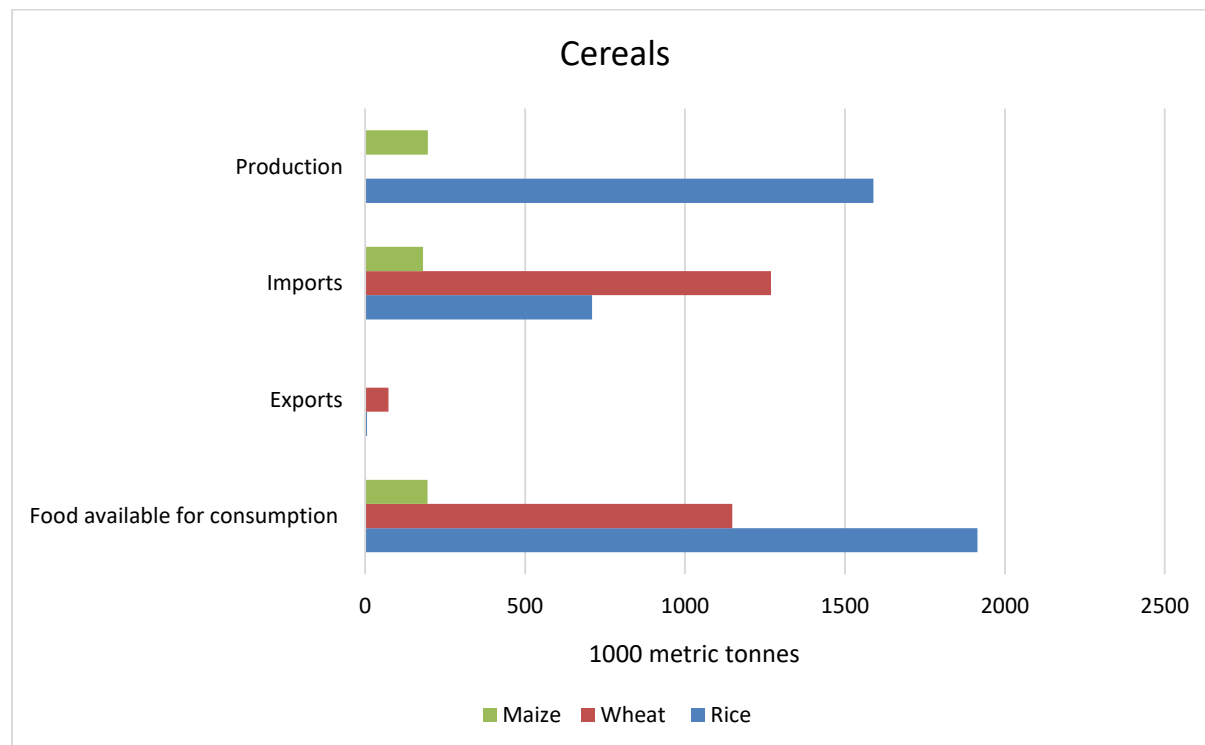


Figure 2.7 Availability of cereals and products

Source: Food balance sheet 2017 (Department of Census & Statistics)

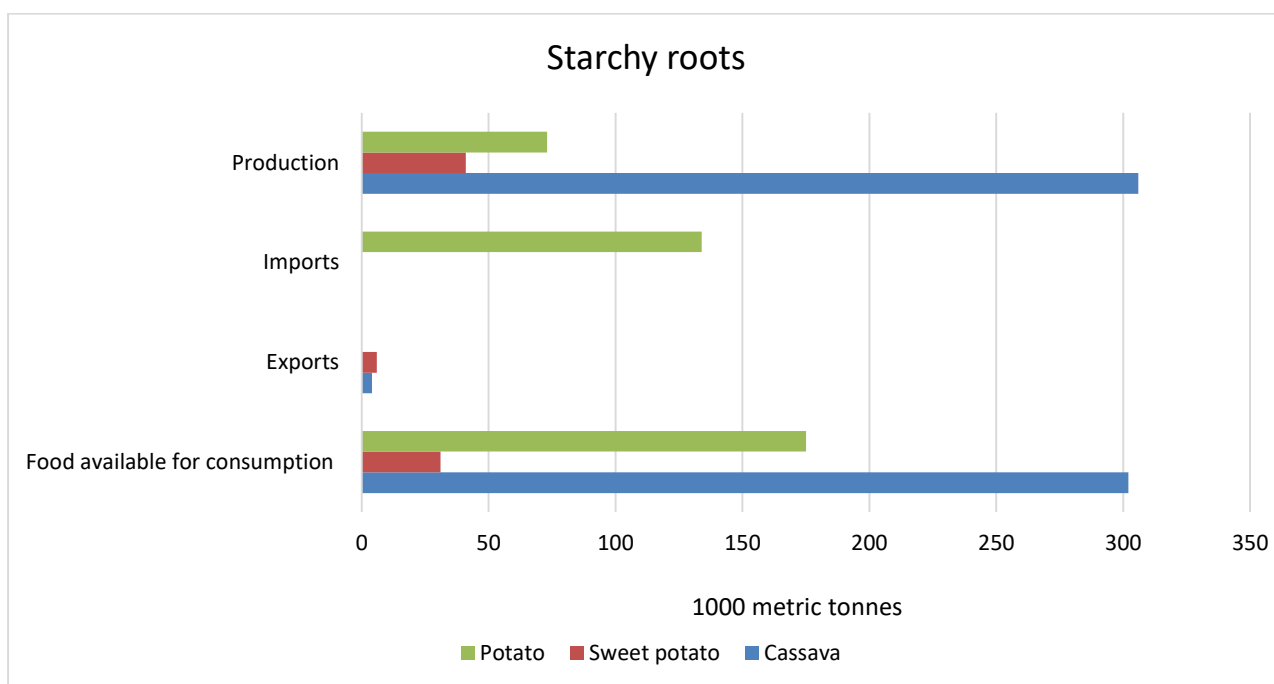


Figure 2.8 Availability of starchy roots

Source: Food balance sheet 2017 (Department of Census & Statistics)

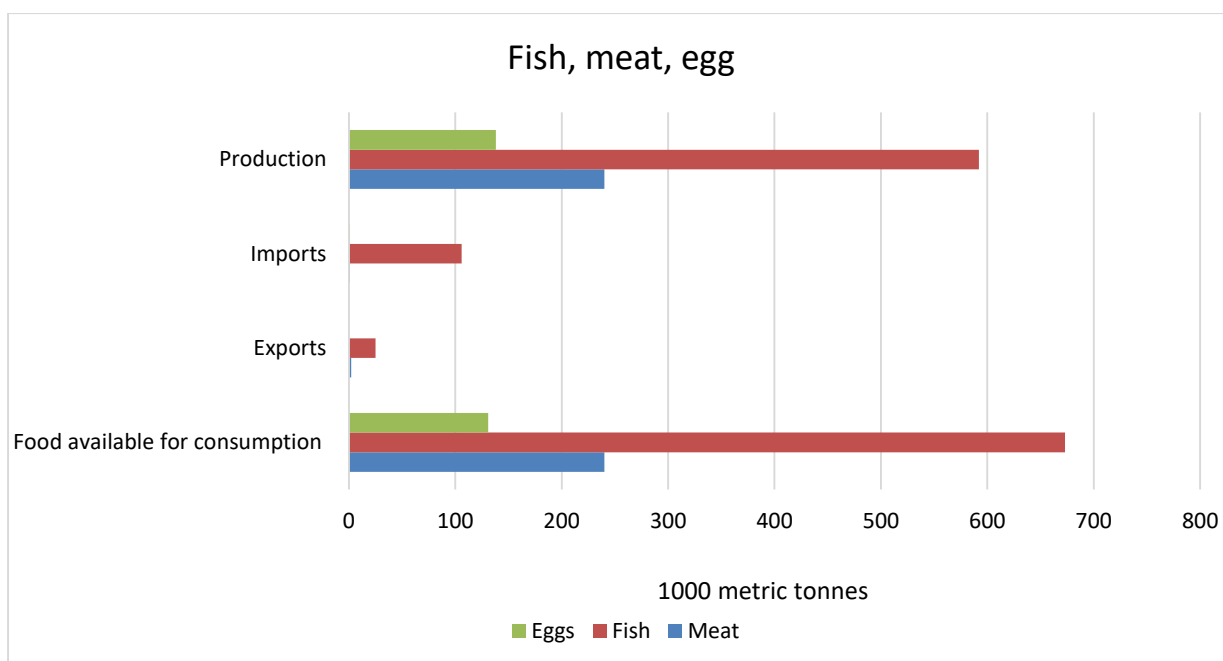


Figure 2.9 Availability of meat, fish and eggs

Source: Food balance sheet 2017 (Department of Census & Statistics)

