

# Ensuring Nutrition Security — A Survey of Urban Indian Consumers' Purchase and Consumption of Fruits and Vegetables

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**Abstract:** A pioneering study by the World Health Organization (WHO) panel on diet, nutrition and prevention of chronic diseases recommended an intake of at least 400 grams or five daily servings of fruits and vegetables (excluding potatoes, cassava and other starchy tubers) with an average serving size of 80 grams, to prevent diet-related chronic diseases and micronutrient deficiencies. It is scientifically proven that fruits and vegetables are essential sources of *phytonutrients*, which promote a range of health benefits. Although the Indian government has introduced a regulation on food security, a number of studies show that Indians are falling short of the WHO recommended intake of fruits and vegetables. Given this background, the paper tries to examine the extent of shortfall in the consumption of fruits and vegetables, if any, based on a primary survey of 1001 middle and upper income urban Indian consumers. It also analyses the purchase patterns of fruits and vegetables, the reasons for the shortfall in consumption, its implications on health and well-being of consumers and whether the shortfall can be supplemented by health/nutritional supplements. The level of awareness among urban Indian consumers is also discussed. The paper finds that young Indians are likely to face a greater shortfall in the consumption to several reasons, based on which it makes policy recommendations to the Indian government to ensure nutrition security.

**Key words:** world health organization; India; nutrition; fruits and vegetables; consumer survey; policy **JEL codes:** C81, D12, I18

## **1. Introduction**

India is one of the fastest growing economies in the world<sup>1</sup> and is home to over 1.3 billion people that comprise 17.6 percent of the global population.<sup>2</sup> As a developing country with a large population, India continues

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<sup>&</sup>lt;sup>1</sup> The IMF World Economic Outlook has found that India had an average growth rate of 7.02 percent over the period of 2000 and 2014, and is predicted to grow at 7.5 percent during 2016. Details at: https://www.imf.org/external/pubs/ft/weo/2016/update/01/ (accessed on February 20, 2016).

<sup>&</sup>lt;sup>2</sup> Data extracted from the United Nations, Department of Economic and Social Affairs, Population Division. Available at: http://esa.un.org/unpd/wpp/ (accessed on May 20, 2016).

to face the challenges of "food security" and "nutrition security". The terms "food security" and "nutrition security" have often been used interchangeably, however, there are subtle differences. While "food security" refers to the adequate supply of food, "nutrition security" refers to the provision of optimal quality of food, in addition to access to health and sanitation facilities (Wüstefeld M., 2013). To ensure "food security", the National Food Security Act (NFSA) was implemented in 2013.<sup>3</sup> While this Act aims to provide subsidized food grains to approximately two-thirds of the population, it does not ensure that Indians have a wholesome diet which offers "nutrition security".

A pioneering study by the World Health Organization (WHO) panel on diet, nutrition and prevention of chronic diseases recommended an intake of at least 400 grams or five daily servings of fruits and vegetables (excluding potatoes, cassava and other starchy tubers) with an average serving size of 80 grams, to prevent diet-related chronic diseases and micronutrient deficiencies (WHO/FAO, 2003). It is scientifically proven that fruits and vegetables are essential sources of *phytonutrients*, which promote a range of health benefits (Liu, 2013; Beecher (1999). It is also established that different combinations of fruits and vegetables provide different types of *phytonutrients* and each of these have different health benefits (Mente et al., 2009; Garcia-Lafuente et al., 2009; Olson et al., 2011).

Taking this as the reference base, several studies have been conducted by international organisations to evaluate consumption of fruits and vegetables across countries and select markets (Lee et al., 2013; Murphy et al., 2012). Notable among these is the World Health Survey (WHS) conducted by the WHO across 70 countries between 2002 and 2004. The survey analysed diet patterns of over 300,000 individuals aged 18 and above, and found that a vast majority of adults (58-88 percent) worldwide did not meet the WHO recommendation of consuming at least five daily servings of fruits and vegetables (or 400 grams) (Murphy et al., 2014). This study found that both, developed and developing countries, are falling short of the recommended intake of fruits and vegetables. India, too, is found short of the recommended consumption.

