Trans Fat Consumption Trends in India
A Strategic Insight

Prepared For:

The Vanaspati Manufacturers' Association of India

&

Indian Vanaspati Producers' Association

FROST & SULLIVAN

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OBJECTIVE

This study has been commissioned by the Vanaspati Industry of India (The Vanaspati Manufacturers' Association of India & Indian Vanaspati Producers' Association).

The objective of this study is:

1. to determine current per capita dietary intake of Trans Fatty Acids (TFA) from various food sources in India at a state level
2. to compare the TFA intake level of India with other countries, as well as WHO recommended guidelines.

BACKGROUND

There are growing concerns about the potential health effects of TFA, particularly those that are derived from partially hydrogenated vegetable oils (PHVO). There has been a vigorous debate regarding the link between dietary intake of TFA and adverse health outcomes. Scientific literature exists which indicates that intake of TFA may be connected to known risk factors for CVD & Diabetes.

There is a perception of growing consumer and media interest in this issue and it has been suggested that India should bring in regulatory measures to reduce TFA intake, similar to those introduced in Denmark, Canada, the USA, and some other European countries.

Dietary intakes of Energy, Fat and TFA vary widely across countries. Nutrient composition of Indian food products differ from those in North America and Europe. Any regulatory measures appropriate for India would need to take account of the food composition and dietary intakes of India and cannot rely solely on the approach taken in other countries.

There are no recently published reliable estimates of total TFA intake in India.

In order to address this, The Vanaspati Industry in India has commissioned Frost & Sullivan to conduct this study on its behalf.

SCOPE, METHODOLOGY & ASSUMPTIONS

Major contributors to the intake of TFA considered for this study are PHVO (Vanaspati, Margarines, and Bakery Shortenings), Edible Vegetable Oils, milk and milk products, and various Animal Meats.

The entire protocol of the study is based on secondary sources of information such as Government of India websites, National Survey results, WHO, other internet databases, etc. No primary consumer research was conducted.

At a basic level, India was segmented into 23 States and Union Territories. State wise population estimates for 2004-05 and 2007-08 were taken from Census of India, GoI[1].

Assumptions used for % Fat and % TFA levels in various food sources

Total Fat intake from various food sources was estimated based on fat content of respective food item. In addition, TFA intake was calculated based on TFA content as percentage of total fat.

Table 1: Assumptions for total fat content and TFA content of various food sources

Food Source	% Fat in total	TFA as % of Total Fat	Source[3]
PHVO	**100%**	**25%**	Assumed conservatively on higher side of range (9.4% - 23.7%) as per CSE Report
Milk & Milk Products	**4.5%**	**5%**	Assumed conservatively on higher side of range (3.7% - 5.3%) as per CSE Report
Edible Vegetable Oils	**100%**	**1%**	Assumed conservatively on higher side of average (0.3 – 1.5% ~ avg 0.9%) as per CSE Report
Sheep & Goat Meat	**13%**	**7%**	Average of range from Internet sources (4.3-9.2%)
Beef & Buffalo Meat	**19%**	**6%**	Average of range from Internet sources (2.8-9.5%)
Pig/Swine Meat	**13%**	**1%**	Average of range from Internet sources (0.2-2.2%)
Poultry Meat	**6%**	**1%**	Average of range from Internet sources (0.2-1.7%)

India – Per Capita estimate of dietary intake for various food items for 2004-05

Daily per capita consumption of the food sources in study scope was obtained from National Sample Survey Organization (NSSO) 61st round results (for the year 2004-05) at a state level[2].

NSSO reports per capita consumption separately for Rural and Urban groups of population. Population weights of Rural and Urban population for each State were considered to determine the

weighted average per capita consumption for each State. The Rural and Urban population was considered as per data from Census of India, GoI.

NSSO takes into account direct household consumption of individual food sources e.g. NSSO provides per capita consumption of Vanaspati & Margarine as purchased in its raw form. Indirect consumption of PHVO through bakery items such as puffs & cakes, deep fried food items such as samosas & other snacks, etc. is not reported separately.