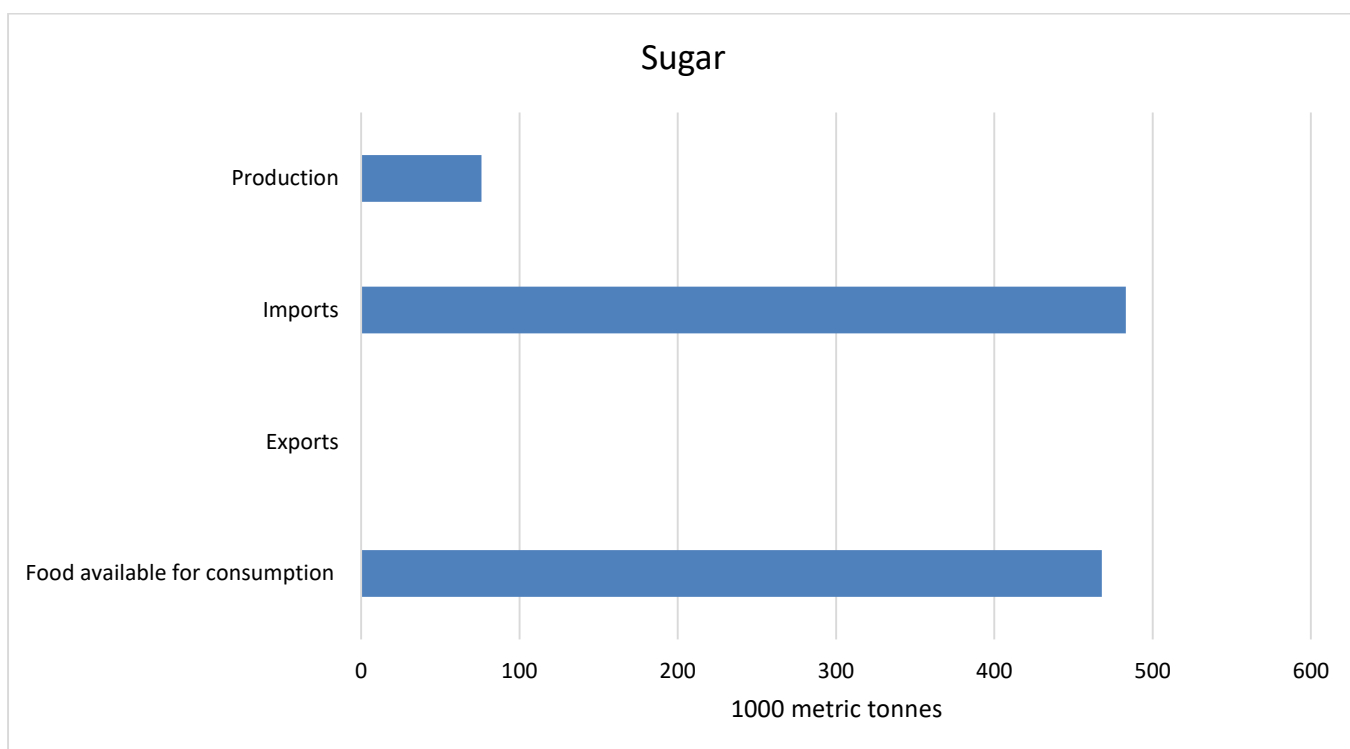


Figure 2.10 Availability of sugar

Source: Food balance sheet 2017 (Department of Census & Statistics)

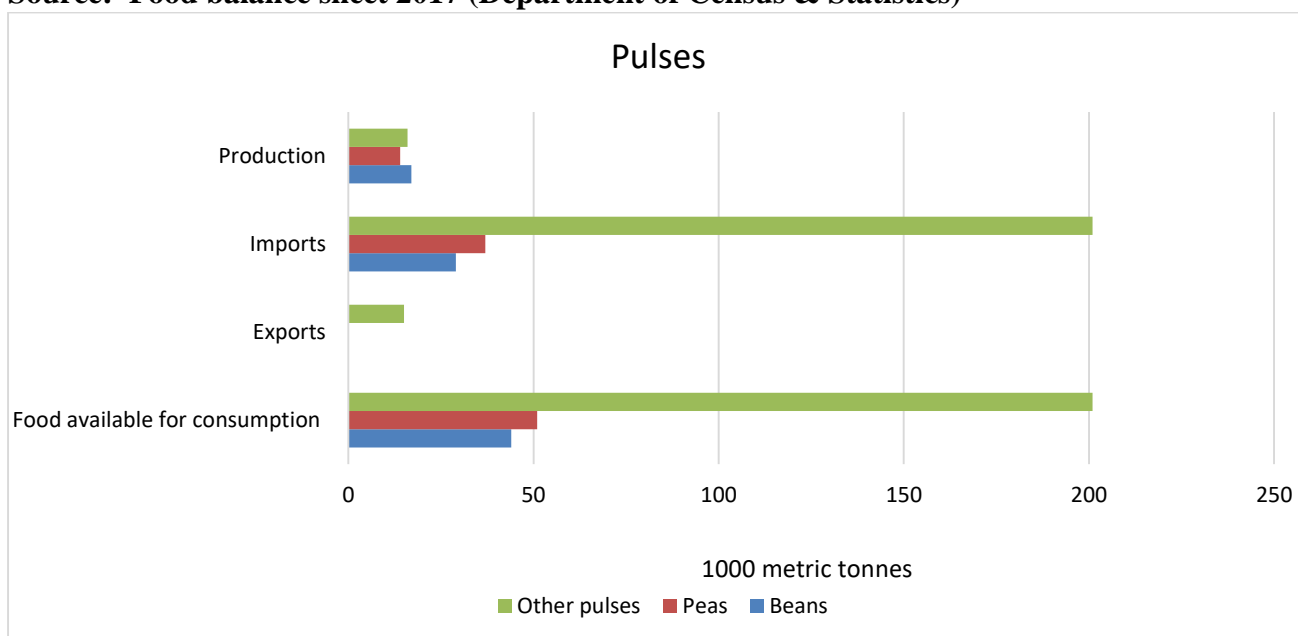


Figure 2.11 Availability of pulses

Source: Food balance sheet 2017 (Department of Census & Statistics)

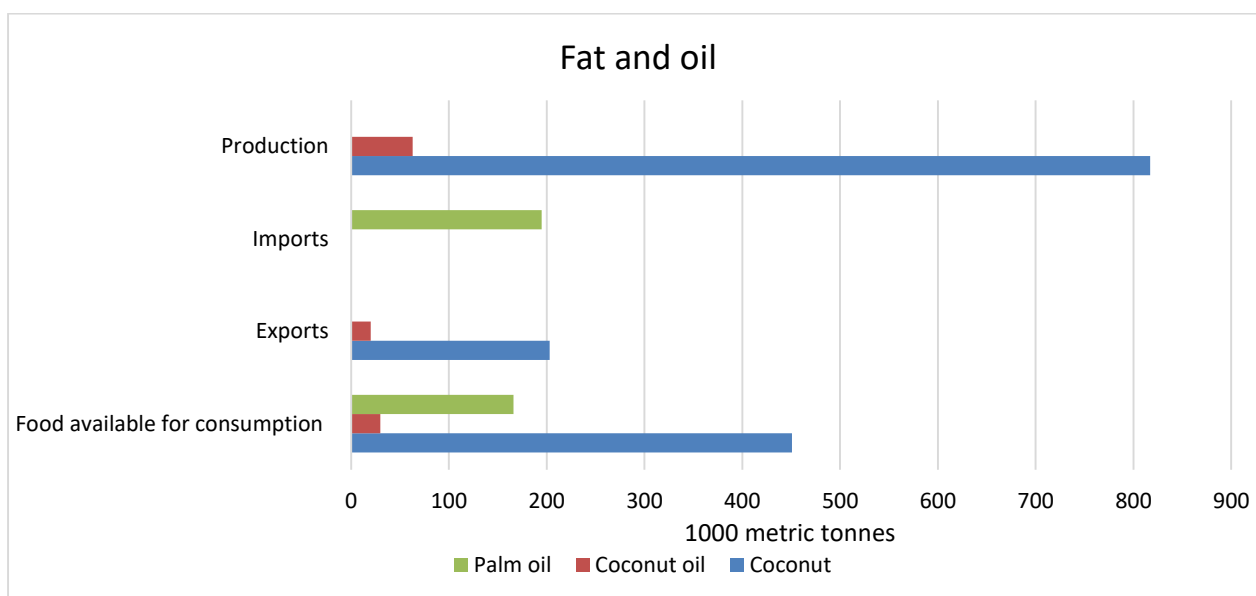


Figure 2.12 Availability of fat and oils

Source: Food balance sheet 2017 (Department of Census & Statistics)

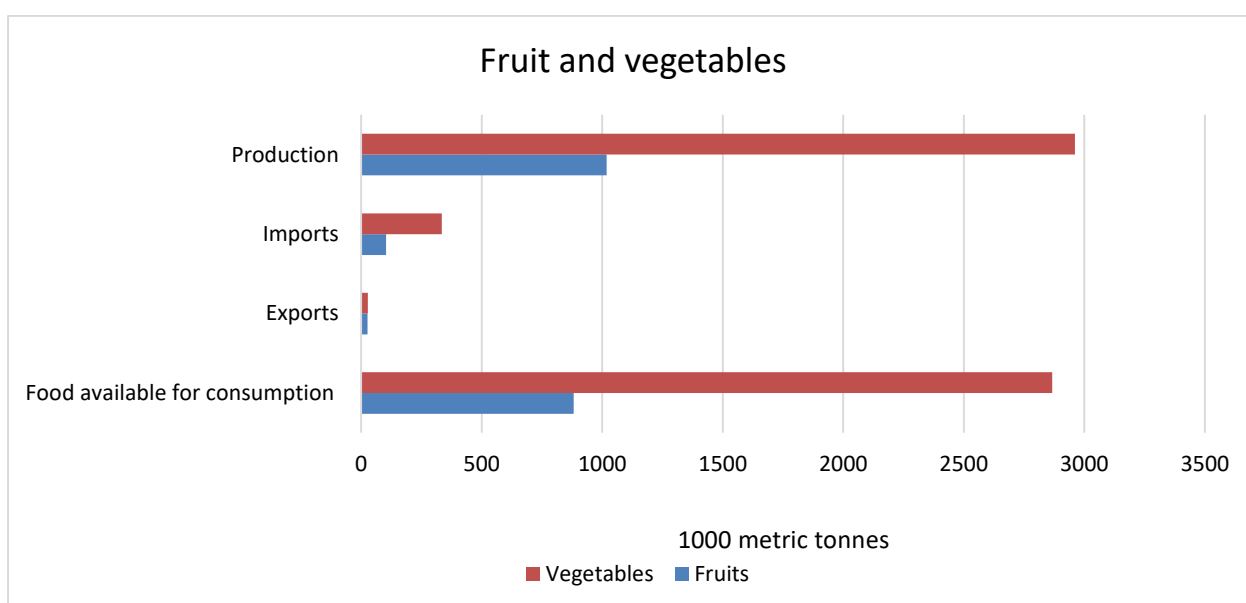


Figure 2.13 Availability of fruits and vegetables

Source: Food balance sheet 2017 (Department of Census & Statistics)