Focusing specifically on India, a number of studies have highlighted that although India is one of the largest producers of fruits and vegetables in the world, Indians are falling short of meeting the nutrient requirements. For example, the National Sample Survey Organisation (NSSO) in its survey-based report, *Nutritional Intake in India (2011-2012)*, found that the Indian diet pattern is skewed towards cereals, and fruits and vegetables account for only 9 percent of the calorie intake. The NSSO survey further showed that since the year 2000, there has been a sharp decline in calorie intake in both, rural and urban India, resulting in low nutrition levels. Further, more than 50 percent of the calories and nutrition are derived from cereals. In the non-cereal category, most calories are drawn from oil, milk and milk products. The WHS Report on India for a sample of 10,750 households from six states (Assam, Karnataka, Maharashtra, Rajasthan, Uttar Pradesh and West Bengal) shows that 78 percent of respondents reported insufficient intake of fruits and vegetables (WHS, 2003). The broad conclusion from all these surveys is that there is a shortfall in the intake of fruits and vegetables in India, which may lead to nutrition deficiencies. This is a cause for concern for a developing country like India, whose growth and development depends on the health of its large population.

Nutrient deficiency in a number of countries is met through health/nutritional supplements. In India, although there is a clear policy on *ayurvedic* nutritional supplements, the Food Safety Authority of India (FSSAI) is yet to come up with a regulation on *non-ayurvedic* nutritional supplements. This not only affects the manufacturers of

<sup>&</sup>lt;sup>3</sup> Details available on: http://dfpd.nic.in/nfsa-act.htm (accessed on May 20, 2016).

nutritional supplements but also the well-being of consumers who are not able to choose the right supplement.

Given this background, the objective of this paper is to understand the extent of shortfall, if any, in the consumption of fruits and vegetables across urban consumers in India. A primary survey of 1,001 respondents was conducted for this purpose. The paper further examines the reasons for the shortfall in consumption, its implications on health and well-being and whether the shortfall can be supplemented by health/nutritional supplements. The paper also evaluates the level of awareness among consumers on the benefits derived from consumption of fruits and vegetables. Finally, the paper provides policy recommendations on ensuring 'nutrition security' in the country.

The next section provides a review of the existing literature. Section 3 discusses the survey methodology and Section 4 presents the key survey findings. Section 5 draws the main conclusions and makes policy recommendations.

## 2. Review of Literature

Existing literature shows that worldwide there has been an increase in the incidence of non-communicable diseases (NCDs) such as cardiovascular diseases, diabetes and cancers, some of which are linked to the diet patterns. In 2008, 36 million people died (69 percent of total deaths) worldwide due to NCDs (WHO, 2010). India lost 5.9 million lives (53 percent of total deaths) in 2010 due to NCDs, which is emerging as a major cause for death in the country (Joshi et al., 2006; Shetty P. S., 2002).

A growing body of literature shows that increasing fruits and vegetables intake could reduce the risk of NCDs (Liu, 2013; Beecher, 1999). Lock et al. (2005) calculated the burden of disease attributable to inadequate consumption of fruits and vegetables across a sample of 26 countries worldwide. The sample was stratified by geographical region, age and gender and implications were evaluated on six health outcomes namely, ischaemic heart disease, stroke, stomach, oesophageal, colorectal and lung cancer. Relative risk ratios associated with an increase in daily intake of fruits and vegetables by 80 grams were found to be in the range of 0.90-0.99 for ages 15 and above and the disease burden (with baseline of consuming a minimum of 600 grams of fruits and vegetables daily) was estimated to be 2.63 million deaths (1.8 percent of total deaths) per year. The study found that lower intake of fruits and vegetables increases the risk of the selected diseases.

