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Food Safety and Standards Authority of India

(A Statutory Authority under the Ministry of Health and Family Welfare, Govt. of India)

FDA Bhawan, Kotla Road, New Delhi-110 002

Dated, the 04th May, 2017

Note

1. To address holistically the issue of High Fat, Sugar and Salt (HFSS) in food and associated health risks, FSSAI constituted an Expert Group that included eminent experts from the fields of medicine, nutrition, and dietetics representing well known medical research and academic institutions.

2. After intensive deliberations and interactions between the members, the Expert Group prepared a draft report on the above subject. The Expert Group also considered the comments and suggestions of the stakeholders' representatives nominated by the Ministry of Food Processing Industries and the Ministry of consumer Affairs and Public Distribution and international and national reviewers.

3. The report of the Expert Group after incorporating the comments and suggestions was approved by the Scientific Committee of FSSAI.

4. The report with its gist is placed at Annexure for the information of general public.

4.5.17

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Enclosure: as above

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GIST OF THE REPORT OF EXPERT GROUP ON CONSUMPTION OF FAT, SUGAR AND SALT AND ITS HEALTH EFFECTS ON INDIAN POPULATION

Introduction: Non communicable diseases (NCD) like diabetes, hypertension and cardiovascular diseases in India account for about 53% of all deaths and 44% of disability-adjusted life years (DALYs) with estimates of such deaths likely to register a sharp increase of over 8 million in 2020 from less than 4 million in pre-2000 period. Demographic changes, changes in lifestyle along with increased urbanization are the major reasons responsible for the tilt towards these diseases.

The major constituents of foods namely high saturated and trans fats, sugar and salt intake are known to significantly increase the risk of chronic diseases. Adverse health effect of consumption of fast foods which have high content of fats, sugar and salt (HFSS), commonly referred to as 'junk foods', on consumers, particularly in young children, has become a cause of concern.

Background: Hon'ble High Court of Delhi had directed the FSSAI to issue directions or guidelines on the subject qua the school children in WP (C) 8568/2010 titled as 'Uday Foundation for Congenital Defects and Rare Blood Groups V/s Union of India and Ors'. In compliance of the above Order, the FSSAI, issued 'Draft Guidelines for making Available Wholesome, Nutritious, Safe, and Hygienic Food to School Children in India'. Apart from this Consumer organizations have made representations to FSSAI regarding HFSS in several food products in the market.

To address the problem holistically, an Expert Group with 11 members included eminent experts from the fields of medicine, nutrition, and dietetics representing renowned medical research and academic institutions was constituted by the Food Safety and Standards Authority of India (FSSAI), an autonomous unit of the Ministry of Health and Family Welfare (MoHFW)

(i) To advise on:

a) The health risks associated with high intake of FSS
b) Current dietary intake of FSS in Indian population
c) Current levels of FSS in Indian food products in the market
d) Potential health risks to vulnerable groups from consumption of high levels of FSS in food products in India

(ii) To provide recommendations on:

a) Healthy dietary intake of Fat, Sugar and Salt;
b) Regulatory limits for Fat, Sugar and Salt in food for manufacturing, processing, import, and/or marketing;
c) Labelling requirements for packaged food;
d) Prescription of regulations for display of Fat, Sugar and Salt in food products sold/ served in eating joints/ catering facilities.

The comments and suggestions of the representatives of stakeholders nominated by the Ministry of Food Processing Industries, the Ministry of consumer Affairs and Public Distribution, and the Centre for Science and Environment and five international and national reviewers were also considered before finalising the report.

Salient features of the Report:

The Food Safety and Standards Act, 2006 does not define the term "junk food". It popularly refers to foods which have no positive nutritional value and in fact when consumed regularly may raise this risk of chronic diseases. These foods are also known as "fast foods". Indian deep fried snacks like samosa, pakoras, etc. and western snacks like burgers, pizzas, chips, sugar-sweetened beverages, all come under the junk food category.

The report recommended having balanced diet which should provide around 60-70% of total calories from carbohydrate, 10-12% from protein and 20-30% from fat and also highlighted the inadequacy of data due to lack of good quality studies from India which prevented making any causal inferences.

This report serve as a guideline document for all the stakeholders, including industry, FSSAI and the consumers in rationalizing the consumption of fat, sugar and salt through processed food products, and thereby, help reduce the burden of chronic diseases in the Indian population. After reviewing Indian studies, government reports and international evidence, the committee summarized the following recommendations;

1. Nutrient specific guidelines:

A) Fats:

- Total fat (visible and invisible) intake in the daily diet:- 20-30% of total calories (e.g for a 2000 kcal diet, total fat should be ≤ 60 g/day).
- Out of the total energy intake per day Saturated Fatty Acids levels should be <10%; Poly Unsaturated Fatty Acids 6-10%, Trans Fatty Acids must be less than <1%; Mono Unsaturated Fatty Acids by difference (about 5-8%).

Encourage the consumption of:

- MUFA & PUFA in everyday diets (e.g. the source of omega 3 fatty acid includes fish, mustard oil, flaxseeds, walnuts etc.)
- Low fat milk and dairy products.
- Cooking oils in rotation basis and blended oils.

Limit the use of:

- Foods containing partially hydrogenated vegetable oil such as bakery products, crackers, cookies, biscuits etc.
- Deep fried foods such as samosas, pakoras, chips, fries, etc.

B) Sugars:

- Indian adults should aim to keep their added sugar intake to about 20-30 g/day.
- Sugar intake in the daily diet: <10% of the total calories (e.g. for a 2000 kcal diet, ≤50 g/day which is the equivalent of around 12.5 teaspoons. (WHO))

Encourage consumption of complex carbohydrates and natural sugar found in fruits and vegetables.

Limit the intake of simple sugars which come largely from sugar sweetened beverages and processed snacks with high added sugar content.

C) Salt: Added salt should be restricted to about 5-6 g/day (ICMR & WHO).

Encourage consumption of inexpensive, seasonal and locally available fresh fruits and vegetables since fruits and vegetables have natural potassium which improves the sodium potassium ratio.

Avoid salt rich foods such as snacks, pickles, dips and chips etc.

2. Reliable monitoring systems to assess FSS intake periodically: Periodic monitoring of FSS intakes at national level to get evidence and establishing regulatory limits.

3. Ban on foods with high FSS Advertising on children's channels or during children shows is urged.

- Progress towards total ban as being done in some countries like Chile.

- Celebrity endorsements of such foods should be discouraged.
- Sensitize the online social media websites to comply with the advertising ban on unhealthy foods.

4. **Imposition of additional tax on the purchase of ultra-processed commodities and sugar sweetened beverages**: Imposing additional tax on the purchase of commodities such as pre-packaged foods with high salt and fat content, sugar sweetened beverages, etc., can be a pragmatic approach to reduce their intake.

5. **Nutrition education and awareness:**
   - Need a multifaceted approach with policy convergence between nutrition, agriculture, food industries, health and allied sectors to bring about significant reduction in FSS intakes at large.
   - Raising consumer knowledge and awareness through public health campaigns, school education programs etc. to make healthier food choices among population.

6. **Advocating reformulation of commercialized products**: Industry should be encouraged for voluntary reformulation of food products to reduce the contents of fats i.e. saturated fats and trans fats, sugar (free sugars) and salt in packaged food.

7. **Role of positive nutritional labelling** plays an important role in creating awareness among the population in order to make healthier food choices. The following information's should be made mandatory for the labelling:
   - Total calories (Energy value)
   - Amounts of carbohydrate, sugars, fat, protein, sodium, dietary fibre
   - Amount of trans fat added in food

8. **Provide a nutrition-sensitive and an enabling environment to make healthier choices** for consumer to switch to better eating patterns by syncing the health sectors, agriculture and food systems.

Report of The Expert Group on Consumption of Fat, Sugar & Salt & its Health effects on Indian Population

FOOD SAFETY AND STANDARDS AUTHORITY OF INDIA

Inspiring Trust, Assuring Safe & Nutritious Food

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Abbreviations, Acronyms and Symbols

ALA	Alpha linolenic acid
CHO	Carbohydrate
CU	Consumption Unit
FAO	Food and Agricultural organization of the United Nations
FSANZ	Food Standards Australia New Zealand
FSSAI	Food Safety and Standards Authority of India
FSS	Fat, Sugar and Salt
GI	Glycaemic Index
HOMO-IR	Homeostatic Model Assessment- Insulin Resistance
ICMR	Indian Medical Council of Research
IGF	Insulin-like Growth Factor
IL-6	Interleukin 6
LA	Linoleic acid
MoHFW	Ministry of Health & Family Welfare
MUFA	Monounsaturated Fatty Acid
N-3	Omega 3 fatty acids
N-6	Omega 6 fatty acids
NIN	National Institute of Nutrition
NNMB	National Nutrition Monitoring Bureau
NSSO	National Sample Survey Organization
PUFA	Polyunsaturated Fatty Acid
SSB	Sugar sweetened beverages
TFA	Trans Fatty Acids
T2DM	Type 2 Diabetes Mellitus
WHO	World Health Organization
WCRF	World cancer research fund

>greater than

<less than

≥equal to or greater than

≤equal to or less than

Definitions

1. **Balanced diet:** A balanced diet is one which contains all the nutrients in desirable quantities and proportions, including macronutrients such as carbohydrates, proteins, fats, and micronutrients such as vitamins, minerals and antioxidant, in addition to roughage or fiber. This can be attained by consuming the right proportion and blend of the four food groups such as cereals, millets and pulses; vegetables and fruits; milk and milk products, egg, meat and fish and oils & fats [1].
2. **Unhealthy diet**: Unhealthy diet is one which is high in sugars, sodium, saturated and transfats, and low in fibre.
3. **High fat:** This is a highly contentious issue in current times. The intake of fat above 35% of total energy has been suggested as high fat by some institutions (FAO/WHO 2008; ICMR 2010). However the ceiling on total fats was recently removed from the USDA guidelines (2015). The majority of fats consumed in the diets should be unsaturated fats. Awareness should be created regarding transfats in deep fried foods The Mediterranean diet which is considered one of the healthiest diets containsmore than 35% fats.
4. **High sugar:**High sugar is defined as high sugar intake.The intake of sugars above 10% (>50 grams of sugar) of total energy intake per day[2].

   Sugar is found in our diets in a variety of ways:

   - Naturally built into the structure of foods such as fruits and vegetables.
   - Naturally present in milk and milk products.
   - As ‘added-sugar’ refers to sugars and syrups added to foods and drinks during processing and preparation.
   - As ‘free sugars’, refers both to added sugars, like sucrose or table sugar, and sugars naturally present in honey, syrups, fruit juices and fruit concentrates. Most free sugars consumed are added to foods and drinks. Free sugars do not include sugar that is naturally built into the structure of foods or sugars naturally present in milk and milk products.
5. **High salt:** The intake of salt above 6g/day (>2g/day sodium)is considered as high salt by WHO[3-5].
6. **Junk food:** The food safety and standards Act 2006 does not define the term “junk food”[6]. This term has entered from common lay man usage to scientific community.

It popularly refers to foods which have no positive nutritional value and infact when consumed often may lead to several health problems (raise risk factors for chronic diseases)[7]. They are also known as “fast foods”. Scientifically this concept of junk foods overlaps with ultra- processed foods which are also quite high in fats, sugars and salt. We have refrained from using the term in this scientific report but we do acknowledge that this term is commonly used and more understood than ultra - processed foods. Indian deep fried snacks like samosa, pakoras, etc. and western snacks like burgers, pizzas, chips, sugar-sweetened beverages, all come under the junk food category.

7. **a. Processed foods:** Any food that has been altered from its natural state by different processing methods. The term processed foods is usually viewed equivalent to junk foods but scientifically there is a huge difference. Many foods are minimally processed to enable them to be consumed. Thus not all processing methods and processed foods are deleterious to health.

   b. Ultra-processed food products: Ultra-processedare food products that are “ready-to- eat” and “ready-to- heat and eat” foods derived through various techniques such as baking, frying, extruding, moulding, hydrogenation and so on [8]. These foods are created by special processes to make food attractive, hyper palatable, cheap, ready to eat. Such products are characteristically energy dense, fatty, sugary or salty and generally obesogenic/ increasing the risk of chronic disease. They also contain various combinations of preservatives; stabilizers, emulsifiers, solvents, binders, bulkers, sweeteners, flavour enhancers; processing aids; colours and flavours [9].**Examples of ultra-processed food products:** Chips, samosa, vada, pakoras, deep fried Indian snacks, French fries, many types of sweet, fatty or salty snack products; ice cream, chocolates, candies (confectionery); burgers and hot dogs; poultry and fish ‘nuggets’ or ‘sticks’ (‘fingers’); mass-manufactured breads, buns, cookies (biscuits); breakfast cereals; pastries, cakes, cake mixes; ‘energy’ bars; preserves (jams), margarines; desserts; canned, bottled, dehydrated, packaged soups, noodles; sauces; meat, yeast extracts; soft, carbonated, cola, ‘energy’ drinks; sugared, sweetened milk drinks, condensed milk, sweetened including ‘fruit’ yoghurts; fruit and fruit ‘nectar’ drinks; instant coffee, cocoa drinks; no-alcohol wine or beer; pre-prepared meat, fish, vegetable, cheese, pizza, pasta dishes; infant formulas, follow-on milks, other baby products; ‘health’, ‘slimming’ products such as powdered or ‘fortified’ meal and dish substitutes [9].

8. **Unprocessed foods**: Those foods which can be consumed with minimal or no processing. Most unprocessed foods: 1) are highly perishable and cannot be stored for a long time and; 2) require intense culinary processing (preparation, seasoning, mixing with other foods, and cooking) to be digestible, safe, and palatable[9, 10].
9. **Children:** 5 to 12 years of age.
10. **Adolescents:** 13 to 17 years of age.
11. **Adults:** 18 years and above.

Executive Summary

India has made tremendous economic progress in the past few decades. However,despite this economic boom, malnutritioncontinues to remain a major problem. Both forms of malnutrition – underweight and overweight/obesity are coexistent in India. To exacerbate this dual burden, Indian children and adults are also grappling with multiple micronutrient deficiencies. It is also estimated that of the 64 million estimated deaths in India in 2015, a staggering 41 million could be attributable to chronic diseases[11, 12]. This disconnect between economic growth and various forms of malnutrition is puzzling and more so when we compare India to countries with similar or slower trajectory of economic growth.

Against this backdrop, it becomes imperative to assess the country's nutrition and public health policies. India's national nutrition policy formulated in 1993 has been instrumental in getting national and international attention to the problem of under-nutrition, stunting and wasting among children. However, the existing policy fails to provide vision and urgent steps that are needed to tackle the rising problem of overweight and obesity due to increasing urbanization, sedentary lifestyles and unhealthy diets. Thus we need to recognize and formulate strategies to reduce the burden of risk factors that fuel the chronic disease epidemic. One such established risk factor is unhealthy diet, especially those high in trans and saturated fats, refined sugars and salt. Evidence from long term cohort studies and high quality intervention studies worldwide indicates that if these unhealthy nutrients (foods with high FSS) are consumed repeatedly by young children, they become prone to developing chronic diseases earlier in their adult life than those consuming balanced diets (rich in fresh fruits and vegetables, complex carbohydrates etc.).

In the development of this report, the first step involved a situation analysis of how much fat, sugar and salt (FSS) are being consumed and what impact do they have on the health of Indians. For this, a systematic review was undertaken which highlighted inadequacy of data due to lack of good quality studies from India. From our search we identified 58 studies from the last decade which were largely observational (mostly cross sectional) in nature. This prevented us from making any causal inferences. A crude average of the nutrient consumption based on the included studies suggested that Indian adults consume about 47.9and 57.1 g/d of total fats (fixed and random effects), 264and 257.2 g/d carbohydrates (fixed and random effects), 54 and 50 g/d sugar (fixed and random effect) and 8 and 9 g/d of

added salt (fixed and random effect). This gives us a rough national average for an adult which is on the higher side for all the three fractions. We urgently need more convincing high quality data from India which currently is lacking. In the absence of high quality data from rigorously conducted studies and very few published in peer reviewed journals, it is advised that further research in this area is undertaken. Evidence from other countries can help generate hypotheses to be tested in well designed and adequately funded studies. The adverse health impact of high consumption of FSS was seen from a few of the included studies but enough evidence exists in the global scientific literature and that should be applicable as the biology is the same. We must be cautious in interpreting too much from this small review done by the group as the quality of studies included therein is not very high. After reviewingIndian studies, government reports and international evidence, the committee summarized the following recommendations. Our overall aim was to ensure that we collectively move towards ensuring calorically adequate and nutritionally appropriate sustainable diets for all individuals at each stage of his/her life course.

Summary of the salient recommendations: The advice given below should be within an overall framework of healthy dietthat isbalanced, rich in locally available and in-expensive fruits and vegetables, whole grains cereals including traditional millets along with an active lifestyle.

Nutrient specific recommendations: Overall moderation and a healthy balance of all nutrients are encouraged. Locally available fresh fruits, vegetables, whole grains and pulses should be included in everyday diet across all age groups.

- **Fats-** Fats should be largely consumed in the unsaturated form. The consumption of unsaturated fatty acids especially the long chain mono- and poly -unsaturated- fatty acids should be encouraged in everyday diets (examples of such fats are provided in Chapter 5).
- **Sugars-** A total of 10% of total energy is allowed as added sugars in our daily diet. Simple sugars and refined carbohydrates should be reduced. These come largely from sugar sweetened beverages and processed snacks with high added sugar content. Complex carbohydrates and natural sugar found in fruits and vegetables should be encouraged for good health. Refined cereal consumption should be limited and whole grain consumption should be encouraged.

Foodswith high FSS, processed snacks, sugar sweetened beverages includingcolas should be avoided.

- **Salt-** Excess sodium intake is an important determinant of hypertension and cardio-vascular (CV) risk. According to WHO as well as ICMR NIN, added salt should be restricted to about 5-6g/ day. The recommended strategies for reduction inchronic diseases include gradual reduction incurrent salt intakesby 30% over the next 10 years. For population-wide recommendation of sodium intake, lowering sodium intake from high intakes (>5g/day) to moderate intakes (3-5g/day) is associated with lower blood pressure and lower CVD in observational studies. Fruits and vegetables have natural potassium which improves the sodium potassium ratio; and therefore,consumption of inexpensive, seasonal and locally available fresh fruits and vegetables should be encouraged. Avoidingprocessed foods, snacks, chutneys, pickles, dips and chips and so on can result in sodium restriction. Gradual reduction in commercial and home cooked recipes for salt can go a long way in reducing the intake without affecting the sensory appeal.