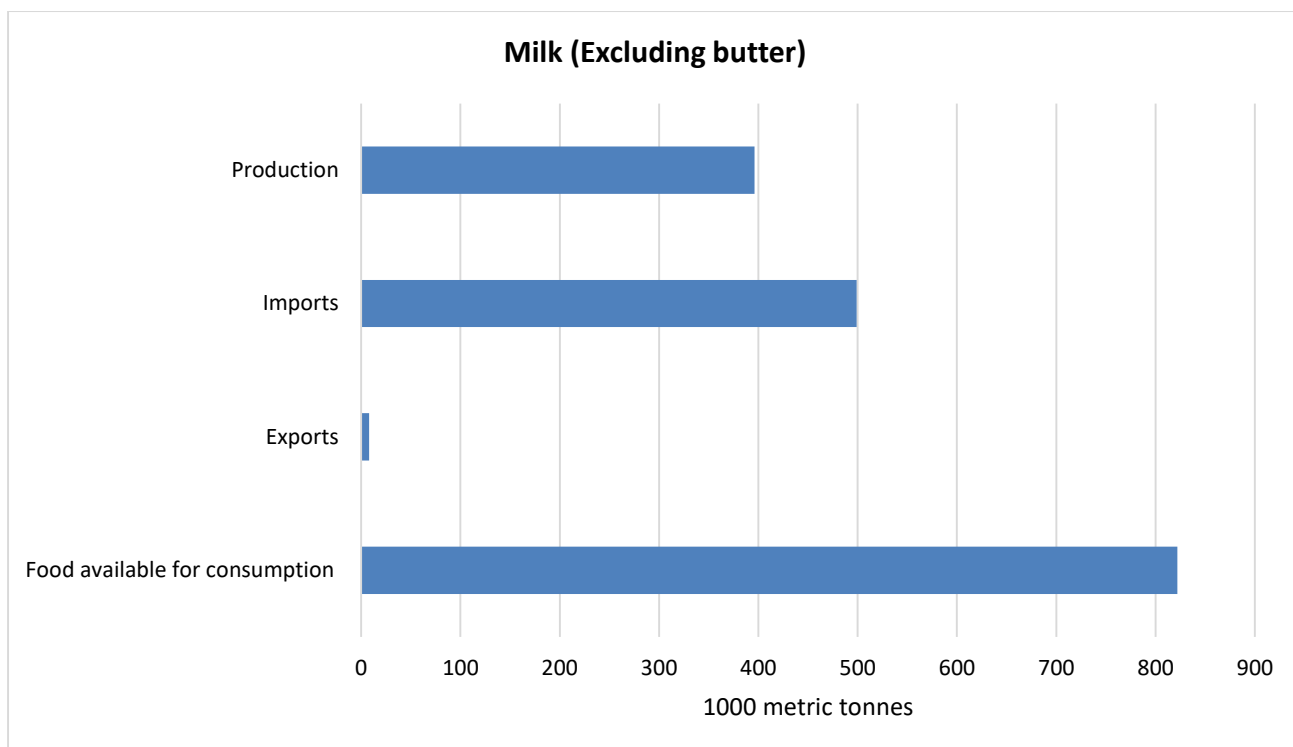


Figure 2.14 Availability of milk

Source: Food balance sheet 2017 (Department of Census & Statistics)

Question 16. How does household’s own food production contribute to household diets?

Conclusion

Households with organized home gardens significantly contribute to the micronutrient intake of family diet.

Evidence

One published article (Thamilini et al, 2019) showed that organized home gardens are helpful to micronutrient intake of family diet.

Question 17. How do food exchanges contribute to household diets?

Conclusion Published data is not available

Evidence Published data is not available for Sri Lanka

Question 18. How does seasonality affect household food availability?

Conclusion Published data is not available

Evidence Published data is not available for Sri Lanka

Question 19. What wild/underutilized foods are available? Who consumes them and when?

Conclusion

Fruits, roots and tubers and vegetables are main food groups lacking in the diet.

Evidence

About 60 underutilised food crops which include fruits, roots and tubers, vegetables have been identified. Due to urbanization and changing food habits significance of these crops at present diminishes. These crops are mainly found in wild or in home gardens in rural areas and many of them are fruit crops and available seasonally (Department of Agriculture, 2008).

Some of these fruits include ;

Citrus aurantium, Syzygium spp, Baccaurea motleyana, Pouteria campechiana Flacourtia inermis Citrus reticulate Citrus grandis Atalantia ceylanica Pometia pinnata Annona reticulate, Dialium spp, Euphoria longana Manilkara zapota Ziziphus mauritiana, Garcinia quaesita, Citrus crenatifolia, Elaeocarpus serratus, Psidium cattleianum, Syzygium cumini, syzygium spp, anona spp. Limonia acidissim, Angle marmelos, Phyllanthus emblica (Department of Agriculture, 2008).

Cereals include *Panicum sumatrense, Paspalum scrobiculatum, Setaria italica and Proso millet, Panicum miliaceum.*

Underutilized Roots and tubers are *Dioscorea alata, D. bulbifera, D. esculenta, D. koyamae, D. oppositifolia, D. pentaphylla, D.spicata, D. tomentosa, D. trimenii, Colocasia esculenta, Alocasia Cucullata, Amorphophallus paeoniifolius, Canna indica*

Vegetables include *Solanum macrocarpon, Solanum torvum, Solanum violaceum, Solanum capsicoides, Coccinia spp, Celosia argentea, Talinum traingulare*

Under utilized legumes are *Macuna pruriens, Phaseolus lunatus, Vigna umbellata, Lablab purpureus, Canavalia gladiata*

In addition there are about 250 wild relatives of crop plants which can be utilized in food production (Department of Agriculture, 2008).

2.6 Access to foods

Question 20. How do market prices/availability or market access affect household food availability?

Published reports and reviews were used to get information on household food availability depending on market prices/availability or market access (Central Bank of Sri Lanka 2013, Weerahawa et al, 2018).

Conclusion

With increasing income share of expenditure on rice has reduced. Expenditure on animal protein sources has increased.

Evidence

- With increase in income, food share of the people has reduced from 60% in 1953 to 32% in 2013.
- Over these years, share of expenditure on rice has declined from 31.5% in 1981 to 13.6% in 2016.
- Household expenditure share on fish has increased from 4.9% in 1981 to 9.1% by 2016, while the share of spending on milk has risen from 3.3% in 1981 to 8.9% in 2016.
- This indicates that our diet has become richer with animal foods when compared to the past.
- During 1980 to 2010, the proportion of household expenditure spent on staple food items, including rice, decreased from 20.5 per cent to 7.3 per cent.
- The proportion of household expenditure spent on more expensive, non-staple foods, including meat, fish, and milk products, increased from 1.1 per cent to 1.7 per cent, 3.3 per cent to 3.7 per cent, and 2.2 per cent to 3.3 per cent, respectively.
- These changing food expenditure patterns indicate that a gradual increase in demand for animal-derived products has accompanied the increase in mean household income.
- Households with the highest levels of income consume the least amount of fish.
- Consumption of animal protein is lower in low household expenditure deciles, due to the high cost of such proteins.
- The consumption of both calories and proteins increases from lower to higher income deciles.

- Protein consumption grows more than the calorie consumption, with increasing income. This indicates an increasing demand for high protein food products (fish, meat, milk products etc.) when income increases.

Question 21. What ready-to-consume products are commonly consumed? (See if these can be classified according to processed vs. ultra-processed foods*)

Data presented in Household Income and Expenditure survey was used to report common ready to consume products.

Conclusion

Common ready to consume products used are bread, biscuits and cakes.

Evidence

Table 2.14 Ready to consume products consumption per person month

Food	Quantity consumed (g/month)
Bread (Normal)	947.64
Biscuits	217.26
Cake	37.50

Source: HIES, 2016

Question 22. What sort of labelling do packaged foods carry? e.g. nutrition facts; ingredient lists; nutrient content and nutrient function claims; front of pack rating systems, - Consumer Price Index - Cost-of-the-diet surveys etc. (Report on what types of labelling for which foods.) Is there any legislation on this?

Conclusion

Packaged foods carry necessary information and contents are periodically monitored by consumer affairs authority.

Evidence

Packaged foods carry information on nutrition facts, ingredient list and nutrient content. Legislations available are Food and drugs act of 1949 and Traffic light system to indicate sugar level in foods and beverages.

Question 23. Are there any trade agreements that particularly affect the food availability in the country? Which foods or food-related goods/services are involved?

- SAARC PREFERENTIAL TRADING ARRANGEMENT (SAPTA) – fish
- INDO-SRI LANKA FREE TRADE AGREEMENT (ISFTA) - sugar

Question 24. What are the main foods that are a) imported, b) exported?

Information on main foods imported and exported reported in Food balance sheet (2017) were used.

Conclusion

Wheat flour, milk powder, sugar, big onions, palm oil, potatoes and fish are main foods imported. Rice , tea, and coconut are mainly exported

Evidence

Table 2. 15 Main foods imported (metric tons)

Food	Quantity
Wheat flour	1269
Milk	499
Sugar	483
Big onion	243
Palm oil	195
Potato	134
Fish	106

Table 2. 16 Main foods exported (metric tons)

Food	Quantity (MT)
Rice	709
Tea	289
Coconut	203

2.7 Food safety

Question 25. What are the main food safety related public health issues in the country? (e.g. animal borne diseases, other foodborne diseases, chemicals (naturally occurring toxins like mycotoxins; persistent organic pollutants like dioxins; heavy metals), drugs/hormones, pesticides, additives, unsafe water source etc. What are the main foods affected?

Conclusion

Limited published information is available on the main food safety issues in Sri Lanka. Food borne infections, aflatoxin contaminations and chemicals used for artificial food ripening are reported main food safety issues.

Evidence

During recent past food safety issues in Sri Lanka have been focused as important due to rapid improvements of food industry and urbanization among others (Munasinghe et al., 2015). Small food outlets as well as retail food establishments have been increasing during last decade. Less attention on food safety in the establishments could be a significant contributor to the burden of food-borne diseases. In the export market quality control systems are needed to meet requirements for fresh food products such as fish, fruits and vegetables. In addition chemical contamination of food from pesticides, toxic heavy metals, and mycotoxins are becoming emerging problems (Munasinghe et al., 2015).

Following issues are being identified in Sri Lanka

- Food borne infections-Bacterial diarrhoea and hepatitis A, *Salmonella* infections, contamination by *Listeria monocytogenes*, and *Vibrio cholerea*
- Several food poisoning cases were reported (Table 2.17)

Table 2.17 Number of food poisoning cases reported by medical officers of health in Sri Lanka

Year	No of cases
2008	1763
2009	1103
2010	1671
2011	1271

Source Munasinghe et al., 2015

- Contamination by aflatoxin has been reported for rice, maize, dried coconut, peanuts, pulses and minor food items like spices.
- Pesticide residues and heavy metal contaminations (cadmium and arsenic) in agricultural products specially in rice could be a potential problem. However, it was reported as local rice does not contain arsenic
- Artificial fruit ripening by chemicals- Calcium carbide or ethephon and oxytocin are reported being used. Banana and mango are the fruits most commonly induced by artificial ripening.