In order to provide a complete and accurate estimate of dietary intake of TFA, the per capita consumption has been adjusted to factor indirect consumption. This has been done using the following approach:

- Total Annual Production estimates for the food sources in study scope were taken from various sources as listed below for the period 2004-05 and 2007-08. Refer Table 3 below.
  - PHVO: Directorate of Vanaspati, Vegetable Oils and Fats (DVVO&F), Government of India
  - Milk & Milk Products: Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture, Government of India
  - Edible Vegetable Oils: The Solvent Extractors' Association of India (http://www.seaofindia.com/)
  - Meat: Food and Agriculture Organization of the United Nations (FAO)
- Total direct consumption (MT per month) was calculated from the NSSO data – weighted average per capita consumption of the State as per NSSO results in Kg/Month/person * Population of the State * 12 ÷ 1000
- Total indirect consumption (MT per month) as a percentage of direct consumption was estimated using various industry estimates and market information. E.g. Industry estimates indicate a 4:3 split for direct to indirect sales of Vanaspati. Hence 75% of direct consumption was taken as indirect consumption. So as per NSSO data persons residing in Delhi directly consume 2,541 MT per month of Vanaspati. Hence it is estimated that 75% of 2,541 = 1,906 MT of Vanaspati are consumed indirectly by way of food items. Additionally Bakery Industry estimates indicate further monthly consumption of 376 MT of PHVO in the form of shortening. So Total PHVO intake in 2004-05 for Delhi is 2,541 + 19,06 + 376 = 4,823 MT per month
- Total per capita consumption for a State was then calculated by adding the direct and indirect consumption and dividing with the population of the State. In the above example

for Delhi, the population for Delhi in 2004-05 is reported as 15,570,000. Hence the per capita daily consumption is 4,823 * 1000,000 ÷ 15,570,000 ÷ 30 = 10.32 g/day/person

- Total National Annual consumption (MT per annum) derived by above approach was then compared with the National Annual production estimates. The variance between the two was found to be less than 10% and is listed in Table 2

Table 2 : Annual National Consumption & Production (MT per annum)

Food Source	2004-05					
	NSSO Direct Consumption	**Assumed Indirect Consumption**	***Indirect as % of Direct Consumption***	**Total Consumption**	**Production Estimate**	***Diff***
Vanaspati & Margarine	498,281	373,710	*75%*	871,991		
Bakery Fats & Shortening		188,017		188,017		
Total PHVO	**498,281**	**561,727**	***113%***	**1,060,008**	**1,151,266**	***-8%***
Milk & Milk Products	**66,051,957**	**26,420,783**	***40%***	**92,472,740**	**92,500,000**	***0%***
Edible Vegetable Oils	**6,533,456**	**3,719,901**	***57%***	**10,253,358**	**11,116,226**	*-8%*
Sheep & Goat Meat	**706,219**	**-**	**-**	**706,219**	**724,976**	***-3%***
Beef & Buffalo Meat	**506,492**	**2,025,969**	***400%***	**2,532,462**	**2,489,939**	***2%***
Pig/Swine Meat	**88,642**	**398,889**	***450%***	**487,531**	**497,000**	***-2%***
Poultry Meat	**790,162**	**790,162**	***100%***	**1,580,324**	**1,715,000**	***-8%***

India – Per Capita estimate of dietary intake for various food items for 2007-08

The most recent NSSO data is available for 2004-05. In order to provide a more recent estimate of dietary intake, the monthly consumption (MT per month) was estimated for 2007-08. This was done using Compounded Annual Growth Rate (CAGR) in production volumes for respective food sources from 2004-05 to 2007-08. The production volumes and CAGR % used for the analysis are listed in Table 3.

The total monthly consumption was divided by the population estimate of the state for 2007-08 to arrive at the daily per capita consumption in g/day/person.

Table 3 : Annual National Production Estimates in MT per annum

Food Source	2004-05	2007-08	CAGR	Source
PHVO	**1,151,266**	**1,203,346**	***1.5%***	Directorate of Vanaspati, Vegetable Oils and Fats, GoI
Milk & Milk Products	**92,500,000**	**104,800,000**	***4.2%***	Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture, GoI
Edible Vegetable Oils	**11,116,226**	**12,307,880**	*3.5%*	The Solvent Extractors' Association of India
Sheep & Goat Meat	**724,976**	**768,547**	***2.0%***	Food and Agriculture Organization of the United Nations
Beef & Buffalo Meat	**2,489,939**	**2,297,137**	***-2.7%***	Food and Agriculture Organization of the United Nations
Pig/Swine Meat	**497,000**	**495,289**	***-0.1%***	Food and Agriculture Organization of the United Nations
Poultry Meat	**1,715,000**	**2,312,800**	***10.5%***	Food and Agriculture Organization of the United Nations

India – Per Capita Energy estimate for 2004-05

State wise NSSO data was considered for total energy intake (Kcal/person/day). The national average derived from NSSO data is 2,051 Kcal/person/day. However, FAO's estimate of per capita energy intake for India for 2003 is 2,472 Kcal/person/day.

Since we have adjusted the per capita consumption by adding indirect consumption, it is reasonable to consider FAO's estimate which is higher than the NSSO estimate of daily energy intake.