- Reliable monitoring and surveillance system to assess FSS intake. Periodic monitoring of FSS intakes at national level will facilitate the much needed evidence and basis for establishing regulatory limits in food for manufacturing and sale.
- Advertisement ban for foods high in FSS during children TV shows or kids TV channels' is urged.In fact, we should progress towards total ban law as being done in a few other countries like Chile. Celebrity endorsements of such foods need to be discouraged. The online social media websites should also comply with advertising ban for unhealthy foods.
- Additional tax on highly processed commodities and sugar sweetened beverages. Imposing additional tax on the purchase of commodities such as pre-packaged foods with high salt and fat content, sugar sweetened beverages, etc., can be a pragmatic approach to reduce their intake.
- Nutrition education and awareness. A multifaceted approach with policy convergence between nutrition, agriculture, food industries, health and allied sectors is warranted to bring about significant reductionin FSS intakes at large. Raising consumer knowledge and awareness through public health campaigns, school education programs can be a helpful approach to make healthier food choices among population.

- Advocating reformulation of commercialized products.Encourage voluntary reformulation of food products to reduce the contents of fats (i.e. saturated fats and trans fats), sugar (free sugars) and salt in packaged food.
- Positive nutritional labelling plays an importantrole in creatingawareness among the population in order to make healthier food choices. Detailed guidance from FSSAI's panel constituted specifically for labelling issues is sought. The draft regulations on labelling by FSSAI need to become directives and enforced stringently.
- Provide a nutrition-sensitive and an enabling environment to allow a consumer to make healthier choices in a sustained fashion.

It is expected that this report will serve as a guideline document for all the stakeholders, including industry, FSSAI and the consumer in rationalizing the consumption of fat, sugar and salt through processed food products, and thereby help reduce the burden of chronic diseases in the Indian population.

Chapter 1
Background

Chronic diseases including cardiovascular and respiratory diseases, mental disorders, diabetes, and cancers and injuries are the leading causes of death and disability in India—their burden will continue to increase during the next 25 years as a consequence of the rapidly ageing population in India [13, 14]. Demographic changes, changes in the lifestyle along with increased rates of urbanization are the major reasons responsible for the tilt towards the chronic diseases[15]. Non communicable diseases (NCD) in India account for about 53% of all deaths and 44% of disability-adjusted life years (DALYs) with estimates of such deaths likely to register a sharp increase of over 8 million in 2020 from less than 4 million in pre-2000 era[16]. The projected cumulative loss of national income for India due to NCD mortality for 2006–2015 was quoted to be about USD237 billion. By 2030, this productivity loss is expected to double to 17.9 million years lost. It is also estimated that of the 64 million estimated global deaths in 2015, a staggering 41 million will be from chronic diseases[12].

Most chronic diseases are common and often occur as co-morbidities. Risk factors for chronic diseases are highly prevalent among the South Asians particularly the Indian population[17]. One of the most important and modifiable risk factors is unhealthy diet[18]. India is in the midst of fighting several battles when it comes to adequate nutritional status and public health nutrition. Co-existence of multiple forms of malnutrition is a common feature, exacerbated by the globalisation, urbanization and related nutrition transition[19]. The current rise in chronic diseases along with the unfinished agenda of under nutrition and micronutrient deficiencies warrants a closer look at the modifiable risk factors like the unhealthy diets[20]. This mandates a closer look at what we eat currently and how best we can incorporate healthier choices/options. This may require mapping of actual consumption of several nutrients which constitute the basic diet[21].

Diet is a complex entity. We usually break it down into nutrients and fractions for deriving specific roles and actions but in the real world, we consume food items and that too in combination with several other foods and beverages. It is difficult and unwise to label all nutrients as healthy or unhealthy. Three fractions- FSS have been associated with adverse events in the long run.It will be useful to collate evidence on consumption of FSS at national and individual levels. In addition to this, epidemiologic evidence relating these nutrients to

actual disease or risk factor development is also vital to analyse. These data are also critical from the standpoint of making any recommendations or suggestions to the healthy or safe consumption limits of these nutrients.

It is imperative that healthy dietary habits are promoted early on to avoid later life health risks. Foods high in saturated or trans fats, sugars and salt have been associated with earlier onset of chronic diseases like diabetes, hypertension and cardiovascular diseases [22, 23]. The major constituents of foods- namely high saturated and trans fats, sugar and salt intake are known to significantly increase the risk of chronic diseases. While food consumption patterns are culturally determined, worldwide there has been a shift towards highly processed foods in the last few decades[24, 25]. Food-processing industry traditionally uses high-levels of sugar, salt and saturated fats in their products,a major determinant of nutrition quality in the processing (or ultra-processing) of foods [10]. Given the popularity of theseprocessed foods, increased consumption and the lifelong exposure, their potential to increase chronic diseases cannot be understated.

Therefore, anExpert Group with 11 members was constituted by the Food Safety and Standards Authority of India (FSSAI), an autonomous unit of the Ministry of Health and Family Welfare (MoHFW) to advise it on:

a) The health risks associated with high intake of FSS
b) Current dietary intake of FSS in Indian population
c) Current levels of FSS in Indian food products in the market
d) Potential health risks to vulnerable groups from consumption of high levels of FSS in food products in India

In view of the major diet-related chronic diseases rising,both globally and nationally, this concerted effort can help design effective strategies for tackling this pressing issue.The primary aim of this work was to help FSSAI collate evidence with respect to the high risks associated with high intake of salt, sugar and fat; chart out the current dietary profile in Indian population with potential health risks to vulnerable groups from high consumption of FSS in Indian food products. Key recommendations on healthy dietary intake of FSS, which can form the basis for fixing regulatory limits in food products, for manufacturing, labeling and sale, were also discussed, and have been summarized.

Chapter 2.1

Scientific evidence on fat, sugar and salt (FSS) consumption and their health impact among population

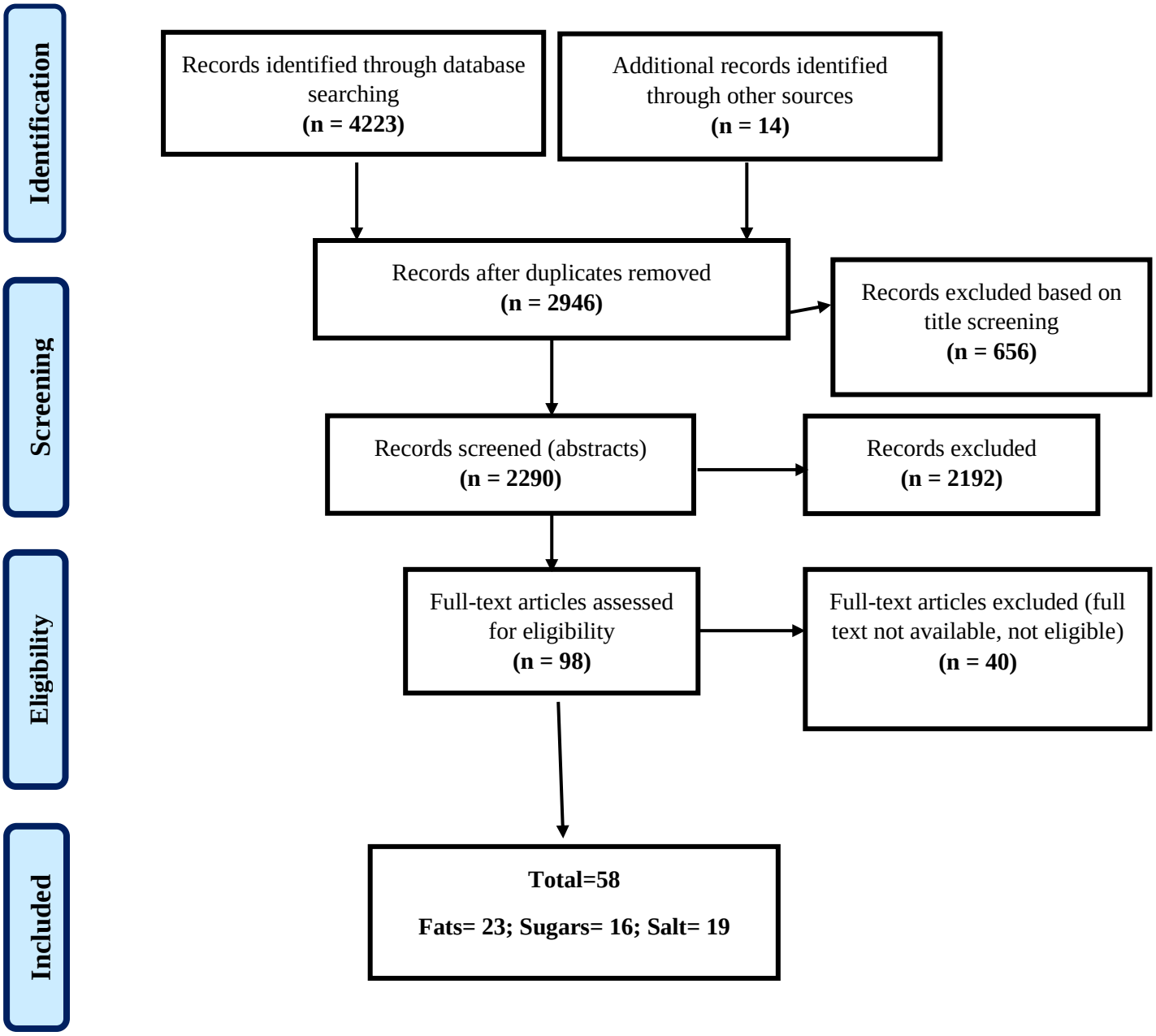
The Process

The first task was to systematically collate Indian evidence on FSS consumption and health effects. Efforts to collect all possible data from published and unpublished region specific, urban, rural, and multi-centric studies from India were made. This systematic review searched available human evidence on consumption and health impact of FSS in the last 10 years (Jan 2005-July 2015) in India. A combination of mesh terms(Annex-6) in two comprehensive databases - PUBMED and EMBASE - were used,and retrieved studies were categorised respectively for each of the three nutrients– fats, sugars, salt (FSS). We found 4223 articles, which after duplicate removal, title and abstract screening were reduced to58 studies for fats, sugar and salt (Table 1). Additional sources were also identified from discussions with experts. Efforts to procure and collate the national databases, survey reports, unpublished large data sets were also undertaken. Inclusion criteria were as follows: English-language publications only, studies in adult and children and males and females of all ages and health conditions, and all study types including reviews. Exclusion criteria included animal studies and those more than 10 years old. Relevant studies cited in review articles or those identified in the search were also considered. Figure 1 shows the PRISMA study selection flowchart.

Detailed quantitative data were extracted from the relevant articles, including the study methods, populations, and outcomes of significance to the review for each of the FSS individually (Annexure 6A, 6B and 6C). A crude mean was computed from the included studies to get some estimates on average consumption of FSS across the nation (Table 2). Not all studies obtained in the systematic review could be included for calculating the crude averages because of limited information provided in those papers. Some had to be excluded because of their concentration on specific fractions within each of the FSS or thereported values on specific populations (pregnant women, population with special needs) etc. We have essentially included studies which have reported consumption values for total fats, carbohydrates or sugar (both averages given separately) and sodium/salt. We computed both

random and fixed effects for each of these and the confidence intervals around the estimated means.

FIGURE 1: PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram.



Major Findings

A. Fats

A total of 23 studies were included- 10 discussing both the consumption and effect of fats on potential health outcomes, 10 mentioning the consumption levels and rest discussing health aspects. The study designs of included studies were: 21 cross-sectional, 1 case-control and 1was a systematic review of 266 country-specific nutrition surveys of dietary fats and oils consumption.Some reported association between high fat (mostly saturated) intake and cardio-metabolic risk (either in the form of obesity, hypertension or insulin resistance). Most studies present intake values as per cent of total energy intake. The dietary assessment was not the primary objective in most of these studies and thus the associations may be underpowered in the identified observational studies. Most studies included 25 year and older adults. A healthy population was surveyed/ recruited in almost 75% of the studies. Rest 25% studies were conducted on subjects with some medical conditions. In almost all the studies, the dietary assessment was either using 24 hour recall sheet for 2 days or food frequency questionnaires (FFQs). In few studies, associations between dietary fat and some biochemical parameter viz. total cholesterol, triglycerides LDL, VLDL and HDL were examined. Fasting blood samples were collected from most of the participants and estimation was largely done through enzyme based assays.

In summary, most studiesshowed that there was higherthan recommended intakes of total and saturated fats. The increasing trends were reported for men and women from both urban and rural settings (though more studies were from urban areas). The sources of fats were not separately reported in most studies. In a few, it was specified that fat intake was high due to increased consumption of out-of-home food, processed and fried foods etc. Regarding associations, most high fat intakes were associated with increased biochemical lipid fractions in the body. One study associated increased fat with breast cancer risk too.

B. SUGARS

A total of 16 studies were included- 2 on health effects, 6 on consumption and 8 on both. A total of twelve studies discussing either consumption of sugar and/or its impact on health were included in the review. Of these 16 studies, 10 were cross-sectional, 3were interventions, 2 were clinical observational and 1 each was case control. The sample size ranged between 15-4624 participants. A total of five studies discussed consumption pattern only, two discussed only the health impact, whereas, five discussed both consumption and its

impact onhealth. Of the 12 studies, three each were set in eastern (West Bengal) and western region, two in the southern and one in the northern region of the country, with the remaining 3 being multi-site studies. Most studies mentioned carbohydrate and not actual sugar intake. Most reported intake of more than 200g/d total carbohydrates (more than 60% of energy coming from total carbohydrate).**In the absence of fractions and details about simple and complex carbohydrate intake, much inference could not be derived.** These studies largely recruited diabetic patients.

In the studies that discussed the consumption pattern (both with and without the health impact), the carbohydrate intake varied between 108-238 g/day. The studies assessing the health impact of consumption of carbohydrates demonstrated that carbohydrate intake was positively associated with Homeostatic model assessment – Insulin Resistance (HOMA-IR), Interleukin 6 (IL-6), Insulin- like Growth Factor (IGF) and so on.

In summary, most studiesshowed that higher than recommended intakes of total carbohydratewas being consumed by Indian adults. The simple and complex carbohydrate fractions were not separately reported in most studies. Regarding associations, most high carbohydrate intakes were associated with increased biochemical fractions like fasting blood sugar, glycosylated haemoglobin and HOMA IR. Data on actual free/ added sugar intake was scarce. However, from the available literature, the intake was much higher in southern compared to northern regions of the country.

C. SALT

A total of 19 studies were included - 7 on effects, 10 on consumption and 1 on both. In addition one systematic review on global, regional and national sodium intake was also included. Association of higher salt intake with hypertension was discussed in most studies. The designs wereeither cross sectional or case control for most studies. Most studies did not report the 24 h urinary sodium levels which are considered the gold standard for sodium/salt intake estimation. The usual dietary assessment methods (Food Frequency Questionnaire (FFQ), 24 h diet recall, and fooddiaries) are known to underestimate the consumption levels. The salt intake was quite high in most studies. The regional variations in salt consumption as expressed by cultural dietary practices were also reflected (drinking of salt tea in Kashmir, Assam etc.). The high salt levels from observational studies also suggested a rise in processed food consumption and frequent eating out trends among younger populations in India. A few

case control studies have looked at the association between high salt intake and oesophageal cancers [26, 27].

Limitations:

The results of a systematic review yielded 58 (largely observational) studies (Annex-6). A crude mean was computed for each nutrient from the included studies. On an average, Indians consume approximately 47.9 and 57.1g/d of total fats (fixed and random effects), whereas, daily intake of total carbohydrates, sugars and salt were estimated to be 264and 257.2 g/d carbohydrates (fixed and random effects), 54and 50 g/d sugar (fixed and random effect)and8 and 9 g/d of added salt (fixed and random effects). All these values are higher than recommended intakes by the NIN, ICMR. The exact fractions of FSS were not very clear from the included studies. Most of the studies were retrieved from the two databases (PUBMED and EMBASE), and some additional information provided by the subject experts were included. Quality issues of most included studies are also an important limitation. Other observations include:

1. Small group of investigators publishing multiple papers from the same dataset.
2. Small and weakly designed studies were commonly published.
3. Mostly, estimation of consumption of FSS was not the primary objective. These were subset analyses of data collected for other purposes.
4. Appropriate statistical measures were not employed in all papers.
5. Lack of replication

Our systematic review included only English language publications largely from the two databases. A meta-analysis could not be undertaken due to the variability or heterogeneity in designs and methods used. The results should be viewed in the light of these limitations. However, overall there was a dearth of good quality epidemiologic and intervention studies from India in the area of public health nutrition. We urgently need long term cohort studies with more emphasis on intervention trials for good quality data.The existing literature from other government reports, working papers and international studies is included in the next chapter.

Table 1: Study designs of the included studies

Study design	Fats (n=23)	Sugar (n=16)	Salt (n=19)	Total (n=58)
Cross-Sectional	20	10	15	45
Intervention	None	3	None	3
Cohort	None		None	
Case-Control	2	1	3	6
Clinical observational	None	2	None	2
Systematic Review	1	None	1	2

Table 2: Derived current consumption levels (crude average of the included studies)

Nutrient	Consumption (g/d)			RDA
	Average population (n)	Fixed effect	Random effect	
Total Fats	819	47.9 [47.85-47.96]	57.1 [53.86-60.38]	30% of total energy (recommendations for SFA and PUFA)
CHO	1083	264 [262.02-265.36]	257 [229.19-285.28]	For CHO, 50-60% of total calories recommended
Sugar	2039	54 [53.76-54.12]	50 [43.34-56.59]	For sugars, less than 10% of total calories (energy intake) per day for both children and adults
Salt[%%]	1362	8[7.81-8.01]	9[7.76-9.56]	5-6 g

***Value in parentheses are 95% confidence interval of parameter estimate**

[%%]Salt estimates are excluding the study on Assam workers byMahanta et al.

Chapter 2.2

Evidence from national and international reports

2.2.1 National Reports

a) National Nutrition Monitoring Bureau (NNMB, 2012)

The prevalence of hypertension was 22% among men and women (SBP ≥140 mm Hg and / or DBP ≥90 mm Hg). The prevalence of hypertension was high (26-30%) in the States of Kerala followed by West Bengal and Maharashtra. The reported prevalence of diabetes mellitus was 8.2% and 6.8% among adult men and women.