Question 26. What expert recommendations are found in the literature referring to the above topics?

- Distributing quality seeds at low rates to be implemented to increase the quality of production of subsidiary food crops, in order to promote legumes and pulses consumption.
- Popularizing the consumption of pulses and legumes by making people aware of health and nutritional benefits consuming more pulses and legumes.
- The vegetable and fruit consumption to be increased by including more vegetables and fruit in main meals. Awareness programs should be conducted for the masses in rural, urban and estate sectors.

- Improving the agriculture extension services to increase production and consumption of paddy and subsidiary crops according to the present socio-economic and technical scenarios.
- Strengthening home gardens under Divi Naguma and Department of Agriculture programs to add more fresh vegetables and fruits into day-to-day meals for each household.
- Educating the present generation (School children and youth) about the fact that Sri Lanka has a rich tradition of meal diversity, variety of crops that can be utilized, the bountiful variety of green leaves
- Continuing the maximum retail price of rice (ceiling price) as a national policy

2.8 Chapter Summary and Analysis

Published research and reports as well as unpublished major work were used to address questions related to food consumption, dietary patterns, nutrient intake, food sustainability, availability, access, and safety in the context of Sri Lanka. The lack of published data on dietary intake at national level was a large obstacle in obtaining conclusions for this review.

General population

A greater part of the Sri Lankan diet comprises of rice. Rural areas have the highest numbers of meals of rice with lesser numbers of such meals taken by estate communities. However the rice consumption figure is based on gross intakes from HIES and food balance sheets and small studies and not from a national statistically significant dietary intake studies. Rice consumption figures vary vastly across studies and time periods. Therefore it is difficult to conclude the amount of rice consumed.

It was found that adults consume proportionately more carbohydrates exceeding recommended level of energy. According to the dietary intake study done by Jayawardane et al, the consumption of carbohydrates, both wheat and rice provides 71% of total energy. This is high compared to recommendations of limiting carbohydrates to 60% of total energy, as given in Indian FBDGs.

Large gaps are found in the consumption of fruit, roots, tubers and vegetables with 95% of the population not consuming the required 5 vegetables and fruits. The reasons given for this low

consumption with regard to affordability requires some investigation, as even those who are richer consume low amounts.

As mentioned above whole fruit and vegetable are under consumed sugar and starch are over consumed. The variety of food in the diet is not adequate for different age groups.

Vitamin A, iron, folate and vitamin B₁₂ intakes were well below the recommendations.

Food from animal sources/protein consumption is relatively low in absolute terms, though there is a trend of increasing amounts over the years. Dairy products are under consumed. Though protein rich food consumption has increased according to some publications, it does not meet recommendations of 20% of total energy according to Jayawardane et al which says that less than 11% of energy comes from protein. Though food balance sheets are only proxies of dietary patterns, it is shown that the consumption of local beans and peas is low, while pulses are high. The main pulse is dhal which is imported.

Starch, added sugar and sodium consumption is higher than the recommendation. Current dietary intakes of Sri Lankans show a vast variation from recommendations.

There are gaps in consumption of protein rich food and fat in rural areas and estates excluding women in urban areas.

Published work on commonly fortified foods and their consumption pattern are limited. Per capita supply of all food categories has increased in recent years indicating similar consumption trends. The proportion of expenditure on total food as a share of income has decreased and shows a greater degree of stabilized consumption.

Young Child Nutrition

The evidence presented shows that optimum infant feeding excluding exclusive breastfeeding (EBF) is practiced up to 23 months. It is evident that EBF at most covers 5 months of age. Therefore it is arguable that breast feeding parameters are satisfied up to 6 months of age in Sri Lanka.

Dietary diversity of infants improve with age and education of mother and wealth quintile and detailed assessment is required to see if public health interventions have been effective in going beyond socio economic status to instill correct infant feeding behavior among all population groups.

However, there seems to be an improvement in the number of children under 5 consuming a diverse diet over the past 10 years. It was shown in a survey in 2009 (Nutrition and Food Security Survey – NFSS, UNICEF 2009) that only 35% of all children under 5 consumed the Minimum Acceptable Diet. However most recent assessments show that two thirds of children under 5 years of age receive food from the minimum required number of food groups including iron rich food and Vitamin A. There is still a difference in dietary diversity among urban children vs the rural and plantation area. Much of the evidence shows that the diet of young children in the plantations is the worst in its low diversity.

Maternal Food Intake

This also mirrors young child feeding patterns in that the diversity of diet among rural and plantation mothers is lagging behind urban mothers.

2.9 Limitations

1. Data published from a national dietary survey for Sri Lankan population is not available
2. At national level dietary patterns of the population in Sri Lanka have not been studied
3. Relationship between dietary pattern and diet related health outcomes such as cardiovascular diseases, type 2 diabetes, obesity, overweight, cancers, high blood pressure, bone diseases, non alcoholic fatty liver diseases, kidney diseases, are not determined at national level.
4. Food pattern modeling which is needed to understand implications of food constituents on nutrient adequacy and health outcomes have not been done at any length.
5. Published data on fortified foods, nutrient intake from fortified foods at national level is not available
6. No inventory studies on the nutrient contents, intake and functional use potential as food of underutilized and wild types of crop plants in Sri Lanka

2.10 Needs for future Research

1. National food composition database need to be developed for all foods to maintain methodological and data accuracy of nutrient intake research.
2. Need to conduct periodic national dietary surveys representing different age groups, sectors and socio economic strata.

3. Dietary patterns of Sri Lankan population need to be studied giving special reference to age groups exploring relationship with health outcomes which have public health significance in Sri Lanka
4. Food pattern modeling need to be done to understand and to quantify the diet of populations
5. Need to include survey on intake of fortified foods and nutrient intake from fortified foods in a periodic national dietary survey
6. Need to study use and intake of underutilized foods in Sri Lanka

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Chapter 3

Policy and Programs

3.1 Introduction

Individual nutrition is affected by multiple factors and policies influence in the macro environment. Food related policies and programmes are led to promote the consumption of healthy foods depending on the environment created among consumers.

There are a number of policies and programmes implemented in Sri Lanka including national nutrition policy to promote healthy eating and wellness of the population. In this review existing sources of evidence such as reports, policy briefs from leading organizations, government ministries and published research were used to review features promoting healthy eating, proper nutrition and nutrition wellbeing of the policies and food related programmes and impact of them on dietary intake, quality, behavior, and/or preferences and on nutrition status.

3.2 Part A - Policy Review

List of questions

1. How does healthy eating/nutritious diets/foods feature in key policies?

(Health policies , Agriculture policies , Environmental policies , Education policies , Social protection policies including welfare, Development, women's development and population policies , Other policies related to food supplies and nutrition and Macroeconomic policies)

2. What are the impacts of these policies on people's/children's dietary intake, quality, behaviour, and/or preference; on nutrition status; on weight status, if known?

Conclusion

A number of policy documents are available addressing food, nutrition and health status of the population. However impact assessment is not routine and comprehensive. Causal relationships are not analyzed. This is needed to enhance the efficacy of policy implementation.

The main policies related to food and nutrition, agriculture and health are presented in Table 3.1. In addition circulars, guidelines and strategies are available in complimentary to policies and programmes to improve food , nutrition and health status of different segments of the population (Table 3.2). Impact assessment of available policy implementations is presented (Table 3.1, and 3.2).

3.3 Part B Food related Programme Review

List of questions

1. How does healthy eating/nutritious diets/foods feature in key programmes?

Health programmes (maternal; infant and young child; Vit A, iron, iodine supplementation; NCD programmes; oral health programmes etc.)

Agriculture and food security • Education programs (e.g. Do children learn about healthy foods and diets at school? Are there any obesity prevention programs at school?)

Social protection programs • Rural & urban development, women's development and population policies

Other programs related to food supplies and nutrition

2. What are the impacts of these programs on people's/children's dietary intake, quality, behaviour, and/or preference; on nutrition status; on weight status, if known?

Supplementation, IDD, Food Fortification - Guidelines & Reports on maternal-infant-young child-adolescents nutrition - NCD program - National Multi-sectoral Nutrition Action Plans, Social protection - Agricultural Sector Development programs Oral health programs

Table 3.1 Policy review

Name of the Policy	Features promoting healthy eating , proper nutrition and nutrition wellbeing	Impact assessment on dietary intake, quality, behavior, and/or preferences and on nutrition status
<p>National Health Policy, 1996</p>	<ul style="list-style-type: none"> ○ Malnutrition and nutritional deficiencies have been identified under priority areas ○ Ensure primary health care 	<p>Published information is not available on impact assessment on dietary intake, diet quality behavior, preferences and on nutrition status. Limited reports are available to report the progress and outcomes of related programmes.</p>
<p>National Population and Reproductive Health Policy</p>	<ul style="list-style-type: none"> ○ Achieve gender equality and empowering women; women can combine the roles of child bearing, breastfeeding and child rearing with participation in the work force ○ Ensure reproductive health ○ Family planning as part of the maternal and child health programmes ○ Ensure special care of the elderly 	<p>Impact assessment is not available as a published evidence.</p>

<p>National Nutrition Policy (NNP)</p>	<ul style="list-style-type: none"> ○ Ensuring optimal nutrition throughout lifecycle; pregnant mothers, lactating mothers, infant and young child, preschool and school children, adolescents, adults, elderly ○ Ensure capacity to deliver effective and appropriate interventions; behaviour change communications, capacity building, community empowerment, media ○ Ensure effective management of adequate nutrition to vulnerable populations, emergencies, conflicts, illness ○ Ensuring food and nutrition security for all; food based approaches; dietary diversifications, nutrient enhancement, food safety ○ Strengthen advocacy, partnerships and networking; political commitments, inter agency partnerships, ○ Strengthen research, monitoring and evaluation; nutrition surveillance, evidence based review 	<p>Limited published work is available on review of implementation of 2010 NNP of Sri Lanka (Samarakoon et al.,)</p> <p>The level of implementation of National Nutrition Policy (NNP) 2010-2018 was reviewed to examine the extent of implementation of the NNP , to identify the gaps in implementation and to make recommendations to revise the NNP. Nutrition programs listed have been initiated and carried out by the Ministry of Health (MoH), and other sectors. It is concluded that in depth analysis of the extent of implementation of the NNP in relation to the <i>policy targets</i> are not possible due to lack of information on outcomes, quality and efficacy of policy implementation.</p> <p>Drawbacks of implementation include</p>
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- Focusing only on maternal and child undernutrition and micronutrient deficiencies
- Exclusive breastfeeding (≤ 6 months) shows some improvement, but not reaching the target of 90%.
- No national-level statistics to assess the impact due to lack of comparability between the baseline data and current statistics in 2017
- Limited nutrition promotion activities amongst the youth, adults, and elderly population
- Severe lack of knowledge, technical skills and resources for program planning, management and monitoring of nutrition intervention at the national, regional and grassroots levels
- Behaviour change promotion activities are difficult to assess and a