FAO does not provide a state wise split of energy for India. Hence NSSO state wise estimate was used as the base and pro-rated to match with the national average of FAO estimate of 2,472 Kcal/person/day.

NSSO results do not provide energy intake estimate for certain states. The following assumptions have been made:

- Delhi, Chandigarh, Himachal Pradesh, and Jammu & Kashmir – Estimated same as average of North India (Punjab, Haryana, Uttar Pradesh, Rajasthan)
- Uttaranchal – Assumed same as Uttar Pradesh
- NESA – Assumed same as Assam

Table 4: Per capita energy estimate in Kcal/person/day for 2004-05

State	NSSO	FAO (prorated using national average)
Delhi	2,274	2,741
Chandigarh	2,270	2,736
Haryana	2,237	2,696
Punjab	2,209	2,663
Jammu & Kashmir	2,193	2,643
Uttar Pradesh	2,184	2,633
Himachal Pradesh	2,175	2,622
Rajasthan	2,165	2,610
Gujarat	2,136	2,575
NESA	2,079	2,506
Jharkhand	2,072	2,497
Bihar	2,064	2,488
Uttaranchal	2,055	2,477
Orissa	2,040	2,460
West Bengal	2,039	2,458
UT	2,033	2,451
Kerala	2,009	2,422
Andhra Pradesh	1,996	2,406
Chhattisgarh	1,971	2,376
Madhya Pradesh	1,936	2,333
Maharashtra	1,897	2,286
Tamil Nadu	1,883	2,270
Karnataka	1,879	2,265
All India	**2,051**	**2,472**

Global – Per capita Energy, Fat and TFA intake data for select countries

TFA intake for global comparison is available from various research studies conducted by health agencies of respective countries. Data is available for Brazil, US, UK, Canada, Denmark and Australia.

Table 5: Daily per capita TFA intake and TFA as percentage of Energy for global countries

Country	TFA intake (g/day/person)	TFA as % of Energy	Source
Australia	1.2 to 1.6	0.6%	FSANZ, (2006) [9]
Brazil	4.5 to 7.2		PAHO [10]
Canada	4.9	2.2%	Health Canada, (2005) [11]
Denmark	2.6	1.0%	Stender, S. and Dyerberg, J. (2003) [12]
United Kingdom		1.2%	UK FSA (2001) [13]
United States of America	2.6	5.8%	American Heart Association (2006) [14]

Daily per capita Energy and Fat intake data for these countries was obtained from Food and Agriculture Organization of the United Nations (FAO) [4]. Since latest estimate of per capita Energy & Fat intake was available for 2003, per capita energy and fat intake for 2007-08 was estimated using CAGR in total energy and fat intake from 1999-2003.

Table 6: Daily per capita Energy intake in Kcal/day/person

Country	1999	2000	2001	2002	2003	2007-08
Australia	3,057	3,068	3,129	3,090	3,134	3,152
Brazil	2,993	2,985	2,996	3,036	3,145	3,285
Canada	3,515	3,559	3,565	3,610	3,604	3,667
Denmark	3,380	3,383	3,390	3,489	3,472	3,537
India	2,435	2,411	2,398	2,460	2,472	2,475
United Kingdom	3,415	3,380	3,431	3,449	3,449	3,442
United States of America	3,705	3,816	3,784	3,766	3,753	3,789

Table 7: Daily per capita Fat Intake in g/day/person

Country	1999	2000	2001	2002	2003	2007-08
Australia	131	135	137	131	132	130
Brazil	90	92	91	93	95	100
Canada	147	148	146	146	148	148

Denmark	136	138	140	140	138	139
India	51	52	51	51	53	54
United Kingdom	143	141	142	137	134	124
United States of America	147	156	157	156	155	163

Results

TFA intake from PHVO

- PHVO in the form of Vanaspati is used as primarily for deep frying purposes, both directly by home users and as an industrial cooking medium.
- NSSO survey figures were referred to for direct intake of Vanaspati/Margarine at a state level. Indirect intake of Vanaspati/Margarine in the form of industrial cooking medium was estimated as 75% of direct intake to arrive at total Vanaspati intake.
- PHVO is also used for production of Bakery Fats & Shortening.
- Intake in the form of bakery fats/shortenings was arrived at from state level institutional sales of fats and shortenings.
- Total PHVO intake was estimated as a summation of Vanaspati/Margarine and Bakery Fats intake. This was further extrapolated to 2007-08 using growth rate in national PHVO production from 2004-05 to 2007-08.
- Refer Table 1 for assumptions on % Fat content and %TFA content in PHVO.