According to NNMB 2012 data, the average consumption of fats and oils among household was 15g/CU/day, against the recommended level of 20g/CU/day, whereas, for sugar and jaggery it was found to be 13g/CU/day, against the recommended level of 30g/CU/day.

b) National Institute of Nutrition, ICMR:

Assessment of Consumption of Processed and Non-processed Foods in India (2010-2011)

- **Average consumption of foodstuffs among children in urban India (1-9 years):** The average intake of fats and oils was 13g/day among children aged 4-9 years which was higher as compared to children aged 1-3 years. Also, the average intake of sugar and jaggery was 13g/day among children aged 7-9 years.
- **Average consumption of foodstuffs (g/day) among adolescents in urban India (10-17 years):** The average intake of fats and oils was 19g/day among adolescents aged 13-17 years which was higher as compared to adolescents aged 10-12 years. Also, the average intake of sugar and jaggery was 14g/day among adolescents aged 13-15 years which was relatively higher.
- **Average consumption of foodstuffs (g/day) among adults in urban India (18- ≥60 years):** It was observed that the average intake of fats and oils, sugar and jaggery was higher among adults ≥ 60 years of age. The average intake of fats and oils was 27g/day, whereas, the sugar and jaggery intake was 15g/day.

Ultra-processed Foods

- **Average daily consumption of processed foods (g or ml /day) among urban population:**The mean intake of fried snacks (18.93 g/d) and sweets (12.2%) was higher in HIG, whereas, the mean intake of chat items (savory snacks, largely from roadside sources)10.18% was higher among LIG group. Highest consumption of Bakery items (12.89 g/d) was observed in slums.
- **Consumption of processed foods (g or ml/day) among urban population in India by socioeconomic group:** It was observed that fried snacks (75 g/d) and sweets (44.3 g/day) was highly consumed among LIG, whereas, chat items (42.3 g/day) were highly consumed among industrial labour workers. Bakery items (60g/day) was highly consumed in slums

Table 3: Consumption of processed foods (g or ml/day) at 95th percentiles among urban population in India by socioeconomic group

Food group	HIG	MIG	LIG	ILW	Slums
Fried Snacks	61.0	55.6	**75.0**	53.8	68.5
Chat items	32.0	31.4	35.4	**42.3**	32.6
Bakery Items	12.2	6.0	27.2	16.1	**60.0**
Sweets	40.0	30.8	**44.3**	36.3	28.6

- **Trans fat level in high riskprocessed foods**: It was observed that the TFA level was higher in puff (0.04-0.18) followed by biscuit (0-0.132) and cake (0.002- 0.111).

c) Nutritional analysis of junk food by CSE [28]- This report also advises against theconsumptionofunhealthy junk foods especially by children. They found unacceptable and high levels of all three fractions- salt, sugar and fats (trans fats). They urge for stricter labeling rules too. According to them none of the takeaway foods like pizzas burgers, fries,and potato chips provide nutritional informationon the product packs. They rightly point out that the absence of nutritional data per/100g makes comparisons between productsdifficult. Theyrecommend mandatory labeling, at least for serving size, trans fats, saturated fats,sugars and salt along with already mandatory labelingof nutritional information for all processed foodsincluding takeaway foods.

2.2.2 International Reports-

A. The Global Nutrition Report 2015[19]: this report embodies examples and evidence of implemented policy actions around the world to improve food environments in the context of obesity, 2004–2015(**Annex-7).**

B. Ending the childhood obesity,WHO [29]:

C. Guideline: Sugars intake for adult and children,WHO[30]

D.Marketing of foods high in fat, salt and sugar to children: update 2012–2013,WHO[31]

E. Mapping salt reduction initiatives in the WHO European Region,WHO[32]

G. Guideline: Sodium intake for adult and children,WHO.[5]

H. curbing global sugar consumption,WCRF[2]

I.Restrict food marketing,WCRF.[33]

Summary of the above reports:

Most of the above reports endorse that foods high in FSS are detrimental to human health and should be restricted. This needs a strong political will, a concerted effort and cooperation from multiple stakeholders. According to FAO/WHO, the recommendation for a maximum intake value of 30-35%E oftotal fat is considered to be prudent. WHO recommends that adults and children restrict their intake of free sugarsto less than 10% of total energy intake per day, which is the equivalent of around 12.5 teaspoons of sugar for adults.As per WHO recommendations, salt intake level should be less than 5 g per person per day for the prevention of cardiovascular diseases. There have been several policies proposed by countries so as to reduce the consumption of foods high in fat, sugar and salt among the population. For instance, policy action taken by United Kingdom on mandatory regulation of broadcast food advertising to children wherethe prohibition on advertisement and product placement of foods high in fats, sugars and salt, as defined by a nutrient profiling model, during TV and radio programmes considered to have 20% or more viewers under 16 years old as compared to general viewing population (sponsorship of TV programmes included). The restrictions came into force in February 2007, with a phased implementation by advertisers by end of 2008. Another example of policy on mandatory requirement that advertisements must carry a health message or warning, in France alltelevision advertising (targeted at children or adults) must be steered by a message on the principles of dietary education as approved by the National Institute of Health Education for Food Products such as processed food and drinks, or food and drinks containing added fats, sweeteners and/or salt. *The messages were defined*

by a 2007 Decree: "For your health, eat at least five fruits and vegetables a day"; "For your health, exercise regularly"; "For your health, avoid eating too many foods that are high in fat, sugar or salt"; "For your health, avoid snacking between meals".

The overall message from most of these international reports points towards a public health benefit in limiting the foods high in FSS. We may not have found too many good quality studies from India itself but since the biologyis likely to be similar, we should be able to extrapolate the international recommendations to Indians. India is witnessing huge rise in the risk factors as well as the chronic disease burden across all age groups. The related public health and nutrition issues need to be addressed urgently to be able to tackle this rising epidemic. This needs stronger policies and their improved implementation, anenabling environment for making better dietary choices, and effective surveillance of risk factors among general and vulnerable populations. We must also invest more resources to get better quality data by conducting well designed intervention studies or surveys.

Chapter 3

Food labeling of packed foods

Food labeling plays a critical role in being a primary interface between suppliers and consumers. It is a finite space subject to an increasing demand to contain more information. Protection of consumers and fair marketing has always been emphasized in all government efforts (in form of policies or guidelines) but poorly implemented. An improvement in nutrition labeling could contribute towards helping to make theexisting point-of-purchase environment more conduciveto the selection of healthy choices. However, suchimprovements must be set within a context of wideraction to promote better nutrition across India.

There is a vast array of literature on food labeling. The detailed review and providing recommendations per say is beyond the scope of this Expert Group. But we have tried to present what currently exists in FSSAI guidelines and also summarized briefly in examples from other countries. This is not exhaustive and needs further work by the Scientific Panel on labeling. Therefore, we request thispanelto take this work forward.

A. India

The salient features of the FSSAI 2011- Draft Regulation on Labeling (claims) especially with respect to FSS are summarized below.

Labeling of pre-packaged Foods:

- Every pre-packaged food shall carry a label containing information as required under these regulations unless otherwise provided;
    - **The name of food:** The name of the food shall be the common or generic name which may additionally include trade name or description of food contained in the package.
    - **Contents** on the label shall be clear, unambiguous, prominent, conspicuous, indelible and readily legible by the consumer under normal conditions of purchase and use. The declarations should be printed or inscribed on the package in such style or type of lettering so as to be boldly, clearly and conspicuously present in distinct contrast to the background of the label.

(a) **The list of ingredients** shall contain an appropriate title, such as the term "Ingredients";

(b) The name of ingredients used in the product shall be listed in descending order of their composition by weight or volume, at the time of its manufacture, as the case may be.

- **Net quantity or net weight**by weight or volume or number, as the case may be, shall be declared on every package of food in metric system;
- **Date marking**

  (a) Best before: The "Best before" shall be declared on every package, unless otherwise provided in these Regulations. No food shall be sold or distributed to a consumer after the best before period.

  (b)Date of manufacture and/or packing: The date including the month and year on which the food product is manufactured, packed or re-packed may be additionally given on the label.

Nutritional information – Nutritional Information or nutritional facts per 100 g or 100ml or per serving of the product shall be given on the label containing the following:—

(i) energy value in kcal;

(ii) the amounts of protein, carbohydrate (quantity of added sugar) and fat in gram (g) or ml;

(iii) the amount of any other nutrient for which a nutrition or health claim is made: Provided that where a claim is made regarding the amount or type of fatty acids or the amount of cholesterol, the amount of saturated fatty acids, monounsaturated fatty acids and polyunsaturated fatty acids in gram (g) and cholesterol in milligram (mg) shall be declared.In additionthe amount of trans fatty acids in gram (g) shall be declared ;

(v) Where the nutrition declaration is made per serving, the amount in gram (g) or milliliter (ml) shall be included for reference beside the serving measure;

Current Provisions under FSS:

a) **Labelling of edible oils and fats:**

The package, label or the advertisement of edible oils and fats may use the expression "Refined Oil" but not any other exaggerated expressions like "Super-Refined", "Extra Refined", "Micro- Refined", "Double-Refined", Ultra-Refined", "Anti-Cholesterol", Cholesterol Fighter", Cholesterol Free", "Cholesterol Friendly", "Soothing to Heart", "Saturated Fat Free" or such other expressions which are an exaggeration of the quality of the Product.

b) **Labelling of sugar:**

- Every package of Dried Glucose Syrup containing sulphur dioxide exceeding 40 ppm shall bear the following label namely,— DRIED GLUCOSE SYRUP FOR USE IN SUGAR CONFECTIONERY ONLY

- Every package of food which is permitted to contain artificial sweetener mentioned in table given in regulation 3.1.3 (1) of Food Safety and Standards (Food Products standards and Food Additive) Amendment Regulations, 2015and an advertisement for such food shall carry the following label, namely,—
    - This contains ..... (Name of the artificial sweeteners).
    - Not recommended for children.
    - (a) *Quantity of sweetener added ...……..... g/100 g.
    - (b) No sugar added in the product.
    - *Not for Phenylketonurics (if Aspertame is added)

c) **Labelling of salt:**

Every container or package of table iodised salt or iron fortified common salt containing permitted anticaking agent shall bear the following label, namely,- IODIZED SALT / IRON FORTIFIED COMMON SALT* CONTAINS PERMITTED ANTICAKING AGENT

Nutritional and Health Claims

- This part relates to use of nutritional and /or health claims made on any food, as defined under Food Safety andStandards Act 2006, and rules and regulations therein, on label irrespective of whether or not the particular food is covered by any individual standard under these Regulations.

- This Regulation shall also apply to nutrition and health claims made on commercial communications including internet, whether in labelling, presentation or advertising (both print andelectronic format) of foods to be delivered as such to the final consumer.

Nutritional claims: Nutrition claim means any representation which states, suggests or implies that a food has particular nutritional properties including but not limited to the energy value and to the content of protein, fat and carbohydrates, as well as the content of vitamins, minerals and other permitted listed nutrients and can be of two types:

a. Nutrient content claim is a nutrition claim that directly or indirectly describes the level of a nutrient contained in a food. (Examples: "contains/source of……."; "high in ……", "rich in……..", "low in ……., etc.)

b. Nutrient comparative claim is a claim that compares the nutrient levels and/or energy value of two or more foods. (Examples: "reduced"; "less than"; "fewer"; "increased"; "more than".)

Health claims:

Health claim means any representation that states, suggests, or implies that a relationship exists between a food or a constituent of that food and health. Health Claims can be of three types: a. Nutrient Function claims, other function claims and disease Risk Reduction claim.

"Health claims (nutrient function) on Food which has fat, salt or sugars in excess of the amounts mentioned in the table below for respective age groups shall alongside the claim also mention that the food is high in one or more of the ingredients in the manner - "This food is high in ……."(to be filled in by sugars or salt or fat.) as the case may be. Moreover, if the claim is based on reduction of any one of these ingredients i.e. salt or sugar or fat but is high in any or both of the other two, then a declaration "this food is low in ……. but high in ……." as applicable shall be given additionally.

B. Global nutrition labelling framework – specific example from Australia

In its policy options to promote healthy diets, the WHO Global Action Plan (GAP) on Prevention and Control of Non-communicable diseases recommends Member States:

Develop guidelines, recommendations or policy measures that engage different relevant sectors, such as food producers and processors, and other relevant commercial operators, as well as consumers, to:

- *Reduce the level of salt/sodium added to food (prepared orprocessed)*
- *Increase availability, affordability and consumption of fruit and vegetables*
- *Reduce saturated fatty acids in food and replace them with unsaturated fatty acids*
- *Replace hydrogenated fats which is asource of trans-fats with unsaturated fats*
- *Reduce the content of free and added sugars in food and non-alcoholic beverages*
- *Limit excess calorie intake, reduce portion size and energy density of foods*

Nutrition labelling is an important component of comprehensive policies that seek to achieve these objectives. Specifically, the GAP recommends that countries:

Promote nutrition labelling, according to but not limited to, international standards, in particular the Codex Alimentarius, for all pre-packaged foods including those for which nutrition or health claims are made

Relevant International Standards

The Codex Guidelines on Nutrition Labelling define nutrition labelling as consisting of both (1) a nutrient declaration and (2) supplementary nutrition information.

(a)Nutrient declarations/panels

The Guidelines were amended in July 2012, and now recommend *mandatory* nutrient declarations for all pre-packed foods, even if no health claims are made. This change is reflective of a global trend, with over 25 countries and the EU now requiring mandatory declaration of nutrient content.[1]

Codex recommends the following be displayed on a mandatory basis, either per 100g/ml, or per serve:

- Energy value (kJ or kcal)

[1] European Council on Food Information, Global Update on Nutrition Labelling 2015, Executive Summary http://www.eufic.org/upl/1/default/doc/GlobalUpdateExecSumJan2015.pdf

- Protein (grams)
- Available carbohydrate (i.e. dietary carbohydrate excluding dietary fibre) (grams)
- Fat and saturated fat (grams)
- Sodium (milligrams), or expressed in salt equivalent as 'salt'(grams) – this has been done in the UK and evidence suggests 'salt' is better understood by consumers
- Total sugars (grams)
- Any other nutrient for which a nutrition or health claim is made
- Nutrients considered to be relevant for maintaining a good nutritional status, as required by national legislation (added sugars, trans-fats, fibre and specific vitamins and minerals are included in some countries and may be relevant here).

(b) Standardised Front-of-Pack labelling as supplementary nutrition information

There is growing opinion that nutrition information should be easier for consumers to understand and use. We suggest that India review leading international examples including Australia's innovative Health Star Rating System as an example of providing easy to understand nutrition information to consumers.

While Codex Guidelines suggest nutrition labels 'should not lead consumers to believe that there is exact quantitative knowledge of what individuals should eat in order to maintain health', they also recognise that supplementary nutrition information may be provided to 'increase the consumer's understanding of the nutritional value of their food and to assist in interpreting the nutrient declaration.' The Guidelines recognise countries may differ on the content of information provided, but note such information should usually be provided *in addition to* the nutrient declaration, and be accompanied by education programmes to increase consumer understanding and use.One approach to provision of supplementary information is through Front-of-Pack (FOP) labelling schemes. There is ongoing discussion on which format is most effective in influencing consumer behaviour (e.g. traffic light labels, healthy choice symbols, daily intake guides), but general agreement that using a standard format is preferable to a multitude of different nutrition labels for consumers.

Australia began implementation of its 'Health Star Rating' (HSR) system in June 2014. The HSR system was collaboratively developed by government, public health groups and (unlike

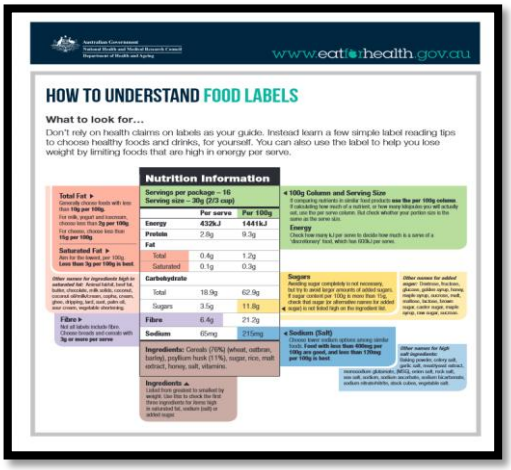
a previous attempt to develop traffic-light-labelling before it) also with industry input. The HSR system uses an algorithm to rate the overall nutritional profile of packaged foods and assigns a rating from ½ a star to 5 stars. Drawing on a product's nutrient composition (measured per 100g), the system factors in total energy (kJ), saturated fat, sodium and (total) sugar, as well as fibre, protein and 'fruit, vegetable, nut and legume content' to allocate points in half star increments. The simple message for consumers is 'more the stars, the healthier the choice'. Although the HSR is currently voluntary, uptake has been promising, with major supermarket retailers and some large companies publicly committing to roll out HSR on full product lines. There is also anecdotal evidence that some high-profile products are being favourably reformulated to achieve a higher star value.

Implementation and enforcement

Effective implementation and enforcement of the chosen intervention are vital. Industry must be given clear guidance on how to generate and display nutrition information in accordance with any voluntary or mandatory guideline. Enforcement responsibilities should be clearly delegated to an appropriate authority. Where resources are limited, consideration may be given to the role of non-government organizations or industry-competitors in supporting government enforcement by drawing attention to suspected cases of non-compliance.

In Australia, enforcement of the national Food Standards Code requirement for nutrition labelling is mostly borne by state level food authorities, with support from the Commonwealth Department of Agriculture for imported food, and the Australian Competition and Consumer Authority where misleading and deceptive conduct is involved (see Box below).

Box: Australian nutrient information panel for consumers



Additionally, a review of the food labeling law and policy (2011) was published by a group of experts commissioned by the Australia and New Zealand Food Regulation Ministerial Council called the Labeling Logic (2011). Labeling Logic contains 61 recommendations spanning several key themes including the policy drivers of food labeling; principles and criteria to guide government decision making on regulatory intervention; public health and safety; new technologies; consumer value issues; presentation; and compliance and enforcement. Recommendations range from high-level principle proposals (such asa conceptual framework to guide decision making on the level of government intervention related to food labeling issues and a nutrition policy to define the use of food labeling for public health purposes) through to principles to underpin decisions relating to specific subject matters (such as nutrition and health claims), and to very technicalrecommendations (such as the font size used on food labels)[34].