In the case of India, the Integrated Disease Surveillance Project (IDSP) of the Ministry of Health and Family Welfare selected a sample of 5000 households from seven states (Andhra Pradesh, Kerala, Madhya Pradesh, Maharashtra, Mizoram, Tamil Nadu and Uttarakhand) between 2007 and 2008 to identify the risk factors that lead to NCDs. It found that a high proportion (75.7-98.9 percent) of the population takes inadequate amounts of fruits and vegetables, which increases the risk of diseases such as hypertension and diabetes.<sup>4</sup>

The theory of nutritional transition (Drewnowski et al., 1997) suggests that a rise in income levels alters consumption patterns of an economy, wherein traditional plant-based diets rich in complex carbohydrates and fibre are replaced by food rich in fats and sugars. This may lead to nutrition deficiencies. Misra et al. (2011) found that in India, rapid economic growth and urbanization have led to increase in fat derived energy by 6 per cent and reduced carbohydrates derived energy by 7 percent in the period between 1973 and 2004. A typical Indian diet is different from the diet of the developed countries and studies have varied opinions on its nutrition content. While

<sup>&</sup>lt;sup>4</sup> National Institute of Medical Statistics, Indian Council of Medical Research (ICMR) (2009).

some studies<sup>5</sup> have pointed out that Indian diets are deficient in vitamins and minerals due to a low intake of fruits and vegetables, other studies such as that by Singh et al. (2006) have found that a typical Indian diet comprising various cereals, vegetables along with spices such as turmeric, mustard seeds, etc. that are rich in phytonutrients can help to prevent chronic diseases. The use of ingredients such as turmeric, cumin seeds, ginger and garlic in preparing Indian meals can compensate for the loss of nutrition due to lower consumption of fruits and vegetables.

While studies may differ with respect to the nutrition content of Indian diets, the Indian government is concerned about ensuring nutrition security. Through the Five-Year Plans of the erstwhile Planning Commission, the government had in the past laid down policies and programmes to improve food and nutrition security.<sup>6</sup> The government also laid down the goals to be achieved in a specified timeframe, and provided the needed funds to implement it through different Five Year Plans. However, the Planning Commission has now been replaced by Niti Aayog, formed on January 1, 2015. The Niti Aayog is yet to come up with a policy on nutrition security.

## 3. Methodology

To understand the extent of shortfall in consumption of fruits and vegetables and its linkages, if any, with health, a primary survey of urban Indian consumers was conducted. In addition, in-depth face-to-face interviews were conducted with industry representatives, nutritionists, Food Safety and Standards Authority of India (FSSAI), Department of Consumer Affairs and other government departments to understand how policies can be designed to ensure nutrition security.

## 3.1 Sampling Procedure

The survey covered 1,001 individuals drawn from households across 5 metro cities covering 7 states, namely National Capital Region (NCR) (New Delhi, Delhi; Gurugram, Haryana; and Noida, Uttar Pradesh), Mumbai (Maharashtra), Kolkata (West Bengal), Chennai (Tamil Nadu) and Hyderabad (Telangana). A stratified random sample was drawn and trained investigators conducted face-to-face interviews using the recall methodology. The sample consisted of individuals from upper and middle income groups, which was further segregated according to the: (a) age group: respondents selected were 18 years or above in age, (b) sex: male or female, (c) socio-economic classification (SEC) category A and B,<sup>7</sup> (d) occupation, (e) income level of the individual and the household, and (f) place of residence within the city (or pin code). Care was taken to cover households with different diet patterns (for example, *vegetarian* and *non-vegetarian*).