Nationally, PHVO intake is estimated at 2.8 g/day/person. At 25% of total PHVO, TFA intake from PHVO is thus estimated at 0.7 g/day/person. Consumption of PHVO ranged widely from 0.6 g/day/person to 25.4 g/day/person; corresponding to TFA intake from 0.16 g/day/person to 6.34 g/day/person.

PHVO intake was found to be highest in Punjab, followed by Chandigarh, Haryana and Delhi. TFA intake in these states was therefore quite high in comparison to national average estimates.

Refer Table 8 for state wise Total and per capita intake of PHVO and TFA.

Table 8: State wise Total PHVO and TFA Intake from PHVO for 2007-08

State	Population in '000	Total Vanaspati Intake (MT/Month)	Total Bakery Fats Intake (MT/Month)	Total PHVO intake (MT/month)	per capita PHVO intake (g/day/person)	per capita TFA intake from PHVO (g/day/person)
Punjab	26,720	19,633	708	20,341	25.38	**6.34**
Chandigarh	1,230	128	333	461	12.50	**3.12**
Haryana	24,170	6,891	517	7,408	10.22	**2.55**
Delhi	16,950	4,648	500	5,148	10.12	**2.53**
Uttaranchal	9,510	434	1,317	1,751	6.14	**1.53**
Himachal Pradesh	6,600	848	267	1,115	5.63	**1.41**
Uttar Pradesh	190,250	22,717	1,667	24,384	4.27	**1.07**
J&K	11,257	636	750	1,386	4.10	**1.03**
UT	3,864	71	404	476	4.10	**1.03**
Jharkhand	30,180	1,912	375	2,287	2.53	**0.63**
Bihar	93,630	5,969	708	6,677	2.38	**0.59**
NESA	42,750	980	1,517	2,496	1.95	**0.49**
Maharashtra	107,970	3,822	1,750	5,572	1.72	**0.43**
Madhya Pradesh	68,740	2,501	750	3,251	1.58	**0.39**
Gujarat	56,630	1,013	1,583	2,596	1.53	**0.38**
Kerala	33,800	212	1,000	1,212	1.20	**0.30**
West Bengal	87,000	1,030	1,500	2,530	0.97	**0.24**
Karnataka	57,550	271	1,333	1,604	0.93	**0.23**
Orissa	39,660	760	333	1,094	0.92	**0.23**
Tamil Nadu	66,110	170	1,333	1,504	0.76	**0.19**
Andhra Pradesh	82,380	146	1,667	1,813	0.73	**0.18**
Chhattisgarh	23,270	366	125	491	0.70	**0.18**
Rajasthan	64,530	795	417	1,211	0.63	**0.16**
Total All India	**1,144,751**	**75,953**	**20,854**	**96,807**	**2.82**	**0.70**

TFA intake from Edible Vegetable Oils

- India consumers a variety of edible vegetable oils namely groundnut oil, mustard oil, coconut oil, soybean oil, sunflower oil, palm oil and other lesser-known oils such as safflower, linseed, cottonseed, rice bran oil, etc.
- Almost all edible vegetable oils are used for direct consumption as a cooking medium in households; therefore, NSSO survey results were referred to for direct consumption of edible oils at a state level.
- However, a significant portion of certain oils (e.g. Palm Oil, Soybean Oil) is also consumed indirectly in the form of processed food products. Therefore, indirect intake of all vegetable oils including palm oil was estimated to arrive at total intake of vegetable oils at a state level.
- The consumption volumes were extrapolated to 2007-08, using growth rate in total edible vegetable oil volumes from 2004-05 to 2007-08.
- Refer Table 1 for assumptions on % Fat content and %TFA content in edible vegetable oils.

India consumes 27.6 g/day/person of edible vegetable oils, which translates to TFA intake of 0.28 g/day/person. The consumption varied from 11.2 g/day/person to 53 g/day/person.

Per capita intake of edible vegetable oil was highest in Maharashtra followed by Karnataka, Andhra Pradesh, Tamil Nadu and Gujarat; corresponding TFA intake was also reported to be high to the tune of 0.42-0.53 g/day/person compared to the national average estimate of 0.28 g/day/person

Refer Table 9 for TFA intake from edible vegetable oils for India in 2007-08.