		<p>behaviour surveillance system has not been implemented.</p> <ul style="list-style-type: none"> ○ Only estate sector is considered ignoring urban poor ○ No recent assessment of anemia
<p>National Policy on Maternal & Child Health</p>	<ul style="list-style-type: none"> ○ Promote health of women and their partners to enter pregnancy in optimal health ○ Ensure a safe outcome for both mother and newborn ○ Ensure reduction of perinatal and neonatal morbidity and mortality ○ Enable all children under five years of age to survive and reach their full potential for growth ○ Ensure that children aged 5 to 9 years and adolescents realize their full potential in growth and development ○ Enable children with special needs to optimally develop their mental, physical and social capacities ○ Enable all couples to have a desired number of children with optimal spacing ○ promote reproductive health of men and women assuring gender equity and equality 	<p>Impact assessment is not available as a published evidence.</p>

National Health Promotion Policy	<ul style="list-style-type: none"> ○ Strengthen leadership for health promotion at all levels ○ Strengthen life-course approach in health promotion by using appropriate interventions 	<p>Impact assessment is not available as a published evidence.</p>
National Agricultural Policy	<ul style="list-style-type: none"> ○ Increased agricultural production to ensure food and nutrition security of population ○ Adopt productive farming systems ○ Increased agricultural productivity and sustainable growth ○ Promote production and use of organic and bio fertilizers while reducing chemical fertilizers ○ Minimize use of synthetic pesticides and promoting eco-friendly bio pesticides and integrated pest management systems ○ Develop methods to minimize pre and postharvest losses of agricultural commodities ○ Enforce sanitary and phyto-sanitary methods in processing and value addition of agricultural commodities ○ Production of high quality products ○ Foster preserve and disseminate traditional knowledge in agriculture production, processing of food for nutritional and medicinal benefits 	

	<ul style="list-style-type: none"> ○ Promote home gardening and urban agriculture to ensure household food and nutrition security and income ○ Promote women participation in home gardening 	
<p>National Climate Change Policy Sri Lanka</p>	<ul style="list-style-type: none"> ○ Taking actions to address the adverse impacts on crop and animal production and fisheries sectors due to climate change and to minimize the impacts on food production and to ensure food security. ○ Encourage climate resilient-environmental friendly and appropriate innovative technologies while promoting the utilization of appropriate traditional knowledge and practices in food production. ○ Enhance climate change resilience of natural ecosystems and its diversity. ○ Encourage environmentally sound and socially acceptable agriculture and livestock practices within the framework of sustainable development. ○ Promote appropriate innovative technologies while encouraging the utilization of appropriate traditional knowledge and practices ○ Promote sustainable consumption and production considering the family as the center of focus to ensure wide 	<p>Impact assessment is not available as a published evidence.</p>

	dissemination of environment friendly lifestyles and practices in the path of sustainable development	
Trade and Tariff Policy	<ul style="list-style-type: none"> ○ Use of food prices and taxes to change consumption pattern of healthy and unhealthy food choices 	To improve the health of Sri Lankans Government needs to increase taxes on unhealthy food products and allow subsidization of nutritious foods to improve health (Weerahewa and Korale Gedara, 2019)
The National policy and strategic framework for prevention and control of chronic non-communicable diseases	<ul style="list-style-type: none"> ○ Implement a cost-effective NCDs screening program at community level with special emphasis on cardiovascular diseases ○ Empower the community for promotion of health lifestyle for NCDs prevention and control ○ Support prevention of chronic NCDs by strengthening policy, regulatory and service delivery measures for reducing level of risk factors of NCDs in the population ○ Ensure the coherence with National Nutritional policy and WHO Global strategy on Diet and physical Activity, and the 	Impact assessment is not available as a published evidence.

	<p>close collaboration with other sectors involved in nutrition related activities</p> <ul style="list-style-type: none"> ○ A coordinated mechanism involving the education, sports and relevant stakeholders to develop a national physical activity guide will be established ○ Provide supportive services for stress management programs at occupational settings ○ Enhance health sector capacity to address stress and related health issues ○ Promote cultural, social and religious activities that promote mental and social wellbeing 	
<p>National multi sectoral action plan for the prevention and control of non- communicable diseases 2016-2020</p>	<ul style="list-style-type: none"> ○ Ensure the priority to the prevention and control of non-communicable diseases in national agenda through strengthened multi-sectoral cooperation and advocacy ○ Strengthen national capacity, leadership governance, multi - sectoral action and partnerships to accelerate country 	<p>Impact assessment is not available as a published evidence</p>

	<p>response for the prevention and control of non-communicable diseases</p> <ul style="list-style-type: none"> ○ Reduce modifiable risk factors for non-communicable diseases and underlying social determinants through health-promoting environments 	
Education Policy	<ul style="list-style-type: none"> ○ Free education to all ○ Special education to differently abled students ○ Free text books ○ Free school uniforms ○ School meal programmes ○ School health programmes ○ Scholarship and student assistance programmes 	<p>Evidence from data showed that educational programmes have contributed increasing literacy rate and high educational achievements. These can be positive influence for good food and nutrition status at individual and household level.</p>
National Policy for Senior Citizens	<ul style="list-style-type: none"> ○ Ensure right for food, care, financial security, and quality life 	<p>Impact assessment is not available as a published evidence.</p>

<p>National Fisheries Policy Ten Year Development Policy Framework of the Fisheries and Aquatic Resources Sector 2007 – 2016:</p>	<ul style="list-style-type: none"> ○ Objectives: To enhance per capita consumption of fish to 60g ○ Corresponding production increase is mentioned 	
<p>National Livestock Breeding Policy 2010</p>	<ul style="list-style-type: none"> ○ Expanded under the corporate contract between National Livestock Development Board and the parent Ministry as well as Ministry of Finance ○ States the objective of improving nutrition and the quality of life of farmers both through nutrition and livelihood development 	

Table 3.2 Complementary plans, strategies and guidelines related to food, nutrition and health

Name of evidence	Purpose	Impact assessment
National Health Strategic Master Plan 2016-2025	Establishment of Nutrition Bureau National Nutrition Programme Development; Developing food based dietary guidelines; nutrition surveillance Establishing nutrition team Coordinating Thripasha programme	
Multi Sector Action Plan for Nutrition (2018 to 2025)	Objective is to prioritize the intergovernmental and multi-sectoral approach to reduce chronic malnutrition, including the development of a legal framework and nutrition policies	Impact assessment is not available as a published evidence.
National Strategy for Infant and young child feeding	Deliver guidance to ensure a good foundation for all infants and young children to provide optimal nutrition.	
Guidelines on Infant and young child feeding	Ensure uniformity of the messages given related to infant and young child	

	feeding among all parties involving in the programme	
Maternal care package		
Manual on integrated nutrition package	To accelerate the reduction of under nutrition in selected worse affected areas in Sri Lanka. Different nutrition interventions are used based on life cycle approach	Limited published information showed the impact of intervention after one year of the implementation (Jayathissa, et al 2011). Conclusions are not given.
Sri Lanka code for promotion, protection and support for breastfeeding and marketing of designated products	Ensure exclusive breast feeding during the first 6 months followed by proper complementary feeding	
Zinc supplementation in managing diarrhea among children under age of 5 y	Zinc supplementation in managing diarrhea	
National strategy for prevention and control of micronutrient deficiencies in Sri Lanka 2017-2022	Prevention and control of micronutrient deficiencies	
Health sector guide to prepare District Nutrition Action Plan		
1Guidelines on deworming children and pregnant women against soil transmitted Helminthes in community setting 2019-2022	Ensure uniformity of the protocols for the programme	

National strategic plan on maternal and newborn health 2012-2016		
National strategic plan on adolescent and youth health 2018-2025		
Protocol on Managing Nutritional Problems Among under five children in the community		
Guideline for feeding infants and preschool children including orphans and those not living with mothers during an emergency situation		
Guideline on model MCH & FP Clinics		
Strategies to promote optimal fetal growth and to minimize the prevalence of low birth weight in Sri Lanka		
Guideline on establishing Nutrition clinics in MOH areas		

Table 3.3 National Programme Review

Programmes	Features promoting healthy eating	Impact on dietary intake, quality, behavior, and/or preference; and on nutrition status
Food based dietary guidelines for Sri Lankans 2011, 2016	Promoting healthy eating	Impact assessment is not available as a published evidence
Improve and promote nutritional status, and healthy life style; Pre-school activity book		
Zn supplementation in managing diarrhea among children under 5 years of age		Impact assessment is not available as a published evidence
Iron supplementation for Pre-term and LBW infants and young children	Elimination of iron deficiency	
Vitamin A mega dose supplementation	Elimination of vitamin A deficiency and its consequences	
Multiple Micronutrient supplementation programme for infants and young children; Multiple micro nutrient (MMN) supplementation for 6, 12 and 18 month age groups	Elimination of micronutrient deficiencies and their consequences	The impact assessment was done in 2012 comparing base line data obtained in 2009 (Senarath et al, 2014) It was found that only 45.2% of the children in the age group 6-23 months in the 12 intervention

		<p>districts have received MMN powder in 2012</p> <p>The majority of them has taken MMN powder between the ages of 6 and 12 months (85%), and used it either daily or every other day (89.4%).</p> <p>When all children aged 6-23 months in the 12 districts are considered, approximately one-third of the target population has taken MMN appropriately.</p> <p>A significant reduction in the prevalence of anaemia in children aged 6-23 months by 11.7%, and an increase in mean Hb level by 0.3 g per dl between 2009 and 2012 were reported.</p> <p>In comparison between children who received MMN and never received MMN in the 12 intervention districts revealed that the prevalence of anaemia was lower (25.2%) among those who have received MMN powder compared to those of not received (29.7%). Difference is not significant</p>
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		<p>Significant reduction in the prevalence of Iron Deficiency anaemia among recipients of MMN (10.1%) in comparison to non-recipients (15.7%) was reported.</p> <p>A significant improvement in the mean Haemoglobin level by 0.15 g per dl was reported in the recipients.</p> <p>A difference was not reported in the serum ferritin or Zn levels between recipients and non-recipients</p>
<p>School health programme</p>	<p>Ensure that school children are healthy, capable of self-promoting their own health and also promoting the health of the family members and of the community</p>	

	enable school children to derive optimal benefit from the educational opportunities provided to them	
Promotion breastfeeding and complementary feeding for infants and young children		One published report is available on the programme aimed at improvement of complementary feeding practices in Hambantota district (Rajapaksha et al, 2014).
Weekly Iron and Folate supplementation for adolescents	Elimination of iron and folic acid deficiencies and their consequences	
Provision of adolescent and youth friendly health services in the field		
Management of severe acute malnutrition		
Improving nutrition outcomes for children in Sri Lanka's estate sector- the positive deviance approach		
National food fortification programme		

Universal salt iodization programme	Eradication of iodine deficiency and its consequences	
Supplementary feeding Thripasha programme		
Oral health programme		
Social protection programme		
Non communicable disease prevention and control programme		
Iron supplementation programme		

3.4 Chapter Summary and Analysis

There are many policies, strategies, programs, protocols and guidelines with some relationship to food and nutrition. However a Technical Review Report for enhanced eating should draw explicit statements of intent to improve either food resources or support structures and mechanisms for improved nutrition. Fourteen policies which would have some relationship to the subject at hand have been reviewed. Key word analysis has been done with regard to objectives of these policies to improve the food environment. A second question has been examined with regard to impact of these policies.