C. Global update on nutritional labelling by the European Food Information Council (EUFIC)

This is a very recent update prepared by the EUFIC (Feb 2016) [35]. The debate over which nutritionlabeling scheme is the mosteffective is likely to continue forthe foreseeable future and moreresearch would be useful toinform these discussions.

The summary points outlined therein:

- Policy decisions should fundamentally be based on science:the key question is which labelling scheme gives the best guidancefrom a nutritional point of view.

- Nutrition labelling policy should take into account consumeruse, interpretation and understanding of different nutrition labellingschemes, but ultimately it is the impact on purchasing decisionsand overall diets that matters.

The report also poses some important questions:

- Do consumers make long-term healthier food choices as a result of having used nutrition information on food packaging?
- To what extent do nutrition labelling schemes have to be standardised to help consumers cultivate healthy eating habits?
- How can consumer best be helped to make good use of nutrition labels to make better food choices?
- How can consumers be motivated to eat more healthily? What awareness raising and education initiatives are most effective? Who should be the primary target of which information and education initiatives – parents, children, others?
- Is nutrition labelling beyond packaged foods useful?

Overall, by providing nutrition information about the nutrientcontent of foods, nutrition labeling allows for—but does not necessarilycause—more healthful food choices. Recent studies have found thatthe presence of nutrition labels can improve subjective understanding of labeling, but did not note a significant difference in impact betweenthe different types of labels. Research has also found that use of nutritionlabels is increasing across geographical regions, while differencesbased on gender, age, income and education levels persist.

D. Food labelling of packaged foods in UK

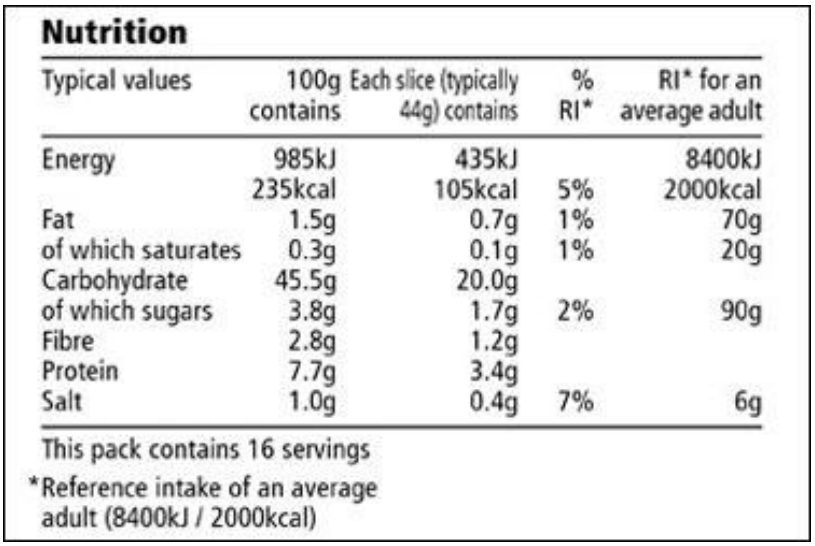
Most pre-packed foods have a nutrition label on the back or side of the packaging.

These labels include information on energy in kilojoules (kJ) and kilocalories (kcal), fat, saturated fat, carbohydrate, sugars, protein and salt. All nutrition information is provided per 100 grams and sometimes per portion of the food.

Supermarkets and food manufacturers now highlight the energy, fat, saturated fat, sugars and salt content on the front of the packaging, alongside the reference intake for each of these.

Nutrition labels on the back or side of packaging

Nutrition labels are often displayed as a panel or grid on the back or side of packaging. For example, the image below shows the back of pack nutrition label on a loaf of white bread.



Nutrition

Typical values	100g contains	Each slice (typically 44g) contains	% RI*	RI* for an average adult
Energy	985kJ 235kcal	435kJ 105kcal	5%	8400kJ 2000kcal
Fat	1.5g	0.7g	1%	70g
of which saturates	0.3g	0.1g	1%	20g
Carbohydrate	45.5g	20.0g		
of which sugars	3.8g	1.7g	2%	90g
Fibre	2.8g	1.2g		
Protein	7.7g	3.4g		
Salt	1.0g	0.4g	7%	6g

This pack contains 16 servings

*Reference intake of an average adult (8400kJ / 2000kcal)

This type of label includes information on energy (kJ/kcal), fat, saturates (saturated fat), carbohydrate, sugars, protein and salt. It may also provide additional information on certain nutrients such as fibre. All nutrition information is provided per 100 grams and sometimes per portion of the food.

Guidelines to tell if food is high in fat, saturated fat, salt or sugar, or not

Total Fat

High: more than 17.5g of fat per 100g

Low: 3g of fat or less per 100g

Saturated Fat

High: more than 5 g of saturated fat per 100 g

Low: 1.5g of saturated fat or less per 100g

Sugars

High: more than 22.5g of total sugars per 100g

Low: 5g of total sugars or less per 100g

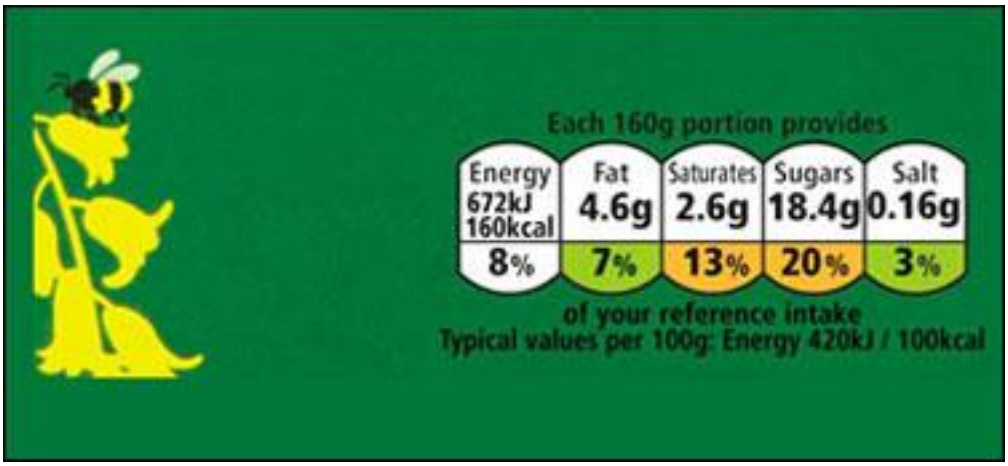
Salt

High: more than 1.5g of salt per 100g (or 0.6g sodium)

Low: 0.3g of salt or less per 100g (or 0.1g sodium)

Nutrition labels on the front of packaging

Most of the big supermarkets and many food manufacturers also display nutritional information on the front of pre-packed food. This is very useful when you want to compare different food products at a glance.



Front-of-pack labels, such as the label in the above image, usually give a quick guide to:

- energy
- fat content
- saturated fat content
- sugar content
- salt content

These labels provide information on the number of grams of fat, saturated fat, sugars and salt, and the amount of energy (in kJ and kcal) in a serving or portion of the food. Some front-of-pack nutrition labels also provide information about reference intakes.

Reference intakes

Nutrition labels can also provide information on how a particular food or drink product fits into your daily diet.

Reference intakes are guidelines about the approximate amount of particular nutrients and energy required for a healthy diet.

Red, amber and green color-coding

Some front-of-pack nutrition labels use red, amber and green colour-coding.

Color-coded nutritional information tells at a glance if the food has high, medium or low amounts of fat, saturated fat, sugars and salt. For example red means high, amber means medium, green means low.

Ingredients list

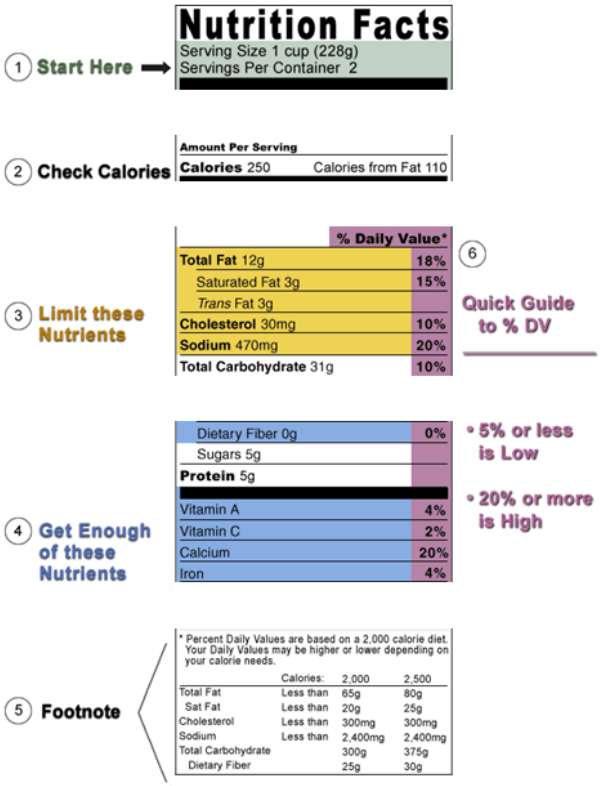
Most pre-packed food products also have a list of ingredients on the packaging or on an attached label. Ingredients are listed in order of weight, so the main ingredients in the packaged food always come first.

E. US FDA Nutrition Facts label for packaged foods[36]-

Overview

The information in the main or top section can vary with each food product; it contains product-specific information (serving size, calories, and nutrient information). The bottom part contains a footnote with Daily Values (DVs) for 2,000 and 2,500 calorie diets. This footnote provides recommended dietary information for important nutrients, including fats, sodium and fiber. The footnote is found only on larger packages and does not change from product to product.

Sample Label for Macaroni and Cheese



1. The Serving Size

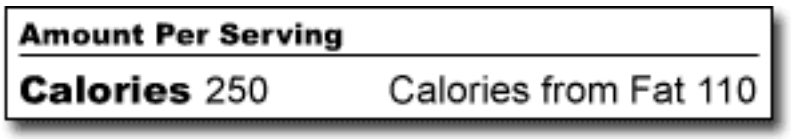
(#1 on sample label)

The first place to start when you look at the Nutrition Facts label is the serving size and the number of servings in the package. Serving sizes are standardized to make it easier to compare similar foods; they are provided in familiar units, such as cups or pieces, followed by the metric amount, e.g., the number of grams.

Example					
	Single Serving	**%DV**		**Double Serving**	**%DV**
Serving Size	1 cup (228g)			2 cups (456g)	
Calories	250			500	
Calories from Fat	110			220	
Total Fat	12g	18%		24g	36%
***Trans* Fat**	1.5g			3g	
Saturated Fat	3g	15%		6g	30%
Cholesterol	30mg	10%		60mg	20%
Sodium	470mg	20%		940mg	40%
Total	31g	10%		62g	20%

Carbohydrate					
Dietary Fiber	0g	0%		0g	0%
Sugars	5g			10g	
Protein	5g			10g	
Vitamin A		4%			8%
Vitamin C		2%			4%
Calcium		20%			40%
Iron		4%			8%

2. Calories (and Calories from Fat)



General Guide to Calories

- 40 Calories is low
- 100 Calories is moderate
- 400 Calories or more is high

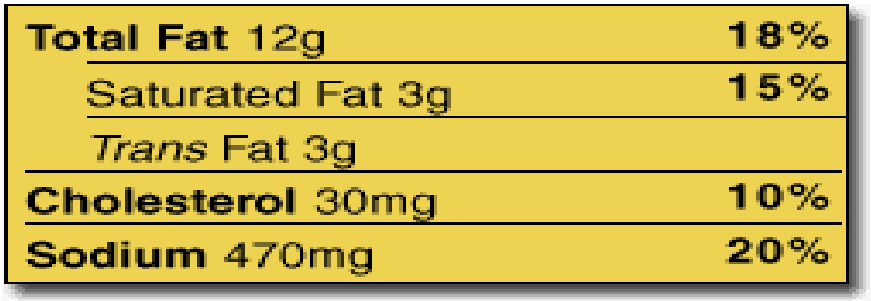
The General Guide to Calories provides a general reference for calories when you look at a Nutrition Facts label. This guide is based on a 2,000 calorie diet.

The Nutrients: How Much?

Look at the top of the nutrient section in the sample label. It shows you some key nutrients that impact on your health and separates them into two main groups:

Limit These Nutrients

(#3 on sample label)



Get Enough of These

(#4 on sample label)

Dietary Fiber 0g	0%
Vitamin A	4%
Vitamin C	2%
Calcium	20%
Iron	4%

5. Understanding the Footnote on the Bottom of the Nutrition Facts Label

(#5 on sample label)

* Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs.

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Note the ***** used after the heading "%Daily Value" on the Nutrition Facts label. It refers to the Footnote in the lower part of the nutrition label, which tells you "**%DVs are based on a 2,000 calorie diet**". Look at the amounts circled in red in the footnote--these are the Daily Values (DV) for each nutrient listed and are based on public health experts' advice. DVs are recommended levels of intakes. DVs in the footnote are based on a 2,000 or 2,500 calorie diet.

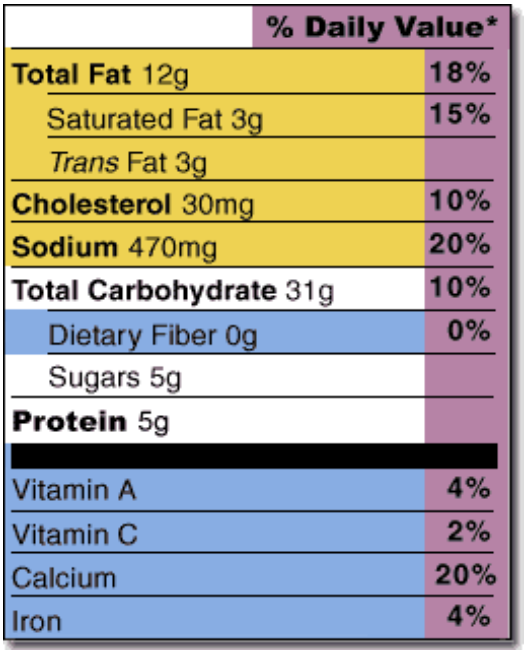
6. The Percent Daily Value (%DV)

The % Daily Values (%DVs) are based on the Daily Value recommendations for key nutrients but only for a 2,000 calorie daily diet

Quick Guide to %DV

Example- How the Daily Values Relate to the %DVs

Nutrient	DV	%DV	Goal
Total Fat	65g	= 100%DV	Less than
Sat Fat	20g	= 100%DV	Less than
Cholesterol	300mg	= 100%DV	Less than
Sodium	2400mg	= 100%DV	Less than
Total Carbohydrate	300g	= 100%DV	At least
Dietary Fiber	25g	= 100%DV	At least



5%DV or less is low and 20%DV or more is high

(#6 on sample label)

This guide tells you that **5%DV or less is low** for all nutrients, those you want to limit (e.g., fat, saturated fat, cholesterol, and sodium), or for those that you want to consume in greater amounts (fiber, calcium, etc.). As the **Quick Guide** shows, **20%DV or more is high** for all nutrients.

- Coca Cola will display red warning logo on its cans to indicate high sugar content
- **Company has decided to adopt the colour coded traffic light system, designed to help consumers identify healthy products**

The traffic light labelling system uses red, amber and green on a front of pack nutrition label to identify whether products are high medium or low in sugar, fat, and salt.

There are also figures to show how much one portion of the product contributes to the daily recommended maximum.

The company said its adoption of the new labels were consistent with a commitment to provide consumers with transparent nutrition information on the front of its packs.

Pictorial warning to foods with high FSS: A distant dream

- Ontario Medical Association is fighting for warning labels on foods with high FSS
- Some suggest the letter J in scarlet on the food.
- Skull and crossed bones like on cigarettes also suggested.
- However, not being practiced at present

F. Some other international examples for further reading include the following: All have their strengths and weaknesses.

Possible models for front-of-pack labelling

Scheme	Responsible agency	Country
Keyhole	Swedish National Food Administration, Norwegian Directorate of Health and the Norwegian Food Safety Authority, Danish Veterinary and Food Administration	Sweden, Norway, Denmark
Fruits & Veggies—More Matters	National Cancer Institute, Centers for Disease Control	US
Healthier Choice Symbol and Healthier Snack Symbol	Health Promotion Board	Singapore
Traffic Light Labelling	Food Standards Agency, Department of Health	UK
Heart Check	American Heart Association	US
Health Check	Canadian Heart and Stroke Foundation	Canada
Protects Health Scheme	Slovenian Heart Foundation	Slovenia
Tick programme	Australian Heart Foundation	Australia
Heart Symbol	Finnish Heart Association and Finnish Diabetes Association	Finland
Choices International	Choice International Foundation	International
GI Symbol	Glycemic Index Limited	Australia and New Zealand
The Sensible Solution	Kraft International	International
Giant Food Healthy Ideas	Giant Food	US
Smart Spot	PepsiCo	International

+ **EUFIC: Global Update on Nutrition Labelling (February 2013)**

(Adapted from a presentation made by Prof Mike Rayner, Director British Heart Foundation in May 2013. Accessed on 4th May 2016)

Chapter 4

Regulatory Limits for Manufacturing and Sale of HFSS Foods

Regulation of foods high in fats, sugars and salt (HFSS) has been strongly advocated by several national and international organizations including the World Health Organization (WHO) and the world Cancer Research Fund (WCRF) [29, 31, 33]. In fact in 2013, WHO came out with a report advocating against the marketing strategies being used by food industries and media to target young children to influence their impressionable minds[31]. They endorsed strict regulation of such marketing gimmicks so as to prevent younger generations falling prey to making unhealthy dietary choices. The report emphasizes the importance of decision makers in all countries to engage with this matter and invest in stricter policy measures for ensuring long term public health.

In India, FSSAI is the regulatory body for approving the nutrient content of processed foods via the Food Safety and Standard Act, 2006. Till the year 2005, thirteen different laws were applicable on the food and food processing sector. Multiple laws/ regulations prescribe varied standards regarding food additives, contaminants, food colours, and preservatives and labelling. In order to rationalize the multiplicity of food laws, a Group of Ministers (GoM) was set up to suggest legislative and other changes to formulate integrated food law, to be a single reference point in relation to regulation of food products. Based on the recommendations of the GoM the ministry of food processing enacted the Food Safety & Standard Act (FSSA), 2006. Salient features of the act are:

- FSSA will be aided by several scientific panels and a central advisory committee to lay down standards for food safety. These standards will include specifications for ingredients, contaminants, pesticide residue, biological hazards and labels.
- The law will be enforced through State Commissioners of Food Safety and local level officials.
- Everyone in the food sector is required to get a licence or a registration which would be issued by local authorities

- Every distributor is required to be able to identify any food article to its manufacturer, and every seller to its distributor. Anyone in the sector should be able to initiate recall procedures if he/she finds that the food sold had violated specified standards in each food.