Table 9: State wise Total Edible Vegetable Oils intake and TFA intake from Edible Vegetable Oils for 2007-08

State	Population in '000	Total Edible Vegetable Oils intake (MT/month)	per capita intake of Edible Vegetable Oils (g/day/person)	per capita TFA intake from Edible Vegetable Oils (g/day/person)
Maharashtra	107,970	171,751	53.0	**0.53**
Karnataka	57,550	80,417	46.6	**0.47**
Andhra Pradesh	82,380	113,217	45.8	**0.46**
Tamil Nadu	66,110	84,997	42.9	**0.43**
Gujarat	56,630	70,579	41.5	**0.42**
UT	3,864	3,762	32.5	**0.32**
Chandigarh	1,230	1,192	32.3	**0.32**
Delhi	16,950	14,666	28.8	**0.29**
Himachal Pradesh	6,600	5,100	25.8	**0.26**
Madhya Pradesh	68,740	51,963	25.2	**0.25**
Chhattisgarh	23,270	17,322	24.8	**0.25**
Orissa	39,660	28,042	23.6	**0.24**
J&K	11,257	7,494	22.2	**0.22**
Kerala	33,800	22,294	22.0	**0.22**
Rajasthan	64,530	39,572	20.4	**0.20**
Uttaranchal	9,510	5,789	20.3	**0.20**
West Bengal	87,000	50,473	19.3	**0.19**
NESA	42,750	22,480	17.5	**0.18**
Uttar Pradesh	190,250	84,751	14.8	**0.15**
Jharkhand	30,180	12,964	14.3	**0.14**
Bihar	93,630	39,516	14.1	**0.14**
Punjab	26,720	9,759	12.2	**0.12**
Haryana	24,170	8,064	11.1	**0.11**
Total All India	**1,144,751**	**946,166**	**27.6**	**0.28**

TFA intake from Milk & Milk Products:

- State wise direct milk and milk product consumption for the year 2004-05 was referred from the NSSO national survey report.
- NSSO reports Liquid Milk consumption in Liters. Density of Milk was taken as 1.03 Kg/Liter to arrive at monthly consumption in Kg.
- However, this does not include indirect milk fat intake in the form of sweets, other industrial applications. Therefore, indirect milk fat intake was factored in as 40 percent of direct milk fat intake.
- Intake of total milk fat (direct and indirect) in 2004-05 was extrapolated to 2007-08 by applying growth rate in Indian milk production from 2004-05 to 2007-08.
- Refer Table 1 for assumptions on % Fat content and %TFA content in Milk & Milk products.

At a national level in 2007-08, it is estimated that India consumed 11.4 g/day/person of milk fats, which gives TFA intake from milk fats as 0.57 g/day/person. Milk fat intake ranged from 2.6 g/day to 33.2 g/day with Haryana, Punjab and Chandigarh showing a high milk fat consumption on account of high consumption of milk products such as butter, ghee, etc. The corresponding TFA intake ranged from 0.13 g/day/person to 1.66 g/day/person.

Refer Table 10 for total Milk Fats intake and TFA intake from milk fats for India in 2007-08.

Table 10: State wise Total Milk Fats and TFA intake from Milk Fats for 2007-08

State	Population in '000	Total intake of Milk Fats (MT/month)	per capita intake of Milk Fats (g/day/person)	per capita TFA intake from Milk Fats (g/day/person)
Haryana	24,170	24,095	33.23	**1.66**
Chandigarh	1,230	1,104	29.91	**1.50**
Punjab	26,720	22,741	28.37	**1.42**
Rajasthan	64,530	49,131	25.38	**1.27**
Delhi	16,950	11,890	23.38	**1.17**
Himachal Pradesh	6,600	4,440	22.42	**1.12**
J&K	11,257	7,044	20.86	**1.04**
Gujarat	56,630	28,893	17.01	**0.85**
Uttaranchal	9,510	4,660	16.33	**0.82**
Madhya Pradesh	68,740	26,408	12.81	**0.64**
Uttar Pradesh	190,250	68,880	12.07	**0.60**
Karnataka	57,550	16,781	9.72	**0.49**
Maharashtra	107,970	30,051	9.28	**0.46**
Tamil Nadu	66,110	17,714	8.93	**0.45**
Andhra Pradesh	82,380	21,287	8.61	**0.43**
UT	3,864	960	8.28	**0.41**
Kerala	33,800	7,928	7.82	**0.39**
Bihar	93,630	20,852	7.42	**0.37**
Jharkhand	30,180	4,604	5.08	**0.25**
West Bengal	87,000	12,696	4.86	**0.24**
NESA	42,750	5,545	4.32	**0.22**
Chhattisgarh	23,270	2,059	2.95	**0.15**
Orissa	39,660	3,122	2.62	**0.13**
Total All India	**1,144,751**	**392,884**	**11.44**	**0.57**

TFA intake from Meat

- Meat products considered for study were
  - Sheep & Goat meat
  - Beef & Buffalo meat
  - Pig/Swine Meat and
  - Poultry meat.
- NSSO survey results of 2004-05 were referred to for direct consumption of meat in households, which typically considers meat cooked and consumed at home.
- However, out of home consumption of meat at hotel/restaurant chains, fast food outlets and consumption of other forms of processed meat products, etc contributes a significant percentage to the actual consumption.
- Indirect consumption of meat products has been factored in separately using annual production volume estimate from FAO Stat net of exports. Refer Table 11 for FAO Production and Exports volume data of meat and meat products.
- Meat intake values were extrapolated to 2007-08 using growth rate in consumption from 2004-05 to 2007-08.
- Refer Table 1 for assumptions on % Fat content and %TFA content in different meat sources.