# **3.2 Instrument**

The survey was conducted using a semi-structured questionnaire. Respondents were asked about their purchases and intakes of fruits and vegetables. For the intake, the survey used a show card to demonstrate the WHO recommended serving sizes. Questions were asked regarding frequency of intake (number of days per week) and size of intake in a particular day (number of servings per day). Respondents were asked about the reasons for the shortfall in intake of fruits and vegetables, their perception of health, whether they were engaged in any physical activities and about their intake of health/nutritional supplements. A number of awareness questions were asked. These include awareness about:

<sup>&</sup>lt;sup>5</sup> See Indian National Science Academy (2009)

<sup>&</sup>lt;sup>6</sup> For example, see Planning Commission (2007)

<sup>&</sup>lt;sup>7</sup> A SEC category can be determined with a combination of factors such as occupation, education level, ownership of consumer durables, etc.

(a) Benefits of fruits and vegetables consumption

(b) WHO recommended daily intakes of fruits and vegetables

The responses were collected during the months of July-September, 2015. Descriptive statistics and econometric techniques (truncated Tobit regressions) were used to analyse the data.

# 4. Primary Survey — Sample Description and Results

## 4.1 Sample Description

Out of the 1001 respondents, 200 respondents were from NCR; 200 each from Kolkata, Chennai and Hyderabad; and remaining 201 respondents were from Mumbai. There were 578 male (57.7 percent) respondents and the rest were females. Majority of respondents (56.8 percent) lived in households of two to four members, while 39.3 percent respondents lived in family sizes of more than 5 members. Only 39 respondents (3.9 percent) reported to live alone. Around 70 percent of the respondents had completed their graduation or higher education. This is not surprising as the sample was drawn from SEC category A and B. The survey shows that the purchase and consumption of fruits and vegetables would depend on a number of factors such as household income, diet type and the number of members in the household.

## 4.2 Key Survey Findings

4.2.1 Purchase of Fruits and Vegetables

Fruits and vegetables can be sold through formal (for example, supermarkets) or informal (for example, neighbourhood mom-and pop stores, push carts) retailers, which in turn have different formats — store, pushcart, online selling. The respondents were asked to report where they purchase their fruits and vegetables from. This is a multiple choice question as the respondent can use more than one option. The survey found that 72.2 percent of the purchases were made from the informal sector.

Respondents were asked to report — who did the purchase of fruits and vegetables in the household in the past week. Majority of the respondents (85.8 percent) reported that purchases were made by them or a family member. House helps made the purchases for only 141 respondents in the sample (14.1 percent).

The top criteria for the purchase of fruits and vegetables were quality/freshness/cleanliness (82.3 percent of respondents) and price (44.4 percent).

4.2.2 Income Spent on Fruits and Vegetables

On an average, the survey respondents spent 48.3 percent of their annual disposable income on consumption, which includes consumption of fruits and vegetables, apparels, accessories, jewellery and consumer durables, among others. Further, the respondents spent an average of 8.9 percent of their annual income on fruits and vegetables. These findings were in line with the NSSO (2011-2012) survey. Figure 1 shows the percentage of income spent on fruits and vegetables *vis-à-vis* percentage of income spent on total consumption across cities.

## 4.2.3 Indian Diet Pattern

Indian diet patterns can be broadly classified as *vegetarian diet* and *non-vegetarian diet* (eat eggs, meat, fish, chicken, etc. along with vegetables). Variations in diet types are expected to have implications on the daily consumption of fruits and vegetables for an individual. Figure 2 shows the sample representation by vegetarian and non-vegetarian diet type across cities.



Figure 1 Percentage of Income Spent on Total Consumption vis-à-vis the Percentage of Income Spent on Fruits and Vegetables



Figure 2 Distribution of Respondents by Vegetarian and Non-Vegetarian Diet Type across Different Cities (in numbers)

The majority (53 percent) of our sample was non-vegetarians. Variations exist across cities, with Kolkata having the largest proportion (94 percent) of non-vegetarians and Mumbai having the largest proportion (72.14 percent) of vegetarians, relative to other cities.