Globally more than 72 per cent of food sales occur through super stores. In India there are 12 million outlets selling food and related items including push carts, wet markets and neighborhood kirana stores. The kirana stores are generally located in small space and have no cold storage facilities. They also have restrictedcapital resulting in lack of shopping variety. The Indian retail sector is estimated to have a market size of about $180 billion but the organized sector represents only 2 per cent share of this market[37].

In India, a recent application called the FOOD SWITCH appplanned and executed as a collaboration between researchers based at The George Institute for Global Health, developers from Xyris Software Pty Ltd, and the health communications team at Bupa Australiawas launched[38]. FoodSwitch comes with handy filters to suit different health needs.While using the SaltSwitch, EnergySwitch, FatSwitch or SugarSwitch filters, the healthier choices listed should have a lower amount of the relevant nutrient (salt, kilojoules, saturated fat, and total sugar respectively) than the product scanned. This is an innovative application which is geared towards educating, enabling and also encouraging people to make healthier food choices.

Some global regulatory practices with respect to manufacturing and sale of FSS which have been followed up by different countries worldwide are presented below. Some of them endorse WHO's directives and long term data may yield the accrued beneficial impact of investing early in ensuring child health and advocating healthy / balanced nutritional practices. We have reviewed the following countries- **Australia and New Zealand, and European Union countries** in order to understand the regulatory framework and how do they vary from one country to another.

1. AUSTRALIAAND NEW ZEALAND

a. Trans fatty acids (TFAs) in Australian and New Zealand Food Supply-

In 2009 a review on TFA was conducted by the Food Standards Australia New Zealand (FSANZ), to address the 2007 Review Report recommendation: *on non-*

regulatory measures to reduce TFA in the food supply and to assess the need to consider regulatory action [39].

- Findings: In 2009, the dietary modelling techniques used to assess TFA levels. Thesetechniques have been considered to generate a more accurate estimate of TFA intakes than those used in the previous FSANZ assessment in 2006. This data reported that intakes of manufactured TFA have been decreased in the Australian and New Zealand population by around 25-45%. Estimated mean TFA intake was 0.5%-0.6% of total energy % from both ruminant and manufactured sources, with *more than 90% of Australians and more than 85% of New Zealanders having TFA intakes below 1% of energy*.
- The food products contributing disproportionally to the higher TFA levels among small proportion of Australians whose total TFA intake is above 1% of total dietary energy are **pastry products, sausages and luncheon meats and creamy style pasta dishes**.
- The food products contributing disproportionally to the higher TFA levels among New Zealanders whose total TFA intake is above 1% of total dietary energy are**pastry products and creamy style pasta dishes, as well as cheese, popcorn, doughnuts and take away style fish products**.

b. Survey of the trans fatty acid content of Australian and New Zealand foods in 2013

- A survey has been conducted in 2013 of the trans fatty acid content of Australian and New Zealand foods. The survey aimed to lay current levels of TFAs in a range of ultra-processed and takeaway foods available in Australia and New Zealand [40].

Key finding:

> "*TFAs were detected in 36 of the 39 product categories analyzed. The highest median concentrations of TFAs were found in edible oil spreads, vegetable oils, croissants, custard baked goods, and prepared pastry. TFAs were not detected in pikelets/pancakes, snack bars and toasted style muesli. While TFAs were detected in most product categories, the median concentrations in Australian and New Zealand foods were generally low. Statistically significant ($p<0.01$) increases in TFA concentration were observed in only one product category—chicken nuggets/products".*

Source: *Food Standards Australia New Zealand. Survey of the trans fatty acid content of Australian and New Zealand foods 2013.*

c. The Food and Health Dialogue (the Dialogue)

In 2007 National Children's Nutrition and Physical Activity Survey (NCNPAS) found that many Australian children's dietary patterns are less than optimal with high consumption of salt and saturated fat, and low consumption of fruit and vegetables**.** As a result, the Food and Health Dialogue (the Dialogue) was established in March 2009 [41].

The primary activity is action on innovation of food, including a voluntary reformulation program across a range of commonly consumed foods. This program aims to decrease the saturated fat, energy, sodium and added sugars, and increase the fibre, wholegrains, fruits and vegetables.

Reference: The summary of Food Categories Engaged under the Food and Health Dialogue to date (Annexure 6).

2. EU COUNTRIES

An audiovisual Media Services Directive was adopted in 2010 by The European Parliament and Council of the EU (Directive 2010/13/EU) modifying and renaming the Television without Frontiers Directive. Advertising unhealthy food and drinks in children's programmes is addressed in the Directive through Article 9 stating:

"Member States and the Commission shall encourage media service providers to develop codes of conduct regarding inappropriate audiovisual commercial communications, accompanying or included in children's programmes, of foods and beverages containing nutrients and substances with a nutritional or physiological effect, in particular those such as fat, trans-fatty acids, salt/sodium and sugars, excessive intakes of which in the overall diet are not recommended. The majority of the EU countries rely on general advertising regulations, which do not specifically address the promotion of HFSS food and beverage products to children, and on self-regulatory mechanisms which may or may not include specific controls to limit the promotion of such products to children".

Source: *World Health Organization. Marketing of foods high in fat, salt and sugar to children: update 2012–2013[31].*

For High Fat Sugar & Salt foods in UK, Statutory rules apply to advertisements on TV channels dedicated to children, in or around programmes aimed at children (including pre-schoolchildren), or in or around programmes that are likely to be of particular appeal to children aged 4–15 years. The definition of particular appeal is that the programme attracts children in excess of their proportion in the population (by 20% or more) [42].

The United Kingdom is a major provider of satellite channel content throughout much of the European Region. Under EU cross-border rules, the regulations applying in the United Kingdom apply to channels transmitting from the United Kingdom to other jurisdictions.

The Code of Advertising Practice extension covers:

… advertisements and other marketing communications by or from companies, organizations or sole traders on their own web sites, or in other non-paid-for space online under their control, that are directly connected with the supply or transfer of goods, services, opportunities and gifts, or which consist of direct solicitations of donations as part of their own fund-raising activities. Previously, the Advertising Standards Authority's remit online was limited to paid-for advertisements (such as pop-ups and banner advertisements) and sales promotions, wherever they appeared.

In practice, the Code of Advertising Practice provisions will now apply to advertisers' own web sites and advertising on social media sites. This will help in preventing: food based advertisements that uplift poor nutritional and dietary practices; marketing that uses promotional offers to lure children and advertisements related to foods that encourage high pressure techniques.

Chapter 5
Recommendations of the Group

In India, therising burden of mortality and morbidity due to chronic diseases such as cardiovascular, respiratory diseases, diabetes and cancers is alarming [14, 15, 17]. In the next 25 years, the burden of chronic diseases will tend to increase continuously as a ramification of the rapidly transitioning food intakes, changing dietary patterns and other lifestyle factors. Thus in the light of current scientific evidence, the committee made a concerted attempt to provide a few recommendations to improve the current diets and move towards making informed healthier choices in an enabling environment.

Recommendation 1: Nutrient Specific guidelines

These are largely derived from our nationally accepted NIN ICMR dietary guidelines (2010) [1]. In addition, recently published studies and reports have also been considered.

A balanced diet is one which contains different types of foods in such quantities and proportions so that the need for calories, proteins, minerals, vitamins and other nutrients is adequately met and a small provision is made for extra nutrients to withstand short duration of leanness. In addition a balanced diet should provide bioactive phytochemicals such as dietary fibre, antioxidants and other nutraceuticals which have positive health benefits. Low glycaemic index foods are preferred. A balanced diet should provide around 60-70% of total calories from carbohydrate, 10-12% from protein and 20-30% of total calories from fat.

FAT

Intake levels:

The scientific community is highly divided when it comes to fats and their healthy intake levels. The umbrella term “fats” embodies a lot of differentially acting fractions. It is important that we pay attention to this distinction especially in terms of their health impact. The international bodies are gradually moving towards removing the ceiling on total fat consumption (example 2015 USDA guidelines). They feel that this pushes people towards making wrong choices as people start consuming more simple sugars instead. Global experts (several of them on our advisory board as reviewers) feel that the message for masses should be to replace saturated with unsaturated fats in their diets. Industrial trans fats should be

completely eliminated. The focus from total fats should be removed and in fact reassessment of consumption levels for fats should be looked into. However, the expert panel has still summarized what the current guidelines from India suggest.

- According to ICMR 2010, the intake of visible fat in Indian adults range between 20-40 g/day. Fat intake crossing 35% of total calories may increase the risk associated with diet related chronic diseases and should be avoided. Thus for good health, the total fat (visible and invisible) intake in the daily diet can be between 20-30% of total calories.So, for a 2000 kcal diet, total fat should not exceed 60g per day. Visible and/or invisible fat coming from animal foods may be reduced and substituted in part with pulses, legumes and whole nuts.
- SFAs levels should be <10% of the total energy intake per day; PUFA 6-10%, TFAs must be less than <1%; MUFA by difference (about 5-8%)
    - Within the ambit of allowed fat intake, PUFAs in our diet should be encouraged. PUFAs include the essential omega 6 and omega-3 polyunsaturated fatty acids e.g. Linoleic acid and arachidonic acid (AA), and alpha-linolenic acid (ALA), respectively.
    - The ideal ratio of omega3: omega 6 ranges from 1:1 to 1:5-10. The current diets are reported to have 1:15-20[43]. It is recommended to include more omega 3s.
    - The richest source of long chain omega-3 is fish. For non-vegetarians, it is recommended to have one portion of fish (50-60g) at least once a week. The vegetarian sources of omega 3 include mustard oil, flaxseeds, walnuts etc.

Cooking practices:

- It is useful to rotate oils as they help in reducing chronic diseases. Use at least 2 or more types of oils in everyday cooking. Also, cooking oils can be blended which are easily available in the markets.
    - Example of blend cooking oils: Groundnut or Sesame or Rice bran + Mustard/Canola/Soyabean
- Foods prepared by partially hydrogenated vegetable oil such as bakery products, crackers, cookies, biscuits etc should be limited.
- Limit the use of deep fried foods

- Avoid consuming ultra-processed foods (samosas, pakoras, burgers, chips, fries, cakes, pastries,etc.)
- Low fat milk and dairy products are recommended.

SUGAR

Intake levels:

- The World Health Organization's (WHO) sugar guideline, issued in March 2015, recommends that adults and children restrict their sugar intake to less than 10% of the total energy intake per day, which is the equivalent of around 12.5 teaspoons of sugar for adults, and suggests a further reduction to below 5% of total energy intake per day[30]. For an average daily diet containing 2,000 calories, 10% of total calories is equivalent to about 50 grams of sugar or around 12.5 teaspoons. For further (dental) health benefits, the guideline suggests keeping sugar consumption to below 5% of total calories per day, the equivalent of about 25 grams of sugar or around 6 teaspoons. Keeping the rising chronic disease burden in mind, Indian adults should aim to keep their added sugar intake to about 20-30g/d. A total of 60-65% energy can come from carbohydrates as recommended by ICMR 2010.

General points to be considered:

- Sweetened beverages such as colas, packaged fruit juices, aerated drinks should be avoided/limitedas far as possible as the sugar in these products provides empty calories.
- High amounts of fat and sugar are used to prepare confectionary (cakes, pastries) and sweets. These foods should be consumed sparingly.
- Raw fruits and vegetables should be consumed rather than packaged fruit juices.
- Fresh fruit juices (prepared at home) can also be consumed.
- Added sugars and refined cereals should be seldom used.

SALT

- Excess sodium intake is an important determinant of hypertension and CVD risk. According to WHO as well as ICMR NIN, added salt should be restricted to about 5-6g per day. The recommended strategies for reduction of chronic diseases include gradual reduction in current salt intakes (by 30% over the next 10 years). Fruits and vegetables have natural potassium which improves the sodium potassium ratio; and

therefore consumption of inexpensive, seasonal and locally available fresh fruits and vegetables should be encouraged. Avoid ultra-processed foods, snacks, chutneys, pickles, dips and chips and so on. Gradual reduction in commercial and home cooked recipes for salt can go a long way in reducing the intake without affecting the sensory appeal.

- For population-wide recommendation of sodium intake, lowering sodium intake from high intakes (>5g/day) to moderate intakes (3-5g/day) is associated with lower blood pressure and lower CVD in observational studies. Although there are no RCTs demonstrating a reduction in CVD with lowering sodium intake from high to moderate levels, the consistency in data from observational studies (reporting a lower CVD risk in populations consuming moderate intake compared to high sodium intake) and clinical trials (reporting a reduction in blood pressure) support reducing high sodium intake in all populations.
- Salt intake should not exceed 5g/day. Potassium intake should be 10-28 g/day as recommended by ICMR 2010. The ratio of sodium to potassium in our current diet is high and needs to be reduced for long term health benefits.

General points to be considered:

- Gradual reduction in the amount of salt added to commercial preparations and home recipes should be encouraged.
- Intake of ultra-processed foods such as pickles, salted chips, namkeens, salted-biscuits, ketchups, chutneys should be restricted.
- Fruits and vegetables should be consumed as they provide an adequate amount of potassium and can improve the sodium potassium ratio.
- Other substitutes like lemon, tamarind etc. should be used to replace added salt.

Recommendation 2: Reliable Monitoring systems to assess FSS intake periodically

Given the dire need for generating high quality reliable data on dietary intakes, effective monitoring systems are needed in place for assessing FSS intake, sources of FSS (both old and new), public awareness about harmful effects of excess FSS consumption and region specific food environments are strongly recommended. Periodic monitoring of FSS intakes at a national level will warrant strong basis for establishing regulatory limits for food

inmanufacturing sale. Data from national level dietary surveys like National Nutrition Monitoring Bureau (NNMB), National Sample Survey Organization (NSSO), NCD risk factor surveys (such as WHO's STEPS) provide insightful linkages between current levels of intake with NCD prevalence[44, 45]. In addition to periodic monitoring exercise, publically accessible nutrition database of locally consumed foods (both raw and ultra-processed) should be made available and periodically updated. This would help in identifying foods contributing most to FSS and in turn aid in setting up cut-off limits in ultra-processed foods in addition to updating serving sizes consistent with current eating trends.

Example of Multisectoral Food Chain Approaches to Reduce Trans Fat Consumption

Aim: The need for a multisectoral food chain approaches to reduce trans fat consumption in India study aims to assess intervention options in low-income consumers.

Methods: Data were collected at the manufacturer, retailer and consumer levels. Qualitative interviews were conducted with vanaspati manufacturers (n = 13) and local food vendors (n = 44). Laboratory analyses (n = 39) of street foods/snacks sold by the vendors were also conducted. Trans fat and snack intakes were also examined in low-income consumers in two rural villages (n = 260) and an urban slum (n = 261).

Results: Manufacturers of vanaspati described reducing transfat levels as feasible but identified challenges in using healthier oils. Households were consuming snacks high in trans-fat as part of daily diets (31 % village and 84.3 % of slum households) and 4 % of rural and 13 % of urban households exceeded WHO recommendations for trans fat intakes.

Conclusion: A multisectoral food chain approach to reduce trans fat is needed in India and likely in other low- and middle-income countries worldwide. This will require investment in the development of competitively priced bakery shortenings and economic incentives for manufacturing foods using healthier oils. Increased production of healthier oils will also be required alongside these investments, which will become increasingly important as more and more countries begin investing in palm oil production.

Source: [46]

Example of Mandatory TFA Regulation on TFA levels in food products

Aim: To assess the TFA levels in Korean food products, and to determine the effect of TFA regulation

Outcome: 7 different categories of Korean food products were purchased in 2005 and 2008. The contents of TFA and lipid and fatty acid composition were analyzed.

Results: It was observed that in 2005 (before regulation), TFA levels ranged from 0.01 to 6.88 g/100g , but after the regulation in 2008 **the levels significantly declined to non-detectable level or up to 0.5 g TFA/100 g, 44.6% of total fatty acids. TFA levels of total fatty acids were significantly reduced by 69% to 89% in cream-filled biscuits and 88% to 97% in cream-stuffed cakes, respectively (P < 0.05),** while the SFAs level distinctly increased up to 29% to 135% in cream-stuffed cakes and 48% to 69%, in cream-stuffed cakes (P <0.05)

Source: [47]

Recommendation 3: Ban on foods with high FSS advertising on children's channels or during children-shows

It has been seen that most of the foods with high FSS advertising is concentrated during and/or on kids channels/shows. The groupseverely criticizedthis practice of sales by influencing young minds. Since television commercials of foods high in fat, sugar or salt greatly influence eating habits of the young and impressionable minds and make them vulnerable to chronic diseases, World Health Organization (WHO) has urged countries to reduce exposure of children to such marketing by implementing a set of international recommendations[31].

In May 2010, WHO member-states endorsed a new set of recommendations on marketing foods and non-alcoholic beverages to children, calling for national and international action to reduce exposure of children to ads that promote foods high in saturated fats, trans-fatty acids, free sugars, or salt.While some countries have taken off advertisements of such products from prime time television and radio and regulated their marketing, a large number of countries, particularly developing nations such as India, are yet to take proactive measures. The WCRF also summarizes evidence from several countries highlighting the policy initiatives which have been attributed to bring about positive impact on the health of those nations[33].

Example of Broadcast Food Adveritising Mandotary Regulation to Children

In Mexico 2014, the Ministry of Health issued an Order restricting the advertising of foods and sweetened beverages, defined according to a nutrient profiling model. The restrictions apply to TV programmes classified as “A” within the times of 2.30-7.30pm on weekdays and 7.00am-7.30pm on weekends, where over 35% of the audience are under age 13. Advertising for these foods is also restricted in films classified as "A". Implementation began on 15 July 2014 for sweetened drinks, potato chips, chocolates and confectionary and will be extended to other foods covered by the nutrient profiling model in January 2015.

Source:[33]

Recommendation 4: Imposition of additional tax on the purchase of ultra-processed commodities and sugar sweetened beverages (SSB)

Imposing additional tax on the purchase of commodities such as pre-packaged foods with high salt and fat content, sugar sweetened beverages, etc., can be a pragmatic approach to reduce the rising burden ofchronic diseases among Indian population. Imposing excise tax on unhealthy eating products can be an endeavor to bring about positive health effects among population. This exercise can be of great importance in supporting nutrition related programmes by the means of profit generated from taxing unhealthy food products.