Table 11: All India Meat Production and Exports Volume

All Volume in MT	Production (FAO Stat)[5]		Exports (APEDA)[6]		Consumption (Production less Exports)	
	2004-05	2007-08	2004-05	2007-08	2004-05	2007-08
Sheep and Goat Meat	734,000	777,456	9,024	8,909	724,976	768,547
Beef and Buffalo Meat	2,827,717	2,780,615	337,778	483,478	2,489,939	2,297,137
Pig/Swine Meat	497,000	497,000	0	1,711	497,000	495,289
Poultry Meat	1,715,000	2,312,800			1,715,000	2,312,800

At a national level, total Fat intake from meat sources is estimated at 1.79 g/day/person, contributing TFA of 0.09 g/day/person in 2007-08. This is considerably low as compared to TFA intake from other food sources.

Refer Table 12 for Total Meat intake & TFA intake from meat & meat products for India in 2007-08

Table 12: State wise Total Meat and TFA intake from Meat for 2007-08

State	Sheep & Goat Meat MT/Month	Beef & Buffalo Meat MT/Month	Pig/Swine Meat MT/Month	Poultry Meat MT/Month	per capita Fat intake from Meat (g/day/person)	per capita TFA intake from Meat (g/day/person)
Jammu & Kashmir	1,875	7,249	162	2,673	5.37	**0.31**
Kerala	497	22,939	904	16,756	5.55	**0.28**
NES	1,325	22,827	26,047	10,095	6.62	**0.25**
Uttar Pradesh	7,712	57,248	1,395	4,787	2.17	**0.13**
West Bengal	2,730	23,000	3,049	27,101	2.62	**0.12**
UT	198	877	92	1,566	2.62	**0.11**
Karnataka	4,808	9,991	1,213	15,208	2.11	**0.10**
Maharashtra	13,718	15,770	480	13,616	1.75	**0.10**
Andhra Pradesh	7,627	10,985	875	30,407	2.07	**0.09**
Tamil Nadu	6,366	6,938	156	18,792	1.69	**0.07**
Delhi	1,086	1,626	954	3,974	1.62	**0.06**
Uttaranchal	606	1,032	177	467	1.14	**0.06**
Jharkhand	1,322	2,514	2,161	6,260	1.46	**0.05**
Haryana	212	1,714	360	2,268	0.75	**0.03**
Orissa	1,279	1,801	665	5,222	0.78	**0.03**
Himachal Pradesh	530	53	42	222	0.49	**0.03**
Gujarat	1,756	2,119	0	3,086	0.49	**0.02**
Rajasthan	3,188	1,290	413	203	0.37	**0.02**
Bihar	2,678	2,968	438	4,837	0.45	**0.02**
Madhya Pradesh	1,880	1,574	95	3,843	0.39	**0.02**
Chhattisgarh	552	103	756	4,167	0.65	**0.01**
Chandigarh	24	0	5	168	0.39	**0.01**
Punjab	420	80	48	1,879	0.24	**0.01**
All India	**62,389**	**194,697**	**40,488**	**177,598**	**1.79**	**0.09**

Total TFA intake for India

National per capita TFA intake is estimated at 1.64 g/day/person which is well below the WHO recommendation of <2.5 g/day/person[7].

However TFA intake ranges widely from 0.6 g/day/person to as high as 7.9 g/day/person. Haryana, Delhi, Punjab, and Chandigarh have high TFA intake primarily due to high intake levels of PHVO and Milk Fats.

Refer Table 13 for total per capita TFA intake from various food sources for India in 2007-08.

At a national level, PHVO contributes 43% of total TFA intake of the country, followed by Milk & Milk products which contribute 35%. Edible vegetable oils contribute 17% and Meat contributes 5% of TFA intake. There is again wide disparity at a state level e.g. in Punjab PHVO contributes almost 80% of total TFA intake, whereas this is only 9% for Rajasthan. Milk Fats are the highest contributor of TFA intake in Rajasthan accounting for 77% of total TFA intake.

Refer Table 14 for State wise contribution of various food sources to total TFA intake for India in 2007-08.