4.2.4 Consumption of Fruits and Vegetables

The survey found that the average intake of fruits and vegetables on a typical day was 3.5 servings (280 grams),<sup>8</sup> which is much lower than the WHO recommendation of at least 5 daily servings (or at least 400 grams) of fruits and vegetables. Out of this, 1.5 servings (120 grams) of fruits and 2 servings (160 grams) of vegetables were consumed by the average urban Indian in the middle and upper income group.

Fruits were primarily consumed in freshly cut (93.8 percent respondents) or juice (59.6 percent) form. Vegetables were primarily consumed in cooked form (97.5 percent) or chopped/raw/salad (72.2 percent). Consumption of fruits and vegetables in canned/tinned form was low. Only 11.1 percent of sample consumed canned fruits.

The consumption of fruits and vegetables did not differ when the purchase was made by the house help

<sup>&</sup>lt;sup>8</sup> Figures for intake of fruits and vegetables *in servings* have been rounded-off to one decimal. The intake of fruits and vegetables *in grams* has been calculated by multiplying *servings* by 80 (the average size of each serving).

vis-à-vis a household member. However, there were substantial differences in the consumption of fruits and vegetables across different age groups, economic status (level of personal and household income), diet type, occupation and city of residence (see Table 1). There was hardly any variation across gender.

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Table 1         Average Intake of Fruits and Vegetables					
Category		Intake	Shortfall		
	in servings	in grams	in grams		
Age (in years)					
18-25	2.97	237.6	162.4		
25-35	3.42	273.6	126.4		
35-50	3.74	299.2	100.8		
50-60	3.65	292	108		
> 60	3.10	248	152		
Income group (in '000 INR)			1 US\$ = INR 65		
200-500	3.09	247.2	152.8		
500-1000	3.55	284	116		
1000-1500	3.67	293.6	106.4		
1500-2500	3.95	316	84		
> 2500	4.00	320	80		
Diet type					
Vegetarian	3.88	310.4	89.6		
Non-vegetarian	3.24	259.2	140.8		
Occupation					
Homemaker	3.65	292	108		
Student	2.94	235.2	164.8		
Office executive, clerk	3.29	263.2	136.8		
Shop owner, trader, entrepreneur, salesman	3.76	300.8	99.2		
Others	3.75	300	100		
City of residence					
NCR	3.19	255.2	144.8		
Mumbai	3.17	253.6	146.4		
Kolkata	2.81	224.8	175.2		
Chennai	4.35	348	52		
Hyderabad	4.05	324	76		

Note: "Others" includes pensioners, teachers and researchers, among others

Table 1 shows that the average consumption of fruits and vegetables was the lowest (only 2.97 servings) among the youngest cohort comprising individuals aged 18-25 years which is primarily the student population. Most of the students who have filled up the survey questionnaire live away from home (in hostels, etc.) and they find it difficult to store fruits and vegetables. The hostel canteens, too, offer mostly cereals and pulses and they do not offer the right mix of fruits and vegetables. Further, a number of respondents referred to lifestyle, eating out, high prices of fruits and vegetables, seasonal availability and lack of knowledge as reasons for not having adequate quantity of fruits and vegetables.

Contrary to the students, housewives had above average intake of fruits and vegetables. A number of respondents across all age groups and cities highlighted that it is difficult to get cut fruits and vegetables when the person is out-of-home. Further, they expressed concerns about the quality of the products. Even organised retail

outlets in India do not offer a wide range of fruits and vegetables in ready-to-eat formats — cut, chilled, juice, etc., as is available in developed countries and the ASEAN (Association of Southeast Asian Nations) countries such as Singapore and Thailand.

Income played a key role in the intake of fruits and vegetables and individuals with higher income were more likely to be closer to the WHO recommended intake of 5 servings (see Table 1). There were variations across cities in the consumption of fruits and vegetables, which is also related to the variation in diet patterns (the sample from some cities have more vegetarians than others) across cities. As is expected, respondents with a vegetarian diet were likely to have greater intake of fruits and vegetables than those who follow a non-vegetarian diet.