Example of taxation on Sugar Sweetened Beverages (SSB)

An economic epidemiologic modeling study by Basu et al suggests that 20% taxation on sugar sweetened beverages (SSB) over the period 2014-2023 can reduce the prevalence of overweight and obesity by 3.0% (95% CI 1.6%–5.9%) and the incidence by 1.6% (95% CI 1.2%–1.9%) for type 2 diabetes among various Indian subpopulations, if the consumption of SSB remain to increase linearly in correspondence with secular trends. According to the authors, SSB cconsumption varied from 9% (37 kcal) among the older cohort of 45–65 year olds to 13% (52 kcal) of overall beverage consumption among the younger 25–44 year old cohort, and was roughly equal among urban (12%, 48 kcal) and rural populations (12%, 45 kcal). SSBs composed 14% of beverage calories among the poorest income tertile and 12% among the wealthiest tertile. However, overall beverage calories were lowest among the poor (310 kcal/person/day) versus the wealthiest tertile (404 kcal/ person/day), hence absolute consumption varied insignificantly by wealth (44 versus 47 kcal/person/day). In absolute numbers, the most type 2 diabetes cases averted from 2014– 2023 were among the older cohort (573,000 among 45–65 year olds versus 477,000 in 25–44 year olds over 2014–2023), men (1.6 million versus 1.2 million women), the highest income tertile (603,000 versus 248,000 in lowest tertile), and rural populations (877,000 versus 741,000 urban). In total, 11.2 million overweight and obesity cases (23.0%, 95% CI 7.5–15.0 million) and 400,000 type 2 diabetes cases (21.6%, 95% CI 300,000–500,000) would be averted from 2014– 2023 by a 20% SSB excise tax, according to their model.

Source: [44]

Recommendation 5: Nutrition education and awareness

Raising consumer knowledge and awareness through public health campaigns can be a helpful approach to make healthier food choices among population. For instance- Public campaigns can be organized in order to enlighten the negative impacts of high salt, sugar and fat content in a diet, and promoting healthy eating practices. This can be done through disseminating information on modified practices related to their consumption and household preparation of foods[48].Multi-sectoral partnerships should be explored to reinforce public health and nutrition messages.

Example of public awareness to reduce the prevalence of risk factors for NCDs (high consumption of fat, sugar and salt----Georgia:

> "Current national initiatives- As part of the National Health Strategy 2011–2015, the national NCD policy has the objective of promoting interventions to reduce the prevalence of the main modifiable risk factors for NCDs, such as unhealthy diets high in fats, sugar and salt. As part of the planned activities, a comprehensive multisectoral strategy to limit the consumption of unhealthy food and a plan to incorporate healthy nutrition programmes into school education programmes are included. Consumer awareness- During World Salt Awareness Week, activities aimed at raising public awareness at national level include conferences, media briefings and the involvement of nongovernmental and governmental sectors. Educational interventions in schools as well as posters, radio spots, newspapers and web sites have been included in the public awareness strategy".

Source:[32]

Recommendation 6: Advocating reformulation of commercialized products

Encourage voluntary reformulation of food products to reduce the contents of fats (i.e. saturated fats and trans fats), sugar (free sugars) and salt in packaged food. Evidence suggests that gradual cuts in the amount of FSS in commonly consumed ready-to-eat food are not noticed by the public and results in significant reduction in calories. Alternatively big players in the food business should be urgedvoluntarily to reduce portion sizes of energy dense, nutrient poor food and beverage products in addition to diversifying to develop products that are healthy alternatives low in free sugars, unhealthy fats, and sodium.

Example of Effects of Modifying Dietary Fat Intake and Intake Recommendations

Over time, high-fat, high-carbohydrate diets with excess calories cause weight gain and obesity. Overconsumption of total, saturated, trans fats, and/or dietary cholesterol can harm the body.Excess dietary fat and calories can result in dyslipidemia and increased risk for atherosclerosis in arteries supplying the heart, brain, limbs, and other organs. Effects of reducing quantity or modifying the quality of dietary fats consumed on cardiovascular risk factors, such as serum cholesterol, are complex. The global nutrition experts currently emphasize replacing SFA and trans fats with unsaturated fats, or MUFA and PUFA, and urge that all recommendations be embedded within the overarching message of achieving and maintaining energy balance. Furthermore, fat should provide 30% or less of total calorie intake to prevent increased risk of CVD. Shifting toward plant-based diets also appears heart healthy. E.g., replacing red meat with some combination of nuts and legumes, and replacing animal fats with vegetable oils, lowers the diet's ratio of SFA to unsaturated fat. No epidemiological or clinical evidence currently supports replacing calories from saturated fats with calories from carbohydrates.

Source: [49]

Recommendation 7: Role of positive nutritional labelling

Nutritional labelling plays an essential role in creating awareness among the population in order to make healthier food choices. As per the mandatory labelling regulation, the food companies involved in manufacturing of food products such as ultra-processed foods, pre-packaged foods and beverages need to provide information on ingredients as follows:

- Total calories (Energy value)
- Amounts of carbohydrate, sugars, fat, protein, sodium, dietary fibre
- Amount of trans fat added in food

Recent data from India shows that our labelling systems need to be urgently strengthened[50, 51]. In a study undertaken to quantify the adherence ofthe declared nutrients on Indian packaged foods with national and global requirements, it was found that only 52% ofproducts displayed nutrient information on energy, protein, carbohydrate, sugar and total fat, meeting the minimumrequirements of the Food Safety and Standards Authority of India (FSSAI). Further a mere 27% met the minimum criteria definedby Codex which also requires the reporting of saturated fat and sodium. There was significant variation incompliance for leading brands, country of manufacture and food group ($p<0.01$ for all). The majorityof Indian packaged foods do not meet national and international

nutrient labelling guidelines. With the Indianpopulation likely to consume much more packaged food over the coming years full and effective food labellingwill be essential[50, 51]. Both government agencies like Consumer Association of India, Chennai and non-governmental organizations like Centre for Science and Environment, Delhi have published in their reports that urgent and honest steps need to be taken to resolve the labelling conundrum for a common man. It is recommended that the draft FSSAI labelling guidelines are stringently enforced in India. While we endorse that FSSAI draft guidelines, we also encourage use of positive nutrition labelling.The manufacturers and food industry should adhere to the directives and progress towards positive and clear labels for food items. The ambiguity on serving sizes and nutritional information needs to be urgently resolved by multiple stakeholder consultation and concrete action[52].

Example of effect of food nutritional labelling use on nutrient intake

Source: [53]

The Effect of Food Label Use on Nutrient Intakes: An Endogenous Switching Regression Analysis

Background: *The concern was on the effect of the diet on health which has resulted in the formulation of the Nutrition Labelling and Education Act (NLEA) implementation in 1994.*

Aim: *The purpose of this study is to assess the impact of food label use on consumers' intake of selected nutrients using the USDA's 1994-96 Continuing Survey of Food Intakes by Individuals (CSFII) and its companion Diet and Health Knowledge Survey (DHKS).*

Results: *When the nutrient intakes of label users and the expected nutrient intakes of label users in the absence of labels were compared, food label use decreases individuals' average daily intakes of calories from total fat and saturated fat, cholesterol, and sodium by 6.90%, 2.10%, 67.60 milligrams, and 29.58 milligrams, respectively. In addition, consumer nutrition label use increases average daily fiber intake by 7.51 grams. The results generally indicate that nutritional label use, indeed, improves the intakes by consumers of the selected nutrients examined in this study.*

Conclusion: *In particular, label use tends to reduce individuals' intakes of calories from total and saturated fat, as well as intakes of cholesterol and sodium, and tends to increase intakes of dietary fiber. These findings provide evidence of the benefits of label use and are of great importance in terms of public policy because improved diets can provide society with dramatic health benefits resulting in life-year gains and medical care cost savings.*

Recommendation 8: Provide a nutrition-sensitive and an enabling environment to make healthier choices

Mere recommendations to eat healthy will not suffice. It is equally important to provide a nutrition sensitive and enabling environment for people to switch to better eating patterns and consume fresh fruits and vegetables, whole grains and reduce processed foods in their diets. Important considerations for the government and other regulatory authorities include syncing the health, agriculture and food systems to empower and enable the consumer who knows how to choose a healthy diet and also has the supporting environment (favorable accessibility, costs, policies) to sustain healthy practices for him-/her-self and his/her family.

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Annex-1

Members of the FSSAI Expert Group on fats, sugar and salt (Alphabetic order)

Group Members	Expertise
• Dr. D. Prabhakaran, Director, Centre for Chronic Conditions & Injuries, Vice President- Research and Policy, Public Health Foundation of India, 44/47, Sector 44, Gurgaon-122002 (Haryana)**CHAIRPERSON**	Cardiologist, , researcher, epidemiologist
• Dr. (Mrs) KalpagamPolasa, Scientist "G" and Director,I/c (Retd.), National Institute of Nutrition, Indian Council of Medical Research (ICMR), Hyderabad-500007 (Andhra Pradesh)	Nutrition expert
• Dr.Pulin Kumar Gupta, Associate Professor of Medicine, Postgraduate Institute of Medical Education and Research, Dr. Ram Manohar Lohia Hospital, New Delhi-110001	Medical doctor
• Dr.RajibDasgupta, Chairperson, Centre for Social Medicine and Community Health, School of Social Sciences, Jawaharlal Nehru University, New Delhi- 110067	Medical doctor, public health expert, researcher
• Ms. Rekha Sharma, Former Chief Dietician and Head, Department of Dietetics, All India Institute of Medical Sciences, New Delhi-110029	Dietician
• Dr. Shweta Khandelwal, Associate Professor, Public Health Foundation of India, 44/47, Sector 44, Gurgaon-122002 (Haryana)- **RAPPORTEUR**	Public health nutritionist, researcher
• Dr. S. Sivasankaran, Professor of Cardiology, SreeChitraTirunal Institute for Medical Sciences & Technology, Thiruvanthapuram-695008 (Kerala).	Cardiologist, researcher
• Dr. Uma Mahadevan, Head, Department of Food and Nutrition, Dean, Faculty of Family and Community Sciences, Maharaja Sayajirao University of Baroda, Vadodara -390002(Gujarat)	Nutrition expert
• Dr.Umesh Kapil, Professor, Public Health Nutrition, Room No. 118; Human Nutrition Unit, Old OT Block, All India Institute of Medical Sciences, New Delhi-110029	Medical doctor, public health nutrition expert
• Dr.Vandana Jain, Additional Professor, Division of Paediatric Endocrinology, Department of Paediatrics, All India Institute of Medical Sciences, New Delhi-110029	Pediatrician, pediatric endocrinologist, researcher
• Dr. Vijay Gupta, Head, Department of Cardiothoracic & Vascular Surgery, Ram Manohar Lohia Hospital, New Delhi-110001	Cardiologist

Annex-2

International & National Reviewers

1. Prof. Walter Willett,
   Harvard T. H. Chan School of Public Health,
   Boston, Massachusetts, USA

2. Prof. Barry Popkin,
   Carolina Population Centre,
   University of North Carolina at Chapel Hill
   North Carolina, USA

2. Prof Corinna Hawkes,
   Centre for Food Policy
   City University,
   London, UK

3. Prof. AnuraKurpad
   Professor and Head, Division of Nutrition,
   St. John's Research Institute
   Bangalore, Karnataka

4. Prof. B. Sesikeran
   Former Director,
   National Institute of Nutrition
   Hyderabad

Annex-3

FSSAI Technical Members

1. Shri Kumar Anil, Advisor, Standards
2. Dr. Sandhya Kabra, Director (QA)
3. Dr. A.K. Sharma, Consultant, FSSAI
4. Dr. S.C. Khurana, Consultant, FSSAI
5. Dr. J. Lewis, Consultant, FSSAI
6. Shri K. Nanda, TO, FSSAI
7. Smt. MiliSaxena, TO, FSSAI

Annex-4

Stakeholders invited by FSSAI for consultation

i. Centre for Science & Environment, Delhi
   Dr. Sunita Narayan
ii. Nominees of Ministry of Food Processing Industries
   Dr. S. Jindal, Former President, AIFPA
   Sh. D.V. Malhan, Executive Secretary, AIFPA
iii. Nominees of Ministry of Consumer Affairs & Public Distribution
   Smt. Preeti Ramesh Shah, Consumer Education & research Centre (CERC) Ahmedabad
   Smt. Nirmala Desikan, Consumer Association of India, Chennai

Annex-5

List of MeSH terms used in PubMed and EMBASE databases

SUGAR

Sugar AND Cardiovascular Diseases

- "Carbohydrates"[Mesh] AND "Cardiovascular Diseases"[Mesh] AND India
- ‘’ Sugar Phosphates’’ [Mesh] AND ‘’Cardiovascular Diseases’’ [Mesh] AND India
- ‘’ Sugar Alcohols’’ [Mesh] AND ‘’ Cardiovascular Diseases’’ [Mesh] AND India
- ‘’ Sugar Acids’’ [Mesh] AND ‘’ Cardiovascular Diseases’’ [Mesh] AND India
- ‘’ Sugar Alcohol Dehydrogenase’’ [Mesh] AND ‘’ Cardiovascular Diseases’’ [Mesh] AND India
- ‘’ Sweetening Agents’’ [Mesh] AND ‘’ Cardiovascular Diseases’’[Mesh] AND India
- ‘’Blood Glucose’’ [Mesh] AND ‘’ Cardiovascular Diseases’’ [Mesh] AND India
- ‘’Coupling sugar’’ [Mesh] AND ‘’Cardiovascular Diseases’’ [Mesh] AND India
- ‘’Sugar-phosphatase’’ [Mesh] AND ‘’ Cardiovascular Diseases’’ [Mesh] AND India

Sugar AND Cancer

- ‘’ Carbohydrates"[Mesh] AND "Cancer"[Mesh] AND India
- ‘’ Sugar Phosphates’’ [Mesh] AND ‘’Cancer’’ [Mesh] AND India
- ‘’ Sugar Alcohols’’ [Mesh] AND ‘’ Cancer’’ [Mesh] AND India
- ‘’ Sugar Acids’’ [Mesh] AND ‘’ Cancer’’ [Mesh] AND India
- ‘’ Sugar Alcohol Dehydrogenase’’ [Mesh] AND ‘’ Cancer’’ [Mesh] AND India
- ‘’ Sweetening Agents’’ [Mesh] AND ‘’ Cancer’’[Mesh] AND India
- ‘’Blood Glucose’’ [Mesh] AND ‘’ Cancer’’ [Mesh] AND India
- ‘’Coupling sugar’’ [Mesh] AND ‘Cancer [Mesh] AND India
- ‘’Sugar-phosphatase’’ [Mesh] AND ‘’ Cancer’’ [Mesh] AND India

Sugar AND Neoplasms

- ’’Carbohydrates"[Mesh] AND "Neoplasms"[Mesh] AND India
- ‘’ Sugar Phosphates’’ [Mesh] AND ‘’Neoplasms’’ [Mesh] AND India
- ‘’ Sugar Alcohols’’ [Mesh] AND ‘’ Neoplasms’’ [Mesh] AND India
- ‘’ Sugar Acids’’ [Mesh] AND ‘’ Neoplasms’’ [Mesh] AND India
- ‘’ Sugar Alcohol Dehydrogenase’’ [Mesh] AND ‘’ Neoplasms’’ [Mesh] AND India
- ‘’ Sweetening Agents’’ [Mesh] AND ‘’ Neoplasms’’[Mesh] AND India
- ‘’Blood Glucose’’ [Mesh] AND ‘’ Neoplasms’’ [Mesh] AND India
- ‘’Coupling sugar’’ [Mesh] AND ‘Neoplasms [Mesh] AND India
- ‘’Sugar-phosphatase’’ [Mesh] AND ‘’ Neoplasms’’ [Mesh] AND India
-

Sugar AND Diabetes Mellitus

- ’’Carbohydrates"[Mesh] AND "Diabetes Mellitus"[Mesh] AND India
- ‘’ Sugar Phosphates’’ [Mesh] AND ‘’ Diabetes Mellitus’’ [Mesh] AND India
- ‘’ Sugar Alcohols’’ [Mesh] AND ‘’ Diabetes Mellitus’’ [Mesh] AND India
- ‘’ Sugar Acids’’ [Mesh] AND ‘’ Diabetes Mellitus’’ [Mesh] AND India
- ‘’ Sugar Alcohol Dehydrogenase’’ [Mesh] AND ‘’ Diabetes Mellitus’’ [Mesh] AND India
- ‘’ Sweetening Agents’’ [Mesh] AND ‘’ Diabetes Mellitus’’[Mesh] AND India
- ‘’Blood Glucose’’ [Mesh] AND ‘’ Diabetes Mellitus’’ [Mesh] AND India
- ‘’Coupling sugar’’ [Mesh] AND ‘Diabetes Mellitus [Mesh] AND India
- ‘’Sugar-phosphatase’’ [Mesh] AND ‘’ Diabetes Mellitus’’ [Mesh] AND India

Sugar AND Diabetes Complications

- ’’Carbohydrates"[Mesh] AND "Diabetes Complications"[Mesh] AND India
- ‘’ Sugar Phosphates’’ [Mesh] AND ‘’ Diabetes Complications’’ [Mesh] AND India
- ‘’ Sugar Alcohols’’ [Mesh] AND ‘’ Diabetes Complications’’ [Mesh] AND India
- ‘’ Sugar Acids’’ [Mesh] AND ‘’ Diabetes Complications’’ [Mesh] AND India
- ‘’ Sugar Alcohol Dehydrogenase’’ [Mesh] AND ‘’ Diabetes Complications’’ [Mesh] AND India
- ‘’ Sweetening Agents’’ [Mesh] AND ‘’ Diabetes Complications’’[Mesh] AND India
- ‘’Blood Glucose’’ [Mesh] AND ‘’ Diabetes Complications’’ [Mesh] AND India
- ‘’Coupling sugar’’ [Mesh] AND ‘Diabetes Complications [Mesh] AND India
- ‘’Sugar-phosphatase’’ [Mesh] AND ‘’ Diabetes Complications’’ [Mesh] AND India