Per capita TFA intake as percentage of energy was calculated to be 0.6% for India, which again is lower than WHO dietary recommendation of 1%[8]. Also per capita fat intake as percentage of total energy was estimated as 15.9% which is at the lower end of WHO recommendation range of 15% to 30%.

At a state level, TFA intake as percentage of energy was estimated to be higher than 1% in Punjab, Haryana, Chandigarh, and Delhi ranging from 1.3-2.7%. For all other states, TFA intake as percentage of energy was lower than the recommended <1%. Only Punjab and Chandigarh are estimated to have TFA intake from PHVO as percentage of Energy of more than 1%. All other States in India have dietary TFA intake from PHVO as percentage of Energy of lower than 1%.

Refer Table 15 for State wise TFA intake as percentage of dietary energy for India in 2007-08.

Table 13: State wise TFA intake from various food sources for 2007-08

State	TFA – PHVO (g/day/person)	TFA – Edible Vegetable Oils (g/day/person)	TFA – Milk Fat (g/day/person)	TFA – Meat (g/day/person)	Total TFA intake (g/day/person)
Punjab	6.34	0.12	1.42	0.01	**7.89**
Chandigarh	3.12	0.32	1.50	0.01	**4.95**
Haryana	2.55	0.11	1.66	0.03	**4.36**
Delhi	2.53	0.29	1.17	0.06	**4.05**
Himachal Pradesh	1.41	0.26	1.12	0.03	**2.81**
Uttaranchal	1.53	0.20	0.82	0.06	**2.62**
Jammu & Kashmir	1.03	0.22	1.04	0.31	**2.60**
Uttar Pradesh	1.07	0.15	0.60	0.13	**1.95**
UT	1.03	0.32	0.41	0.11	**1.88**
Gujarat	0.38	0.42	0.85	0.02	**1.67**
Rajasthan	0.16	0.20	1.27	0.02	**1.65**
Maharashtra	0.43	0.53	0.46	0.10	**1.52**
Madhya Pradesh	0.39	0.25	0.64	0.02	**1.30**
Karnataka	0.23	0.47	0.49	0.10	**1.28**
Kerala	0.30	0.22	0.39	0.28	**1.19**
Andhra Pradesh	0.18	0.46	0.43	0.09	**1.16**
Tamil Nadu	0.19	0.43	0.45	0.07	**1.14**
NES	0.49	0.18	0.22	0.25	**1.13**
Bihar	0.59	0.14	0.37	0.02	**1.13**
Jharkhand	0.63	0.14	0.25	0.05	**1.08**
West Bengal	0.24	0.19	0.24	0.12	**0.80**
Orissa	0.23	0.24	0.13	0.03	**0.63**
Chhattisgarh	0.18	0.25	0.15	0.01	**0.59**
All India	**0.70**	**0.28**	**0.57**	**0.09**	**1.64**

Table 14: Percentage contribution of various food source to total TFA intake

State	PHVO	Milk & Milk Products	Edible Vegetable Oils	Meat & Meat Products
Punjab	80%	18%	2%	0%
Chandigarh	63%	30%	7%	0%
Delhi	62%	29%	7%	2%
Uttaranchal	59%	31%	8%	2%
Haryana	59%	38%	3%	1%
Jharkhand	58%	23%	13%	5%
Uttar Pradesh	55%	31%	8%	7%
UT	55%	22%	17%	6%
Bihar	53%	33%	12%	2%
Himachal Pradesh	50%	40%	9%	1%
NES	43%	19%	15%	22%
Jammu & Kashmir	40%	40%	9%	12%
Orissa	37%	21%	38%	5%
West Bengal	30%	30%	24%	15%
Madhya Pradesh	30%	49%	19%	1%
Chhattisgarh	30%	25%	42%	2%
Maharashtra	28%	31%	35%	6%
Kerala	25%	33%	18%	24%
Gujarat	23%	51%	25%	1%
Karnataka	18%	38%	36%	8%
Tamil Nadu	17%	39%	38%	7%
Andhra Pradesh	16%	37%	40%	7%
Rajasthan	9%	77%	12%	1%
All India	**43%**	**35%**	**17%**	**5%**