Of 14 Policies analyzed, 9 show their explicit intent to improve either food production or nutrition. However not more than 2 policies have had been subjected to review or impact assessment. The balance remaining 5 policies may have implicit references to nutrition and food.

Most of the Plans are drawn up within the Policy to implement nutrition and health related activities. However healthy eating is rarely mentioned even as part of programs.

There are many programs listed as part of plans and policies with regard to nutrition. However only one programme deals with the food based approach and this is the previous food based dietary guidelines.

3.6 Limitations

- Available data generated from cross sectional studies is not utilized to analyze causal relationships to understand persisting nutrition situations among population groups.
- No evidences for the involvement of experts from multi sectors in conducting nutrition status assessment studies considering the multifaceted nature of nutrition issues.

3.7 Future Research Needs

- Need to conduct periodic monitoring and evaluation of programmes to determine the impact assessment.
- Need to get involvement of experts from different sectors from planning to the end of research activities of impact assessment to analyze holistic nature of the situation.

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Chapter 4

Food-related habits, physical activity and other behaviors

4.1 Introduction

Individual food related behavior is determined by perceptions (culture, tradition, religious prohibitions, widespread taboos, food myths influence perceptions), socio economic situation, learning from childhood, the external environment which includes peer to peer learning, role models and media. Food related habits include food selection, proper method of cooking for preserving nutritional value, menu planning, prioritizing, resource allocation and enhancing availability of food close at hand in the home garden. Based on understanding this behaviour it is important to identify the behavioral strategies for correction.

Take away food outlets are mushrooming in urban, semi urban and peripheral. Eating away from home is associated with increased caloric intake and poorer dietary quality compared to eating at home leading to overweight and obesity of people. Further, other lifestyle behaviors related to dietary intake and obesity risk have changed during last decade. Including children, people become more sedentary with more hours of screen time and less time for active recreational activities leading to risk for non-communicable diseases. Dietary behaviors are coupled with different diet-related health outcomes. Further main meals and snacking patterns also play a major role. Not only the type of food eaten but also the frequency of consumption is believed to affect certain non-communicable diseases including obesity, cardiovascular conditions and glucose intolerance. In addition tobacco and alcohol use, some social and ecological barriers, can lead individuals for choice of unhealthy food pattern.

4.2 List of questions

Social – ecological barriers

1. How do the following factors influence food consumption patterns of different population groups?
2. What are the social-ecological barriers and the enablers to different population groups achieving healthy diets?

Eating in and out

3. What are the number of daily eating occasions (meals and snacks) and frequency of meal skipping?
4. What is the frequency and regularity of family shared meals?

5. What household food distribution patterns exist? (e.g. who gets to eat first, how is the food shared among the family members, is there any gender/age bias? Who makes the decisions? etc.)

6. What is known about food and beverage consumption away from home? Is there any relationship between eating out and/or take away meals and body weight in children and adults?

Cooking, storage, handling of food

7. What are the commonly used cooking methods for foods that are regularly consumed?

8. Are there any household food storage/preparation practices that pose particular risks to food safety or nutrition status?

9. Are there any household food storage/preparation practices that are desirable (for food-safety or nutrition), that could be reinforced?

10. Which food processing methods are commonly used at household level?

Infant feeding

11. At what age are infants introduced to solid foods? Does breastfeeding continue? Until what age?

12. What type of foods are infants fed? How are the foods prepared? If it is decided that infants will be covered by the FBDGs

Physical activity

13. What is known about the physical activity of different age groups in the country?

14. What is known about sedentarism of people in the country? What lifestyles contribute to this?

15. What is known about recreational activities of children, adolescents, adults (rural vs. urban vs estate)? (e.g. number of hours watching TV)

Alcohol consumption

01. What is known about alcohol consumption in the country? (age groups, amounts, effects etc.)

02.

Tobacco consumption

17. What is known about tobacco consumption in the country? (age groups, amounts, effects etc.)

Expert Recommendations

18. What expert recommendations are found in the literature re. the above topics?

4.3 Social – ecological barriers

Question 1. How do the following factors influence food consumption patterns of different population groups? (culture, tradition, religious prohibitions, widespread taboos, food myths etc.)

Question 2. What are the social-ecological barriers and the enablers to different population groups achieving healthy diets?

Conclusion

There are many socio-cultural practices and myths in some communities that can influence feeding and caring practices of children. Even though published evidence is scanty, there are a few publications, Based on fairly small samples that have specified these myths and beliefs. These socio cultural practices across at least two ethnicities are; selective feeding of the girl during onset of puberty, the theory on cold and hot foods which is very frequently heard, the myth that certain fruits cause miscarriages and many others. These can and do affect the inadequate nutrient consumption of vulnerable groups.

Evidence

Socio-cultural and ecological barriers and practices exert a significant impact on individual's diet. Some individuals avoid beef and pork for religious reasons and even other types of meat are limited in particular time periods when do observance of different customs. Some practice vegan diets for a particular time period. If balance is not met within diet this could give rise to nutrient inadequacies especially in vulnerable groups (World Bank Group). Socio-cultural views related to gender also can influence feeding practices. In some cultures male children are given priority during feeding time over female children.

4.4 Eating home cooked food vs eating out

Question 3. What are the number of daily eating occasions (meals and snacks) and frequency of meal skipping?

Question 4. What is the frequency and regularity of family shared meals?

Question 5. What household food distribution patterns exist? (e.g. who gets to eat first, how is the food shared among the family members, is there any gender/age bias? Who makes the decisions? etc.)

Question 6. What is known about food and beverage consumption away from home? Is there any relationship between eating out and/or take away meals and body weight in children and adults?

Conclusion

Food Behavioral pattern at national level can be studied in a national survey. However Field Evidence can be used to get insights on this area. Published data is not available

4.5 Cooking, storage, handling of food

Question 7. What are the commonly used cooking methods for foods that are regularly consumed?

Question 8. Are there any household food storage/preparation practices that pose particular risks to food safety or nutrition status?

Question 9. Are there any household food storage/preparation practices that are desirable (for food-safety or nutrition), that could be reinforced?

Question 10. Which food processing methods are commonly used at household level?

Conclusion

Published data is not available. However, field data can be used to get insights in this area.

Evidence

Published data is not available.

4.6 Infant feeding

Question 11. At what age are infants introduced to solid foods? Does breastfeeding continue? Until what age?

Question 12. What type of foods are infants fed? How are the foods prepared? If it is decided that infants will be covered by the FBDGs

Conclusion

Infant feeding practices are streamlined and national level information is available.

Evidence

- Mothers practice exclusive breastfeeding their children for the first 6 months irrespective of the working status. Ever breastfed is 99 % (DHS 2016) About 90 percent of the children were breastfed within one hour of birth Generally mothers avoid other liquids and food in the first 6 months but some working mother introduce complementary foods at the age of 5 months. These foods include infant cereals, porridges and fruits.
- Working mothers reported that they expressed breast milk and feed children.
- Complementary feeding start after 6 months and breastfeeding continue until about 18 months. With complementary foods some mothers give breast milk or formula milk (World Bank Group).
- Animal foods such as sprats, fish, chicken are introduced to infants at 7 and 8 months of age.
- Mothers introduce legumes such as dhal, green gram, gram and cowpeas during complementary feeding.
- In general eggs are introduced after 9 months of age (World Bank Group).
- Around one year of age infants are introduced to family diet.

4.7 Physical activity

Question 13. What is known about the physical activity of different age groups in the country?

Question 14. What is known about sedentary time of people in the country? What lifestyles contribute to this?

Question 15. What is known about recreational activities of children, adolescents, adults (rural vs. urban vs estate)? (e.g. number of hours watching TV)

Conclusion

About 30% of adults do not engage in adequate physical activities as recommended by the WHO. Work place physical inactivity is high among both males and females. Sedentary time is notably high among children though it is lower than physical active time.

Evidence

According to WHO recommendation throughout the week, adults should do at least 150 minutes of moderate-intensity physical activity OR 75 minutes of vigorous-intensity physical activity OR an equivalent combination of moderate- and vigorous-intensity physical activity

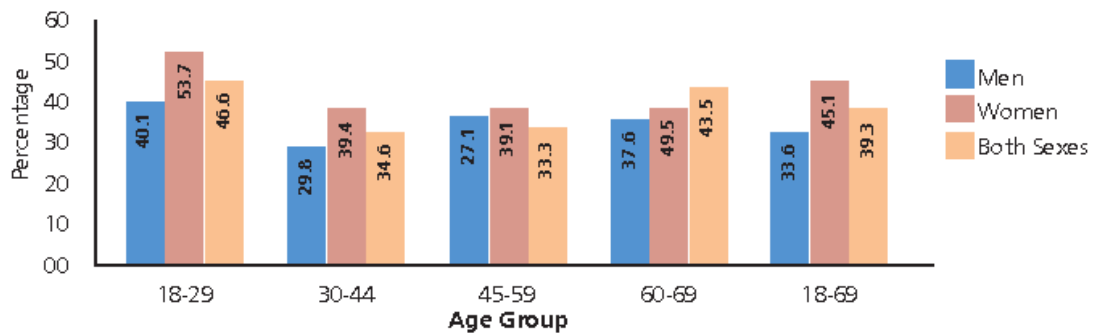
achieving at least 600 MET-minutes. This include activity for work, during transport and leisure time.