SALT

Sodium chloride AND Diabetes Mellitus

- ‘’Sodium Chloride’’ [Mesh] AND "Diabetes Mellitus" [Mesh] AND India

Sodium Chloride AND Cancer

- "Sodium Chloride" [Mesh]AND ‘’Cancer’’[Mesh]AND India

Sodium chloride AND Cardiovascular Diseases

- ‘’Sodium Chloride’’ [Mesh] AND ‘’Cardiovascular Diseases’’[Mesh] AND India

Sodium Chloride AND Diabetes Complications

- ‘’Sodium Chloride’’ [Mesh] AND ‘’Diabetes Complications’’ [Mesh]AND India

Sodium Chloride AND Neoplasm

- ‘’Sodium Chloride’’[Mesh] and ‘’Neoplasm’’[Mesh] AND India

Salt AND Cancer

- ‘’Salt’’ AND ‘’Cancer’’AND India

Salt AND Diabetes Complications

- ‘’Salt’’and ‘’Diabetes Complications’’ And India

Salt AND Diabetes Mellitus

- ‘’Salt’’ AND ‘’Diabetes Mellitus’’ AND India

Salt AND Cardiovascular diseases

- ‘’Salt’’ AND ‘’Cardiovascular Diseases’’ AND India

FAT

Fat AND Cardiovascular Disease

- ‘’Intra- Abdominal Fat’’[Mesh] AND "Cardiovascular Diseases"[Mesh] AND India
- ‘’Abdominal Fat’’[Mesh] AND "Cardiovascular Diseases"[Mesh] AND India
- ‘’Body Fat distribution’’[Mesh] AND "Cardiovascular Diseases"[Mesh] AND India
- ‘’Fat Substitutes’’ [Mesh] AND "Cardiovascular Diseases"[Mesh] AND India
- ‘’Diet, Fat- Restricted’’ [Mesh] AND "Cardiovascular Diseases"[Mesh] AND India
- ‘’Embolism, Fat’’ [Mesh] AND "Cardiovascular Diseases"[Mesh] AND India
- ‘’Hyperlipoproteinemia Type 1’’ [Mesh] AND "Cardiovascular Diseases"[Mesh] AND India
- ‘’Diet, High-Fat’’ [Mesh] AND "Cardiovascular Diseases"[Mesh] AND India
- ‘’Subcutaneous Fat, Abdominal’’[Mesh] AND "Cardiovascular Diseases"[Mesh] AND India
- ‘’Fat Necrosis’’ [Mesh] AND "Cardiovascular Diseases"[Mesh] AND India
- ‘’Fat Body’’ [Mesh] AND "Cardiovascular Diseases"[Mesh] AND India
- ‘’Fat Emulsions, Intravenous’’ [Mesh] AND "Cardiovascular Diseases"[Mesh] AND India
- ‘’Subcutaneous Fat’’ [Mesh] AND "Cardiovascular Diseases"[Mesh] AND India
- ‘’Adipose Tissue’’ [Mesh] AND "Cardiovascular Diseases"[Mesh] AND India
- ‘’Adipocytes, White’’ [Mesh] AND "Cardiovascular Diseases"[Mesh] AND India
- ‘’Adipocytes, Brown’’ [Mesh] AND "Cardiovascular Diseases"[Mesh] AND India
- ‘’Adipose Tissue, White’’ [Mesh] AND "Cardiovascular Diseases"[Mesh] AND India

- ‘’Adipocytes’’ [Mesh] AND "Cardiovascular Diseases"[Mesh] AND India
- ‘’Dietary Fats (Unsaturated)’’ [Mesh] AND "Cardiovascular Diseases"[Mesh] AND India
- ‘’Skinfold Thickness’’ [Mesh] AND "Cardiovascular Diseases"[Mesh] AND India

Fat AND Cancer

- ‘’Intra- Abdominal Fat’’[Mesh] AND "Cancer"[Mesh] AND India
- ‘’Abdominal Fat’’ [Mesh] AND "Cancer "[Mesh] AND India
- ‘’Body Fat distribution’’ [Mesh] AND "Cancer "[Mesh] AND India
- ‘’Fat Substitutes’’ [Mesh] AND "Cancer "[Mesh] AND India
- ‘’Diet, Fat- Restricted’’ [Mesh] AND "Cancer "[Mesh] AND India
- ‘’Embolism, Fat’’ [Mesh] AND "Cancer"[Mesh] AND India
- ‘’Hyperlipoproteinemia Type 1’’ [Mesh] AND "Cancer "[Mesh] AND India
- ‘’Diet, High-Fat’’ [Mesh] AND "Cancer "[Mesh] AND India
- ‘’Subcutaneous Fat, Abdominal’’[Mesh] AND "Cancer "[Mesh] AND India
- ‘’Fat Necrosis’’ [Mesh] AND "Cancer "[Mesh] AND India
- ‘’Fat Body’’ [Mesh] AND "Cancer "[Mesh] AND India
- ‘’Fat Emulsions, Intravenous’’ [Mesh] AND "Cancer "[Mesh] AND India
- ‘’Subcutaneous Fat’’ [Mesh] AND "Cancer "[Mesh] AND India
- ‘’Adipose Tissue’’ [Mesh] AND "Cancer "[Mesh] AND India
- ‘’Adipocytes, White’’ [Mesh] AND "Cancer "[Mesh] AND India
- ‘’Adipocytes, Brown’’ [Mesh] AND "Cancer "[Mesh] AND India
- ‘’Adipose Tissue, White’’ [Mesh] AND "Cancer "[Mesh] AND India
- ‘’Adipocytes’’ [Mesh] AND "Cancer"[Mesh] AND India
- ‘’Dietary Fats (Unsaturated)’’ [Mesh] AND "Cancer "[Mesh] AND India
- ‘’Skinfold Thickness’’ [Mesh] AND "Cancer"[Mesh] AND India

Fat AND Neoplasms

- ’’Intra- Abdominal Fat’’[Mesh] AND "Neoplasms"[Mesh] AND India
- ‘’Abdominal Fat’’ [Mesh] AND "Neoplasms "[Mesh] AND India
- ‘’Body Fat distribution’’ [Mesh] AND "Neoplasms’’ [Mesh] AND India
- ‘’Fat Substitutes’’ [Mesh] AND "Neoplasms "[Mesh] AND India
- ‘’Diet, Fat- Restricted’’ [Mesh] AND "Neoplasms’’ [Mesh] AND India
- ‘’Embolism, Fat’’ [Mesh] AND "Neoplasms "[Mesh] AND India
- ‘’Hyperlipoproteinemia Type 1’’ [Mesh] AND "Neoplasms "[Mesh] AND India
- ‘’Diet, High-Fat’’ [Mesh] AND "Neoplasms "[Mesh] AND India
- ‘’Subcutaneous Fat, Abdominal’’[Mesh] AND "Neoplasms "[Mesh] AND India
- ‘’Fat Necrosis’’ [Mesh] AND "Neoplasms "[Mesh] AND India
- ‘’Fat Body’’ [Mesh] AND "Neoplasms "[Mesh] AND India
- ‘’Fat Emulsions, Intravenous’’ [Mesh] AND "Neoplasms "[Mesh] AND India
- ‘’Subcutaneous Fat’’ [Mesh] AND "Neoplasms "[Mesh] AND India
- ‘’Adipose Tissue’’ [Mesh] AND "Neoplasms "[Mesh] AND India
- ‘’Adipocytes, White’’ [Mesh] AND "Neoplasms "[Mesh] AND India
- ‘’Adipocytes, Brown’’ [Mesh] AND "Neoplasms "[Mesh] AND India
- ‘’Adipose Tissue, White’’ [Mesh] AND "Neoplasms "[Mesh] AND India
- ‘’Adipocytes’’ [Mesh] AND "Neoplasms "[Mesh] AND India
- ‘’Dietary Fats (Unsaturated)’’ [Mesh] AND "Neoplasms "[Mesh] AND India
- ‘’Skinfold Thickness’’ [Mesh] AND "Neoplasms "[Mesh] AND India

Fat AND Diabetes Mellitus

- ’’Intra- Abdominal Fat’’[Mesh] AND "Diabetes Mellitus"[Mesh] AND India
- ‘’Abdominal Fat’’ [Mesh] AND "Diabetes Mellitus "[Mesh] AND India
- ‘’Body Fat distribution’’ [Mesh] AND "Diabetes Mellitus’’ [Mesh] AND India
- ‘’Fat Substitutes’’ [Mesh] AND "Diabetes Mellitus "[Mesh] AND India
- ‘’Diet, Fat- Restricted’’ [Mesh] AND "Diabetes Mellitus’’ [Mesh] AND India
- ‘’Embolism, Fat’’ [Mesh] AND "Diabetes Mellitus "[Mesh] AND India
- ‘’Hyperlipoproteinemia Type 1’’ [Mesh] AND "Diabetes Mellitus "[Mesh] AND India
- ‘’Diet, High-Fat’’ [Mesh] AND "Diabetes Mellitus "[Mesh] AND India
- ‘’Subcutaneous Fat, Abdominal’’[Mesh] AND "Diabetes Mellitus "[Mesh] AND India
- ‘’Fat Necrosis’’ [Mesh] AND "Diabetes Mellitus "[Mesh] AND India
- ‘’Fat Body’’ [Mesh] AND "Diabetes Mellitus "[Mesh] AND India
- ‘’Fat Emulsions, Intravenous’’ [Mesh] AND "Diabetes Mellitus "[Mesh] AND India
- ‘’Subcutaneous Fat’’ [Mesh] AND "Diabetes Mellitus "[Mesh] AND India
- ‘’Adipose Tissue’’ [Mesh] AND "Diabetes Mellitus "[Mesh] AND India
- ‘’Adipocytes, White’’ [Mesh] AND "Diabetes Mellitus "[Mesh] AND India
- ‘’Adipocytes, Brown’’ [Mesh] AND "Diabetes Mellitus "[Mesh] AND India
- ‘’Adipose Tissue, White’’ [Mesh] AND "Diabetes Mellitus "[Mesh] AND India
- ‘’Adipocytes’’ [Mesh] AND "Diabetes Mellitus "[Mesh] AND India
- ‘’Dietary Fats (Unsaturated)’’ [Mesh] AND "Diabetes Mellitus "[Mesh] AND India
- ‘’Skinfold Thickness’’ [Mesh] AND "Diabetes Mellitus "[Mesh] AND India

Fat AND Diabetes Complications

- ’’Intra- Abdominal Fat’’[Mesh] AND "Diabetes Complications"[Mesh] AND India
- ‘’Abdominal Fat’’ [Mesh] AND "Diabetes Complications"[Mesh] AND India
- ‘’Body Fat distribution’’ [Mesh] AND "Diabetes Complications’’ [Mesh] AND India
- ‘’Fat Substitutes’’ [Mesh] AND "Diabetes Complications"[Mesh] AND India
- ‘’Diet, Fat- Restricted’’ [Mesh] AND "Diabetes Complications’’ [Mesh] AND India
- ‘’Embolism, Fat’’ [Mesh] AND "Diabetes Complications"[Mesh] AND India
- ‘’Hyperlipoproteinemia Type 1’’ [Mesh] AND "Diabetes Complications"[Mesh] AND India
- ‘’Diet, High-Fat’’ [Mesh] AND "Diabetes Complications"[Mesh] AND India
- ‘’Subcutaneous Fat, Abdominal’’[Mesh] AND "Diabetes Complications"[Mesh] AND India
- ‘’Fat Necrosis’’ [Mesh] AND "Diabetes Complications"[Mesh] AND India
- ‘’Fat Body’’ [Mesh] AND "Diabetes Complications "[Mesh] AND India
- ‘’Fat Emulsions, Intravenous’’ [Mesh] AND "Diabetes Complications"[Mesh] AND India
- ‘’Subcutaneous Fat’’ [Mesh] AND "Diabetes Complications"[Mesh] AND India
- ‘’Adipose Tissue’’ [Mesh] AND "Diabetes Complications "[Mesh] AND India
- ‘’Adipocytes, White’’ [Mesh] AND "Diabetes Complications"[Mesh] AND India
- ‘’Adipocytes, Brown’’ [Mesh] AND "Diabetes Complications"[Mesh] AND India
- ‘’Adipose Tissue, White’’ [Mesh] AND "Diabetes Complications"[Mesh] AND India
- ‘’Adipocytes’’ [Mesh] AND "Diabetes Complications"[Mesh] AND India
- ‘’Dietary Fats (Unsaturated)’’ [Mesh] AND "Diabetes Complications "[Mesh] AND India
- ‘’Skinfold Thickness’’ [Mesh] AND "Diabetes Complications"[Mesh] AND India

Fat consumption and Health

- ‘’Omega 3 consumption’’ [Mesh]AND ‘’health’’ [Mesh] AND India
- ‘’Omega 6 consumption’’ [Mesh] AND ‘’health’’ [Mesh] AND India
- “PUFA consumption” [Mesh] AND “health” [MESH] AND India
- ‘’MUFA consumption’’ [Mesh]AND ‘’health’’ [Mesh] AND India
- ‘’Total Fat consumption’’ [Mesh] AND‘’CVD’’ [Mesh] AND India

Annex-6

Studies included in the systematic review on FSS

Table 6A: FATS-Included studies on fat consumption and its health impacts among Indian Population

S. No	Citation	Sample size	Type of study	Study setting	Consumption	Health impact
1	[54]	246	Cross sectional	Gujarat	Fat Intake in Indian Gujarati Men: 55.1g/day	Increase fat consumption is directly proportional to increase in IGF-1
2	[55]	200	Case control	West Bengal	Total fat intake in lean control, 45.5±14.2 g, In lean diabetics 44.2±12.4 g, In obese diabetics 62.2 ±11.4 g	
3	[56]	406	Cross sectional	Pune		Saturated fat intake is directly proportional to BMI, Truncal and Abdominal Obesity
4	[57]	120	Cross sectional	Hyderabad	22g/day- Low Income Group 35g/day- Middle Income Group 46g/day-High Income Group	Lower fat intake combined with supplements controls dyslipidemia
5	[58]	3814	Cross sectional	Multi centre	Fat intake (in Delhi): 41.1% of total energy Fat Intake (in Trivandrum): 23.3% of total energy Fat Intake (in Mumbai) : 39.7% of total energy	**Trivandrum:** Fried Savory snacks pattern positively correlated with fat and cholesterol intake. **Mumbai:** Snack-meat pattern strongly correlated with intake of cholesterol (r= 0.57)and meat (r=0.46)
6	[59]	701	Cross sectional	West Bengal	Mean: 25.5 % of total energy	Hydrogenated SFA and vegetable oil consumption is directly proportional to obesity and serum HDL-C
7	[60]	4608	Cross sectional	Multisite		Increase in fat intake is directly proportional to hypertension
8	[61]	4624	Cross sectional	Multisite	Fat intake in urban women: 56.5 ± 0.4 g/day Rural women: 57.8 ± 0.4 g/day	

9	[62]	4624	Cross sectional	multisite	High fat intake > 30% total energy/day in both urban (93.4%) and rural (93.6%) participants	
10	[63]	767	Cross sectional	Hyderabad	2/3rd of participants consumed ghee/butter daily.	Saturated fat intake is directly proportional to prehypertension
11	[64]	1115	Cross sectional	West Bengal		Increase in dietary oil/fat intake is directly proportional to hypertension
12	[65]	300	Cross sectional	Pune	76.5±16.4g in diabetics and 79.4±19.6g in non-diabetics	Dietary fat intake (SFA) is directly proportional to insulin resistance
13	[66]	6198	Cross sectional	11 cities	Fat Intake in men ≥ 20g/day	Increased fat intake is directly proportional to increased triglycerides
14	[67]	6198	Cross sectional	11 cities	visible fat intake (<20g/day) in men was 26.3% and in women 31.2% and (>40g/day) in men was 14.1% and 13.5% in women	Increased fat intake is directly related to cardio metabolic risk. Prevalence of metabolic syndrome was significantly greater in subjects with highest vs. lowest categories fat intake (52 vs. 45%)
15	[68]	304	Case control	Puducherry	Fat consumption among women > 30g/day	Fat consumption, more than 30g/day is directly proportional to 3.6 times breast cancer risk
16	[69]	829	Cross sectional	Bangalore	Increase in ALA (15-20%) in 2nd and 3rd trimester of pregnancy (0.56g/day) among pregnant women	
17	[70]	25	Cross sectional	Kolkatta, Ghaziabad and Goa	Visible fat > 60% of total fat Total fat intake was, 26.9g/day-163.2g/day in all 3 cities U.P- 71.3± 30.0 g/day Goa—58.5 ± 13.6 g/day West Bengal- 70.9 ± 21.3 g/day	
18	[71]	352	Cross-sectional study	New Delhi	Total fat intake: 65.8±33.6 g/day in all subjects, 70.3±34.5 g/day in hyper-insulinemics, 65.0± 33.5 g/day in normo-insulinemics	

19	[72]	280	Cross-sectional study	West Bengal	Total fat: 210.36 ± 53.57 g/day, total PUFA: 82.02 ± 49.73 g/day, and total MUFA: 94.01 ±16.38 g/day.	
20	[73]	1236	Cross-sectional study	New Delhi	Total Daily fat intake: 84 ± 29 g/ d in males and 72± 21 g/d in females	
21	[74]	21 world regions and two time periods (1990 and 2010)	Systematic review	21 world regions including India	In 2010, globally mean global saturated fat intake in adults was 9.4 (%E), omega 6 intake was 5.9 (%E), dietary cholesterol 228 (mg/d), seafood omega 3 fats was 163 (mg/d), plant omega 3 fats was 1371 (mg/d). In India, the estimated saturated fat intake among ≥20 years adults was in the range of 4.0-5.4 %E/day, dietary cholesterol was in the range of 134-166 mg/day, trans fat was 1.0-1.24 %E/day.	
22	[75]	261 households	Cross-Sectional	New Delhi	Visible fats 37g/CU/day; trans-fat consumption was 0.67g/CU/day (range;0.01-11.44g/CU/d).	Dyslipidemia common-low HDL (46.3% & 69.2% of males & females). Overweight-obesity was higher among females than males (34% overweight; 16.6% obesity).
23	[76]	10,077 households and 41507 tribal individuals	Community based cross-sectional studies	120 randomly selected villages each from 9 states in India	Mean consumption of visible fats was found out to be 10g/CU/day.	