Table 15: State wise Fat and TFA intake as percentage of Energy intake

State	Population ('000)	per capita Fat Intake (g/day)	per capita TFA intake (g/day)	per capita Energy intake (Kcal/day)	Fat as % of total energy	TFA as % of total energy	TFA from PHVO as % of total energy
Punjab	26,720	66.2	7.89	2,664	**22.3%**	**2.67%**	**2.14%**
Chandigarh	1,230	75.1	4.95	2,737	**24.7%**	**1.63%**	**1.03%**
Haryana	24,170	55.3	4.36	2,697	**18.5%**	**1.45%**	**0.85%**
Delhi	16,950	64.0	4.05	2,742	**21.0%**	**1.33%**	**0.83%**
Himachal Pradesh	6,600	54.3	2.81	2,623	**18.6%**	**0.97%**	**0.48%**
Uttaranchal	9,510	43.9	2.62	2,478	**15.9%**	**0.95%**	**0.56%**
Jammu & Kashmir	11,257	52.5	2.60	2,644	**17.9%**	**0.88%**	**0.35%**
UT	3,864	47.5	1.88	2,452	**17.4%**	**0.69%**	**0.38%**
Uttar Pradesh	190,250	33.4	1.95	2,634	**11.4%**	**0.67%**	**0.36%**
Maharashtra	107,970	65.8	1.52	2,287	**25.9%**	**0.60%**	**0.17%**
Gujarat	56,630	60.6	1.67	2,576	**21.2%**	**0.58%**	**0.13%**
Rajasthan	64,530	46.8	1.65	2,611	**16.1%**	**0.57%**	**0.05%**
Karnataka	57,550	59.3	1.28	2,265	**23.6%**	**0.51%**	**0.09%**
Madhya Pradesh	68,740	40.0	1.30	2,334	**15.4%**	**0.50%**	**0.15%**
Tamil Nadu	66,110	54.2	1.14	2,271	**21.5%**	**0.45%**	**0.08%**
Kerala	33,800	36.5	1.19	2,423	**13.6%**	**0.44%**	**0.11%**
Andhra Pradesh	82,380	57.2	1.16	2,407	**21.4%**	**0.43%**	**0.07%**
NES	42,750	30.4	1.13	2,507	**10.9%**	**0.41%**	**0.17%**
Bihar	93,630	24.3	1.13	2,489	**8.8%**	**0.41%**	**0.21%**
Jharkhand	30,180	23.4	1.08	2,498	**8.4%**	**0.39%**	**0.23%**
West Bengal	87,000	27.8	0.80	2,459	**10.2%**	**0.29%**	**0.09%**
Orissa	39,660	27.9	0.63	2,460	**10.2%**	**0.23%**	**0.08%**
Chhattisgarh	23,270	29.1	0.59	2,377	**11.0%**	**0.22%**	**0.07%**
All India	**1,144,751**	**43.6**	**1.64**	**2,473**	**15.9%**	**0.60%**	**0.26%**

Global – TFA Intake benchmarks

India's per capita TFA intake of 1.6 g/day/person is lower than most countries except Australia (1.2 – 1.6 g/day – average taken as 1.4 g/day).

India's per capita total Fat intake at 44 g/day/person and Energy intake at 2,473 Kcal/day/person are the lowest among the countries compared.

Table 16: Comparative Analysis of Energy/Fat and TFA intake for various countries

Country	Energy (Kcal/day/person)	Fat Intake (g/day/person)	Fat as % of energy	TFA intake (g/day/person)	TFA as % of energy
Brazil	3,255	99	27%	5.9	1.6%
USA	3,779	161	38%	5.8	2.6%
UK	3,449	134	35%	4.6	1.2%
Canada	3,628	148	37%	4.9	2.2%
Denmark	3,472	138	36%	2.6	1.0%
India	**2,473**	**44**	**16%**	**1.6**	**0.6%**
Australia	3,151	131	37%	1.4	0.6%

CONCLUSIONS

Daily per capita dietary TFA intake in India is estimated at 1.6 g/day. TFA intake as percentage of dietary energy for India is estimated at 0.6%. Both these parameters are lower than the WHO recommended standards of <2.5 g/day and <1%.

India has one of the lowest per capita Fat intake at 44 g/day among the countries benchmarked. Its TFA intake level at 1.6 g/day is also lower than most countries except Australia.

However, certain states in North India have high consumption of Vanaspati and Milk Fats and hence higher TFA intake. Punjab (2.7%), Chandigarh (1.6%), Haryana (1.4%) and Delhi (1.3%) have TFA intake above WHO recommended level of 1%. Of these only Punjab and Chandigarh have dietary TFA intake from PHVO as percentage of Energy of more than 1%.

At a national level, PHVO contributes 43% of total TFA intake of the country, followed by Milk & Milk products which contribute 35%. Edible vegetable oils contribute 18% and Meat contributes 5% of TFA intake. There is again wide disparity at a state level e.g. in Punjab PHVO contributes almost 80% of total TFA intake, whereas this is only 9% for Rajasthan. Milk Fats are the highest contributor of TFA intake in Rajasthan accounting for 77% of total TFA intake.

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