- Recent findings for Sri Lankans using a sample above 5000 18-69 y male and female participants (STEPS, 2015) showed that 22.5% of the males and 38.4% of the females did not meet the WHO recommendation of physical activity.
- Physical inactivity was more among females than males.
- Among age groups 60- 69 years and 18- 29 years showed high inactivity.
- Table 4.1 show the level of physical activity for males and females. More than half of the males (53.7%) engaged in high intensity physical activity whereas 32.2% of the females engage in high intensity physical activity.
- Daily mean time engaged in physical activity of adults was 153.9 minutes. Females in the age group 18-29 years spent the lowest time on physical activities.
- Urban South Asian women are more prone to dysglycaemia at lower levels of sedentary behavior than their Western counterparts (Waidyatilaka I , et al. 2013)

Table 4.1 .Level of Physical activity

Age group (y)	Low	Moderate	High
	Males		
18-29	25.5	23.0	51.5
30-44	29.2	17.8	53.0
45-59	28.9	12.9	58.2
60-69	31.7	16.4	51.9
18-69	28.1	18.2	53.7
	Females		
18-29	49.2	25.7	25.0
30-44	38.7	23.8	37.5
45-59	40.8	22.8	36.4
60-69	52.0	18.7	29.3
18-69	44.2	23.6	32.2

- Nearly 34% of males and 45% of the females do not get recommended physical activity during their work which emphasize the physical inactivity for much time of the day and the prevalence vary with the age group (Figure 4.1)



Source STEPS 2015

Figure 4.1 Reasons for physical inactivity

A study among children 6-12 years showed that time spent on extra classes which was a sedentary activity was 1.6 hours per week. An average of 66.7 minutes/day was spent by the children on sedentary activities such as watching TV and videos, playing computer games and working on the computer. Mean time of sedentary and active work are 1.1 and 1.8 h per day. (Jayatissa et al 2016). Active work considered in this study include time spent on playing, riding bicycles, physical activities, dancing, and gardening.

4.8 Alcohol consumption

Question 16. What is known about alcohol consumption in the country? (age groups, amounts, effects etc.)

Conclusion

There is a gender division in consuming alcohol in the Sri Lankan population. Majority of adults who use alcohol are males and majority of current drinkers are in age group of 30-59 years.

Evidence

- Generally 68% of adults in the population are abstainers of alcohol. Majority of females (96.5%) were lifetime abstainers.
- About 18% of adults are current drinkers and 35 % males are current drinkers. Majority of them belong to the age groups of 30-44 years (42.3%) and 45-59 years (42.7%).

- Percentage of daily drinker is 5.5%
- Mean number of standard drinks per drinking occasion among current male drinkers during past 30 days were 4.3%.
- Male drinkers who consume ≥ 60 g of pure alcohol on average per occasion are classified as high-end level drinkers. It was found that 1.2% of the male adults were drinking at the high-end level.
- Male drinkers who consume <40 g of pure alcohol on average per occasion are classified as lower-end level drinkers. Nearly 32% of the males consume alcohol in lower-end level (STEPS, 2015)

4.9 Tobacco consumption

Question 17. What is known about tobacco consumption in the country? (age groups, amounts, effects etc.)

Conclusion

Notable proportion of individuals especially males use some form of tobacco, In addition a considerable proportion get exposed to second-hand smoke at home and at public and work places.

Evidence

Tobacco use is done as smoked or smokeless tobacco. About 25% of the adults are current users of some form of tobacco. Tobacco use is mainly by men in the Sri Lankan population and is much higher (45.7%) than women (5.3%) (STEPS, 2015).

- The current smoking among males is 29.4%, and all age groups of males above 30 years do smoking at a prevalence of 30% Prevalence of smoking was very low among females (0.1%) and was seen only in the age group of 45-59 years.
- Of the males, 20% were daily smokers.
- A notable proportion of males (53.9%) had never smoked and 16.7% were reported as former smokers (STEPS, 2015).
- It was reported that about 25% of males and 21.6% of the females got exposed to second-hand smoke at home. The age group mostly exposed to second-hand smoke was individuals in the age group of 18-29 years (Figure 4.2).

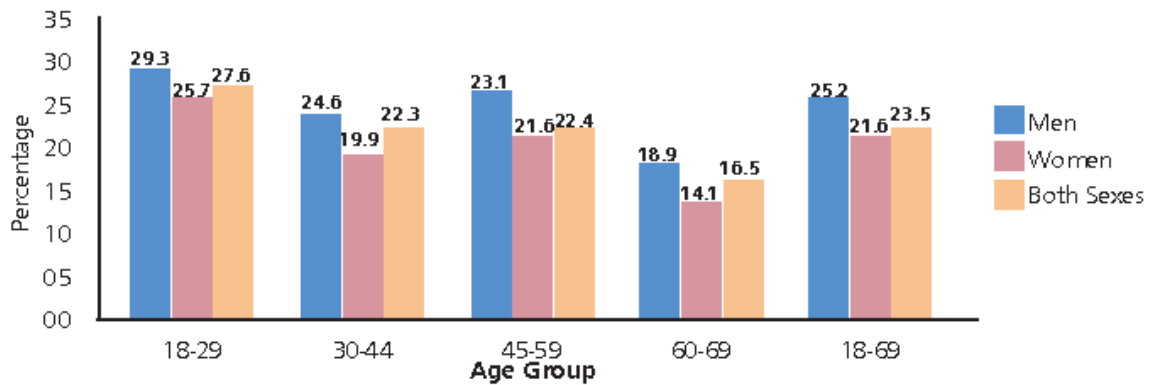


Figure 4.2 Exposure to second hand smoke in home

4.10 Expert Recommendations

18. What expert recommendations are found in the literature refer to. the above topics?

4.11 Chapter summary

Food related and other behavior patterns are important determinants for positive health outcomes. It is obvious that other behaviors such as tobacco and alcohol use can exert detrimental effects on the health of individuals. Physical inactivity can lead to increase the prevalence of overweight and obesity of populations leading to other non-communicable diseases. Nationally representative published data is not available for meal patterns of individuals and food preparation methods and storage at household levels.

School feeding programs have continued for many decades as is well documented. Though the objective of school feeding is not for nutrition improvement, it effects improved attention span, attendance and retention in school. The basis for these programs is the fact the children attend school without eating breakfast, which is a pattern among a large number of children and their families. (School Health and Nutrition, Discussion Paper Series, WB, June, 2014)

Limitations

- Lack of nationally representative data base on cooking methods , storage, and handling of food at household level which is country specific
- No published data on eating pattern of different population living in different sectors

- Even the National Oral health Survey 2016 does not talk about trend in eating sugary food and the relationship to dental caries among children.

Available information of dietary practices, though limited, has identified practices that needs to be reviewed and modified. Hence, more detailed studies on consumption patterns of food items need to be undertaken. Better to address the high consumption pattern of sugary food, biscuits etc. through awareness programmes (**Jayatissa et al 2016**).

Future Research needs

- Need to conduct a national dietary exposure survey representing all age groups and sectors

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Chapter 5

Food Environment and Settings

5.1 Introduction

What people eat is determined by a number of factors including taste, knowledge of health and nutrition value of foods, cost, availability, affordability, convenience, regulations, cultural norms as well as environmental aspects. Environment can promote or challenge the healthy eating. The individual change can be motivated and facilitated through an enabling environment for healthy food choices.

Environmental policy approaches can have an impact at the population level by seeping into organizational structures. Therefore, changes in food environment and policies can improve

access and availability of healthy foods in physical environments such as community food access, child care, schools and workplaces. The questions reviewed in this chapter address place based environments that influence food consumption of individuals.

The food environment is extremely important in having sustainable diets. This requires a host of actions on the part of multiple partners.

5.2 List of questions

Food access at communities

1. Where do people in urban areas/rural areas buy most of their foods?
2. What is the relationship between neighborhood and community access to food retail settings and individuals' dietary intake and quality, and weight status?
3. What types of food are commonly consumed outside home?

Worksite

4. Are there any national or widespread worksite approaches that affect food intake, food quality, behaviours and/or preferences of employees, or on their weight status? What is their impact ?

Early care

5. What is the impact of approaches to prevent diet related diseases in early care and development programs for children ages 2-5 years ?

Schools

6. Are there any school-based approaches that affect the dietary intake quality, behaviour and/or preferences of students, or on their weight status? What is their impact?
7. What is the status of the implementation of School Canteen Guidelines? (- School Health Survey reports, Livelihood and Food Security Assessments)
8. Are there any school-based policies that affect the dietary intake, quality, behavior and/or preferences of students, or on their weight status? What is their impact?

5.3 Access of food by communities

Communities obtain food from retail outlets such as open markets, convenience stores, wet markets, farmer outlets, cooperative shops, super markets. The source of food purchase or obtaining free of charge determines individual consumption pattern of high quality foods to maintain healthy body weight and to prevent diet related diseases. Convenient food preparations will be an important determinant of healthy food consumption.

Question 1. Where do people in urban areas/rural areas buy most of their foods?

Conclusion

The evidence of assessing where people in urban /rural areas buy most of their foods is limited due to insufficient number of studies. However available evidence suggests that people in the rural setting source their food supply partly from home gardens and farms in addition to markets and stores. Main source of food supply of people in urban and semi urban areas is the market.