Table 6B. SUGARS- Included studies on total carbohydrate consumption and its health impacts among Indian Population

S.No	Citation	Sample size	Type of study	Study setting	Consumption	Health impact
1	[77]	80	intervention	Kolkata		Significant increase TG (0.01); decrease HDL (0.01); TG/HDL increase (0.001); FPG increase (<0.001) ; HbA1c increase (<0.001)
2	[65]	300	Cross sectional	Pune	T2D-238g Non Diabetic-230 g	Among T2D, Carbs associated with HOMA IR and IL6
3	[78]	796	Cross sectional	10 sites across all regions of India, viz; East, North, West, South and central,	(T2DM) Total CHO=990; complex CHO=881; simple CHO=108 (Normal) Total CHO=1428; complex CHO=1130; simple CHO=298	
4	[79]	60	Cross sectional- 3 groups as per total insulin requirement (TIR)per day	Lucknow	TIR>2=213g TIR 1-2 = 199 TIR<1 =173.8 g	
5	[80]	246	Cross sectional	Gujarat	Men 177.5g Women 164.7 g	CHO associated with IGF and IGFBP
6	[81]	320 (Grp1 >70% CHO; Grp2 60-70% CHO)	Intervention (5 yr follow up – yearly data on biomarkers)	Kharagpur (WB)	CHO: Exp. Group>70% Control<70%	FBS: control: 89 ± 9 to 94 ± 7 mg⁄dL (P < 0.05) Experimental: 92 ± 8 to 100 ± 8 mg ⁄ dL (P = 0.03)
7	[82]	15	Intervention	Mumbai		Low GI snacks reduce HbA1c and FBS
8	[83]	1843	Cohort (clinical observational study)	Chennai	Reports CHO, GI, GL Men 406, 69, 277 Women 402,69,276	CHO OR 4.98 with T2D
9	[84]	2042	Cross sectional	Chennai	47.9g/d sugar intake	
10	[58]	3814	Cross Sectional	Multi centric (Delhi, Trivandrum, Mumbai)	% of Total E: Delhi=48.2; Trivandrum=60.5; Mumbai=47.3	Sweet pattern in Trivandrum= positively correlated with fat, cholesterol & retinol intake (r>=0.37); snacks-meat pattern in Mumbai strongly correlated (r=0.32) with abdominal adiposity

11	[85]	200	Case Control	WB	Total CHO intake (g): lean control=226.4±32.2; lean diabetic=208.2±28.4; obese diabetic=266.5±31.2	
12	[61]	4624	Cross sectional	Multisite (Haryana, Jaipur, Pune, Kolkata, Kochi and Gandhigram)	CHO intake (g/day): Rural=284.6±1.9 Urban=232.3±2.1	
13	[86]	2043	Clinical observational study	Chennai	GL for Men: 386.8±123.4 Women= 341.1±111.4;	Dietary glycemic load & total dietary carbohydrate intake inversely related to HDL-C (P<0.0001) positively related to fasting plasma TG (P=0.021); Higher dietary (GL P<0.003) & Total COOH (P<0.001) were also associated with lower HDL–LDL ratio.
14	[73]	1236	Cross-sectional, epidemiologic descriptive study.	New Delhi	Total Carbohydrate intake - 277 ± 80 gm/ 13–15 y (n = 254) (Female 238 ± 71 and Male 316 ± 53); 16–18 y (n = 543) (Female 239 ± 62 and Male 313 ± 77); 19–25 y (n = 439) (Female 237 ± 60 and Male 325 ± 89). Cola (Sugar Sweetened beverages) - Male 50 g/d; Female 37 g/d. Sweets - Male 33.3 g/d; Female 30 g/d	Using BMI and percentage body fat as the criteria, 16% males and 15% females were categorized as overweight. On the basis of WC, 18% males and 13% females had abdominal obesity.
15	[71]	352	Cross-sectional, epidemiologic descriptive study.	Randomly selected school children in New Delhi, India (Urban setting)	Carbohydrate intake – All subjects (n=352) 336±107.9; Hyperinsulinemic (>85th Percentile) (n=53) 332.4±103.6; Normoinsulinemic (≤ 85th Percentile) (n=299) 336.6 ± 108.8	Mean insulin levels 107 ± 35 pmol/l; males 106.3 ± 34.2 pmol/l; females 115.3 ± 40.1 pmol/l Body Mass Index, percent body fat and waist circumference were significant higher in the hyperinsulinemic group as compared to normoinsulinemic group (p= 0.0021, 0.0006, 0.0041 respectively)
16	[75]	261 households	Cross-Sectional	New Delhi	consumption of sugar was adequate i.e. 20g (intake/CU) (1.4-137.9) [Median Range]	

Table 6C- SALT- Included studies on salt consumption and its health impacts among Indian Population

S.No	Citation	Sample size	Type of study	Study setting	Consumption	Health impact
1	[26]	2367	Case control	Kashmir		>1250 ml/d increased risk of esophageal cancer (OR=2.60, CI: 1.68-4.02)
2	[27]	200	Case Control	Kashmir	More than 90% took salt-tea at breakfast.	
3	[87]	270	Case Control	Kashmir		Increased 24 hour Na excretion (424±150.50) and low potassium excretion (53.4±38.86) in hypertensive group indicates high Na intake and low intake of dietary K plays role in causation of HTN
4	[88]	300	Cross sectional	Wardha	Salt consumption was (14.6g/capita/d)	
5	[89]	14059	Cross sectional	TN, Maharashtra, Jharkhand	Urban population (7.6±3.3g/d) Rural population (6.8±3.5 g/d)	
6	[90]	192	Cross sectional	Puducherry		Addition of extra salt while dining (OR: 2.49, 95% CI: 1.21–5.11) were independently associated with prevalence of hypertension
7	[91]	600	Cross sectional	W Bengal		13.7% hypertensive subjects were consuming extra salt (p>0.05)
8	[92]	2826	Cross sectional	Dibrugarh Assam	Tea garden worker (29.6g/d) General population (22.9g/d)	
9	[62]	4624	Cross sectional	Urban (Jaipur, Kochi, Kolkata, Pondicherry) & rural (Haryana , Jaipur, Pondicherry, Gandhinagar, Pune).	High Na intake (>2500mg/d) *Additional information (not given in the study): Mean dietary salt intake was (>6.25 g).	
10	[64]	1115	Cross sectional	West Bengal	Patients with hypertension in three successive salt intake groups (3–6.9, 7–10.9 and >11 g/day) were 11.9%, 22.2% and 27.3%.	A statistically significant result was observed between salt intake and hypertension (p < 0.001)

11	[63]	767	Cross sectional	South India (Hyderabad)	Daily use of added salt was higher among officers 15.4% (p<0.001) as compared to other ranks 45.2%.	
12	[93]	482	Cross sectional	Trivandrum, Kerala		Only high salt diet (P= 0.03) & diabetes mellitus (P= 0.004) had association with hypertensive state.
13	[94]	1902	Cross sectional	Chennai	Mean dietary salt intake was (8.5 g/d)	
14	[95]	990 adolescents	Cross sectional	Wardha	Consumption of salt (>10 g per day), had higher prevalence of hypertension and pre-hypertension (3.9%, OR 1.93 (C.I: 0.75-5.26) and (12.0% OR 1.87 (C.I: 1.09-3.26)	
15	[96]	1022 aged 14-19 years	Cross sectional	Delhi	Hypertension was associated with diastolic hypertension in the child (OR 2.21; 95% CI 1.13 to 4.33); the odds ratio decreased after simultaneous adjustment for salt intake (OR 1.98; 95% CI 1.00 to 3.94).	
16	[56]	416	Cross sectional	Pune	Daily Salt intake (>5 gram) among men and women was found out to be 34.2%.	
17	[97]	238	Cross sectional	Tripura	Urban people had higher salt.	
18	[98]	regional (21 regions) national (187 countries)	Systematic review	21 regions & 187 countries	In 2010, global mean sodium intake was 3.95 g/day. In India, mean estimated sodium intake in 2010 among persons aged 20 years and over was 3.72 g/d	
19	[50]	6 (3 retail stores & 3 small stores)	Cross-sectional	Hyderabad		27% complied with the minimum recommendations of Codex, which suggests the additional reporting sodium

Annex-7

Examples of implemented policy actions around the world

Domain	Evidence on the effects from the published literature	Examples of policies adapted by countries	Examples of countries that have implemented policies	National Examples
Nutrition labelling	Nutrient lists and interpretive and calorie labels are effective in improving dietary intake for population groups that want to make healthier choices and for which the label provides previously unknown or poorly understood information. Interpretive and calorie labels are more visible and understandable than nutrient lists. There is minimal evidence that labelshave a significant effect on people who have little intention to eat healthily	Mandatory nutrient lists on packaged foods or select groups of packaged foods	Australia and New Zealand, Canada, Chile, China, Central American countries (Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua), EU-28 (implementation by December 2016), Hong Kong SAR, Israel, Malaysia, MERCOSUR countries (Argentina, Brazil, Paraguay, Uruguay, Venezuela), Mexico, Republic of Korea, United States	In Malaysia, the Guide to Nutrition Labelling and Claims mandates that a nutrient list be provided on select categories of packaged foods, including bread, dairy products, canned food, fruit juices, salad dressings, and soft drinks (implemented in 2010).
		Interpretive or warning labels (mandatory or government guidelines for voluntary implementation)	Australia, Ecuador, Finland, Nordic countries (Denmark, Iceland, Norway, Sweden), Republic of Korea, Singapore, Thailand, United Kingdom	In Ecuador, a regulation of the Ministry of Public Health requires packaged foods to carry a “traffic light” label in which the levels of fats, sugar, and salt are indicated by red (high), orange (medium), or green (low) (implemented in 2014).
		Calorie labels (mandatory or government guidelines for voluntary implementation)	Some Australian states and territories, Republic of Korea, United States	Legislation in several Australian states and territories requires restaurant chains to display the kilojoule content of food products on their menu boards (implementation dates are various).
Marketing	Evidence from both mandatory and voluntary approaches suggests that restrictions on food advertising to children reduce the amount of advertising on the restricted channel, but because restrictions implemented to	Mandatory restrictions on advertising to children of foods high in fats, sugar, and salt	Ireland, Mexico, Republic of Korea, United Kingdom	In the Republic of Korea, TV advertising to children under 18 is prohibited for specific categories of food before, during, and after programs shown between 5 and 7pm and during other children’s programs. The restriction also applies to advertising on TV, radio, and Internet that includes “gratuitous” incentives to purchase, such as free toys (implemented in 2010)
		Mandatory restrictions on the use of specific communications channels and marketing techniques for	Mexico (restrictions during select films in cinemas); Republic of Korea (restrictions on Internet advertising with incentives to purchase); Ireland	

	date are not comprehensive, this does not necessarily lead to overall reductions of children's exposure to the whole marketing mix.	foods high in fats, sugar, and salt	(restrictions on use of celebrities); United Kingdom (restrictions on product placement and sponsorship of TV programs)	
		Requirement that advertisements carry a health message	France	All television advertising (targeted at children or adults) for processed food and drinks, or food and drinks containing added fats, sweeteners, and/or salt, must be accompanied by a health message such as: "For your health, eat at least five fruits and vegetables a day" (implemented in 2007).
Economic tools	Taxes reduce consumption of the taxed product, whereas vouchers, financial incentives, and fruit and vegetable boxes raise consumption of the targeted foods among low-income families.	Health-related food taxes	Berkeley (USA), Chile, Finland, France, French Polynesia, Hungary, Mauritius, Mexico, Samoa, Tonga	In Mexico an excise duty of 1 peso ($0.80) per litre is applied on sugary drinks, and an ad valorem excise duty of 8 percent applies to foods with high caloric density, defined as equal to or more than 275 calories per 100 grams (implemented in 2014)
		Government subsidy schemes for healthy foods for lower-income groups	United Kingdom, United States	In the United States, the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) provides food vouchers to low-income pregnant women, breastfeeding women, and infants and children under age 5. The package of foods that women are permitted to purchase with the vouchers was changed in 2009 to become more nutritious. Women also receive nutrition education (original program implemented in 1972; food package revised in 2009).
Agriculture and food systems	Evidence on the impact on healthy diets is still emerging, but there is moderate evidence from the US that initiatives involvi	"Home-grown" school feeding programs (that is, schools purchase food for school meals direct from farmers)	Brazil	Brazilian law requires 30 percent of the national budget for food served in the school meals program to be spent on foods from family farms, with priority given to foods produced using agroecological methods (implemented in 2010).

	ng local agricultural production can improve dietary knowledge, attitudes, and intake.			
Food offered in specific settings	School food standards reduce calorie intake and increase healthy food intake in schools. School fruit and vegetable programs have a small but significant impact on increasing daily vegetable and especially fruit intake among schoolchildren, including children of low socioeconomic status.	Mandatory standards for food available in schools	Australia, Bermuda, Brazil, Bulgaria, Costa Rica, Estonia, Fiji, Finland, France, Hungary, Iran, Jordan, Kuwait, Latvia, Lithuania, Mauritius, Mexico, Romania, Slovenia, Sweden, United Arab Emirates, United Kingdom, United States, Uruguay, Vanuatu	In Costa Rica, Exec. Decree No. 36910-MEP-S permits schools to sell only food and drink that meet specific nutritional criteria (implemented in 2012). In 2008, the Iranian Ministries of Education and Health developed the Guidelines for Healthy Diet and School Buffets. In 2013 the nutrition part of the guidelines was updated. The guidelines list foods based on their sugar, salt, fat, and additive content
		Mandatory restrictions specific to vending machines in schools	Bermuda, France, Slovenia, some US states	In 2010 Slovenia adopted a ban on vending machines on school premises (since incorporated into the 2013 School Nutrition Law). It was designed not only to reduce consumption of foods high in fat, sugar, and salt, but also to remove marketing space on the exterior of vending machines.
		Government schemes for providing fruits and vegetables in schools	Some Australian states, Canada, EU- 28, Norway, United States	The EU School Fruit Scheme provides financing to 26 EU countries to distribute fruits and vegetables to children age 6–10 years in schools. To receive the financing, schools are also required to implement "accompanying measures," such as educational programs (implemented in 2009).
Nutritional quality of food produced by food processors	Evidence from voluntary approaches consistently shows that salt reduction strategies lead to lower sodium intakes (mandatory salt targets have not been implemented recently enough to be	Government-led voluntary programs for reformulation	Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, Costa Rica, Croatia, Czech Republic, Ecuador, France, Hungary, Ireland, Italy, Kuwait, Mexico, Netherlands, New Zealand, Republic of Korea, Spain, Switzerland, United Kingdom, United States, Uruguay	In 2011, the Chilean government and bakers agreed on a voluntary target for salt content in bread of 600mg/100g.

	evaluated). Regulations on maximum limits lead to reductions in actual and reported trans fatty acids in food and encourage food producers to reformulate their products.	Mandatory limits on salt levels in select foods	Argentina, Belgium, Bulgaria, Greece, Iran, Paraguay, Portugal, South Africa	In 2013, the South African Department of Health adopted mandatory targets for salt reduction in 13 food categories (rolling implementation required by 2016–2019).
		Mandatory removal of trans fats	Argentina, Austria, Denmark, Hungary, Iceland, Iran, Switzerland, United States	In 2010, the Argentine Food Code was amended to limit trans-fat content to less than 2 percent of total vegetable fats in oils and margarines and 5 percent of total fat in all other foods (implemented in 2014).
Food retailing	The evidence base is still emerging.	Initiatives to increase the availability of healthier foods in stores and food service outlets and decrease the availability of less healthy foods	France, Mexico, Singapore, United Kingdom, United States	In Singapore, the Health Promotion Board established the Healthier Hawker program to encourage street food vendors to use healthier ingredients (such as reduced-fat oils, fiber-enriched noodles, brown rice, low-fat milk in place of coconut milk, reduced-sodium salt and low-sugar drinks). The government absorbs some costs associated with the use of healthier ingredients, and participating vendors can display government-certified labels saying, for example, “I cook with healthier oil” (implemented in 2011).

Annex-8

Summary of food categories engaged under the Food and Health Dialogue to date

Food Category	Companies Engaged	Reformulation Targets	Timeframe for Action
Savoury Crackers	Arnott's Australia Kraft Foods Australia Pepsico Australia Woolworths Coles ALDI	1. Maximum sodium reduction target of 850mg/100g across plain crackers. 2. Maximum sodium reduction target of 1000mg/100g across flavoured crackers. 3. Maximum sodium reduction target of 850mg/100g across flavoured rice crackers, flavoured rice cakes and flavoured corn cakes. 15% reduction in sodium towards targets for products with sodium levels significantly above the agreed maximum targets (outlined above).	December 2012 – December 2015
Soups	Unilever Heinz Campbell Arnott's Nestle Woolworths Coles ALDI	Maximum sodium reduction target of 290mg/100g across dry soup products.Average sodium reduction target of 290mg/100g and a maximum target of 300mg/100g, across wet/condensed soup products.	December 2011-December 2014
Breads	George Weston Foods Goodman Fielder Baking Allied Mills Cripps Nubake Woolworths Coles ALDI	Maximum sodium reduction target of 400mg/100g across bread products.	May 2010 – December 2013
Potato/Corn/Extruded Snacks (PCES)	The Smith's Snackfood Company Snack Brands Australia Woolworths Coles ALDI	1. Average sodium reduction target of 550mg/100g and a maximum target of 800mg/100g across 'potato chip' products. 2. Average sodium reduction target of 950mg/100g and a maximum target of 1250mg/100g across 'extruded snack' products. 3. Average sodium reduction target of 850mg/100g and a maximum target of 1100mg/100g across 'salt and vinegar snack' products. 4. Average sodium reduction target of 550mg/100g and a maximum target of 700mg/100g across 'cereal based snack' products.	December 2012 – December 2015

Cheese	Fonterra Australia Murray Goulburn WarnamboolCheese and Butter Lion MondelezInternational (formerly Kraft Foods Australia) Woolworths Coles ALDI	Cheddar and Cheddar Style variety cheese products: Maximum sodium target of 710 mg/100g Mozzarella Cheese Products: Maximum sodium target of 550mg/100g Chilled Processed Cheese Products: Maximum sodium target of 1270mg/100mg OR a 10-15% reduction in sodium towards the maximum target for chilled processed cheese products with sodium levels significantly above the agreed maximum target of 1270mg/100g.	March 2013 – March 2017
Ready-to-eat Breakfast Cereals	Kellogg Sanitarium Cereal Partners Worldwide Woolworths Coles ALDI	15% reduction in sodium across ready-to-eat breakfast cereals with sodium levels exceeding 400mg/100g.	May 2010 – December 2013

Source:[99]