Evidence

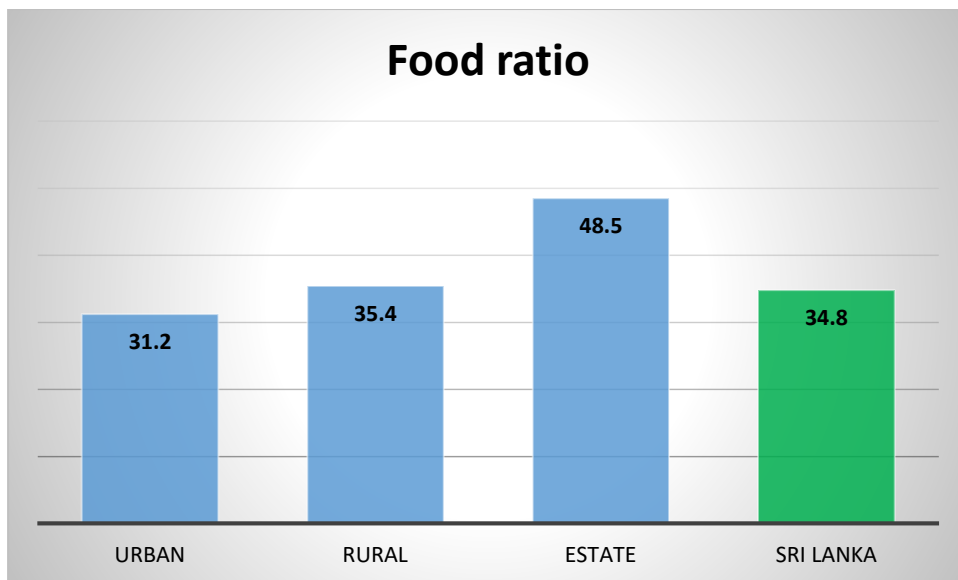
The evidence review was based on published studies and reports (2003-2018) with adequate sample sizes. One study showed that depending on the area of living source of food supply varied (Jayathissa et al., 2014). Table 5.1 shows the demographic characteristics of population by sectors in Sri Lanka

Table 5.1 Demographic Characteristics of population in Sri Lanka

Characteristics	Urban	Rural	Estate	Sri Lanka
Population (Million)	3.6	16.1	0.9	20.7
Monthly mean household income (SLR)	88692	58137	34804	62237
Monthly median household income	57833	42133	26134	45511

Source: Household Income and Expenditure Survey, 2016

Figure 5.1 Food ratio by different sectors of population in Sri Lanka



Question 2 What is the relationship between neighborhood and community access to food retail settings and individuals' dietary intake and quality, and weight status?

Conclusion

The limited evidence is available for assessing the relationship between neighborhood and community access to food retail settings and individuals' dietary intake but evidence is not available for assessing relationship with dietary quality and weight status due to insufficient number of studies.

Evidence

Food consumption patterns were studied in several areas in Sri Lanka (Jayathissa et al., 2014). Areas have been selected from seven districts including rural and estate sector, shanty community and semi urban population. Consumption patterns of rice, green gram, cowpea, finger millet, maize, subsidiary food crops, local tuber roots, jackfruit and breadfruit have been investigated under the study.

Another study on fast food consumption and health status of students of a University in Sri Lanka revealed that 54 % students consumed fast food once or more within a day (Table 5.1). Price and the taste were reported to be the major contributory factor for the selection of food (Jayasinghe and de Silva, 2014).

Table 5.2 Frequency (%) of fast food consumption by University Students (n=205)

Frequency (%)	Male	Female	Average
2-3 times a day	26	15	21
Once a day	39	27	33
4-6 times a week	15	8	12
2-3 times a week	13	30	21
Once a week	7	15	11
Once a fortnight	0	2	1

Source (Jayasinghe and de Silva, 2014)

Question 3 . What types of food are commonly consumed outside home?

Conclusion

The limited evidence is available for assessing the types of food commonly consumed outside home as there has been no national dietary survey. However, available data from small studies showed that bread, cakes, rolls, *Wadai*, pastries and vegetable roti are commonly consumed food items by different population segments.

5.4 Worksite

Question 4. Are there any national or widespread worksite approaches that affect food intake, food quality, behaviors and/or preferences of employees, or on their weight status? What is their impact?

Conclusion

Guidelines have been developed and disseminated to establish and upgrade workplace canteens. Limited evidence is available for assessing the impact of canteen guidelines and

health promotion in terms of food intake, food quality, preferences and effects on their weight status in Sri Lanka.

Evidence

Guidelines have been developed to make the relevant authorities aware on establishing and upgrading the work place canteens for Sri Lankans (Ministry of Health, 2013). Published evidence is not available on impact assessment

5.5 Early care

Question 5. What is the impact of approaches to prevent diet related diseases in early care and development programs for children ages 2-5 years?

Conclusion

There is limited evidence available on assessing impact of approaches to prevent diet related diseases in early care and development programs for children ages 2-5 years in Sri Lanka.

5.6 Schools

Question 6. Are there any school-based approaches that affect the dietary intake, quality, behaviors and/or preferences of students, or on their weight status? What is their impact?

Conclusion

School based approaches such as school canteen guidelines and school nutrition and feeding programmes are implemented at present. There is limited published evidence is available on assessment of school-based approaches that affect the dietary intake, quality, behaviors and/or preferences of students, or on their weight status in Sri Lanka.

Evidence

There are published manuals on some school based approaches such as school canteen policy to streamline the quality of foods sold within the school. Teachers' guide for health promotion schools (Family Health Bureau, 2010) and for school nutrition programmes (Ministry of Education, 2018). The school nutrition programmes are aimed to minimize nutritional problems, promoting local food consumption and improving healthy dietary habits. Further, a guide to reduce overweight and obesity among school children has been published (Family Health Bureau, 2018).

One study determined the barriers to healthy dietary choices among school children in Sri Lanka (Townsend et al., 2019). They identified number of barriers that influenced student dietary choice. These factors are found at several levels of influence including the structural level, living and working level, social and community level and the individual level (Table 5.3).

Table 5.3 Barriers affecting student dietary choice

Level of Influence	Barriers
Structural	Educational policy, national nutrition and development programmes and agricultural policy
Living and working conditions	Employment, agriculture, food availability, education and the school environment, family
Social and community influences	Avoiding fresh milk and eggs considering they cause phlegm to be produced Avoid eating meat specially girls believing they increase body fat and encourage weight gain
Individual factors	Knowledge, preference and other health behaviors

Source (Townsend et al., 2019)

Question 7. What is the status of the implementation of School Canteen Guidelines?

Conclusion

Limited published evidence is available in Sri Lanka on assessment of the implementation of School Canteen Guidelines. This study concluded that implementation of school canteen guidelines has not progresses much.

Evidence

One study showed the status of implementation of school canteen guidelines in Colombo and Gampaha districts, Western Province, Sri Lanka. This study concluded that implementation of school canteen guidelines is less effective due to a number of reasons (Weerasinghe et al., 2015).

- Majority (80%) of canteens were located in a suitable place and 78% had a clean outside environment.
- Only two third of food preparation areas satisfied the basic criteria.
- Availability of dining area for students was 50%.
- More than 80% of canteens had waste water drainage and 89% of canteens had bins for waste disposal. However, majority of canteens did not keep bins closed.
- Only 50% of the canteens had cooling equipment, and majority of them had a practice to store raw materials and cooked food separately.
- Almost in 30 % of canteens, food was not covered in the serving area, and more than 90% of food handlers of canteens used neither aprons nor gloves.

Question 8. Are there any school-based policies that affect the dietary intake, quality, behaviors and/or preferences of students, or on their weight status? What is their impact?

Conclusion

School canteen policy and school nutrition programmes are in effect to enhance the dietary intake, quality of diet at the school and to monitor the weight status along with other health programmes such as immunization and micro nutrient supplementation. The limited published evidence is available on impact assessment of policies and programmes that affect the dietary intake, quality, behaviours and/or preferences of students, or on their weight status in Sri Lanka.

Evidence

Nutrition plays an important role in cognitive development, physical and mental health status of students leading to better school performance. Sri Lankan children and adolescents are increasingly at risk developing of non-communicable diseases and metabolic syndromes as a result of their unhealthy dietary practices. A study conducted among 5-15 year old school children in Colombo, Sri Lanka found that 31% had at least one metabolic derangement and 10% had two metabolic derangements (Wickramasinghe et al., 2013). Worsening dietary habits and low physical activity level may lead to increasing prevalence of obesity and future NCD burden in the country. According to Report of the 2016 Sri Lanka Global School based student Health Survey only

- 3% students reported going hungry most of the times or always because of lack of sufficient food in their homes.
- 32 % and 36% of students reported eating fruits and vegetables, two or more times per day.
- 26% reported drinking carbonated soft drinks one or more times per day.
- 28% of students reported being physically active at least 60 minutes per day on 5 or more days during the 7 days before the survey and more than one-third of the students reported spending time sitting (GSHS, 2017).

Population of this report mainly represented adolescents aged 13-18 years. Relationships among food intake, food quality, and nutritional status have not been analyzed.

5.7 Chapter summary

People in rural agricultural areas get obtain food partly from home gardens and farms in addition to market sources. Main source of food supply of people in urban and semi urban areas is the market. Limited evidence is available for assessing the relationship between neighborhood and community access to food retail settings and individuals' dietary intake. Food commonly consumed outside home are bread, cakes, rolls, *Wade*, pastries and vegetable roti by different population segments. Guidelines have been developed and disseminated to establish and upgrade the workplace canteens. The limited evidence is available for assessing the impact of canteen guidelines in promoting health among students in Sri Lanka. School based approaches such as school canteen policy and school nutrition programmes are in practice but limited published evidence is available on assessment of the implementation of School Canteen Guidelines. There is also limited published evidence available on impact assessment of policies that affect the dietary intake, quality, behaviours and/or preferences of students, or on their weight status in Sri Lanka.

There is practically no information on type and quantity of foods consumed from the home garden. This also has implications on the contribution of females to subsistence level agriculture and recognition of women as major food producers at household level (FAO Sri Lanka Country Gender Assessment in Agriculture and Rural Sector, 2019)

In summary, the food environment and its influence on food consumption patterns and dietary quality needs in depth study and analysis, which should be accurately documented and freely

available. If the food environment has to be improved as an enabler of proper food consumption, a study on dietary intake has to be undertaken without delay.

5.8 Limitations

- No evidence is available on assessing impact of approaches to prevent diet related diseases in early care and development programs for children ages 2-5 years
- Information from a national level dietary survey is not available to assess the type of foods consumed by people outside home
- The limited published evidence is available on assessment of school-based approaches that affect the dietary intake, quality, behaviors and/or preferences of students, or on their weight status in Sri Lanka

5.9 Future Research needs

- Need to assess the impact of approaches to prevent diet related diseases in early care and development programs for children less than 5 y
- Need to conduct research find the type of foods consumed by people outside home
- Need research on relationship between dietary intake, physical activity pattern and impact on weight status of students.
- National survey need to be conducted to assess efficacy of canteen policy to enhance positive health outcomes of students

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