To understand the factors that impact the intake of fruits and vegetables for an average individual, a regression was run to analyse the impact of demographics (including gender, age group, household income, household composition, diet type, etc.) on the intake of fruits and vegetables (see Box 1). The regression confirmed that the consumption of fruits and vegetables is significantly affected by factors such as household income, age group, occupation, diet type and city of residence. As discussed earlier, a major point of concern that emerged from this analysis has been that students were found to be falling short in their daily intake of fruits and vegetables.

#### Box 1 Regression Analysis to determine impact of demographics on intake of fruits and vegetables

#### The Truncated Tobit Regression method was used to estimate the regression specification given by

 $Y = \alpha + \beta X + \epsilon$ 

where, Y is the dependent variable and X is the vector of independent variables.  $\alpha$  is the constant term,  $\beta$  is the vector of coefficients of the independent variables and  $\epsilon$  is the error term.

The dependent variable in the regression analysis is *total serving* which measures the total servings of fruits and vegetables consumed. Since observed values of *total serving* are always positive, the dependent variable is truncated from left at 0. The independent variables considered are as follows:

(a) *Age\_Group* captures the age bracket

(b) Annual\_HHs\_Income measures the total annual income of the household

(c) *HHs\_Members\_No* measures the numbers of members in the household

(d) Male is a dummy variable and takes value 1 if gender is "male"

(e) Veg is a dummy variable and takes value 1 if diet type is "vegetarian"<sup>1</sup>

(f) Homemaker is a dummy variable and takes value 1 if occupation is "homemaker"

(g) Student is a dummy variable and takes value 1 if occupation is "student"

(h) Househelp is a dummy variable and takes value 1 if fruits and vegetables are purchased by the house-help

(i) Dieteres is a dummy variable and takes value 1 if the respondent has a dietary restriction or an allergy.

(j) NCR, Bom, Kol and Chen are dummy variables and take value 1 if the location is NCR, Mumbai, Kolkata or Chennai, respectively.

There are four model specifications in the regression analysis to capture the significance of variations in intake of fruits and vegetables across gender, diet type, occupation of respondents and location. The regression results are given in Table A. Location dummies are not included in Models 1, 2 and 3. In Model 4, the location dummies are introduced to capture location specific effects. As clearly seen, annual household income has a positive and significant impact on the total intake of fruits and vegetables (the coefficient is positive and significant for *Annual\_HHs\_Income* in all the model specifications). The intake of fruits and vegetables is significantly higher for vegetarians (the coefficient for *Veg* is positive and significant). Homemakers, on an average, consume more while students consume less than the average as Homemaker is positive and significant, while the Student is negative and significant. Dietary restrictions and purchase of fruits and vegetables by the domestic help have no impact on the total intake as seen in Model 4 (the coefficients for Househelp and Dieteres are both insignificant). Models 1 and 2 show that the older the age group, greater is the consumption of fruits and vegetables. However, the Age\_Group coefficient loses its significance in Models 3 and 4. As seen in Model 4, there is something inherent to a location, primarily the kind of cuisine they have, that determines the intake of fruits and vegetables. For example, Kolkata has the least intake of fruits and vegetables (as compared to the base category- Hyderabad) and this could be attributed to the fact that consumers in Kolkata are more likely to have fish and meat and consume less fruits and vegetables.

## Ensuring Nutrition Security — A Survey of Urban Indian Consumers' Purchase and Consumption of Fruits and Vegetables

$\begin{tabular}{ c c c c c c c } & (2) & (3) & (4) \\ \hline Total serving & Total serving & Total serving \\ \hline 0.0822** & 0.0484 & -0.0026 \\ (3.05) & (2.23) & (1.15) & (-0.08) \\ \hline 0.0522*** & 0.231*** & 0.228*** & 0.238*** \\ \hline 0.238*** & 0.238*** & 0.238*** \\ \hline 0.238** & 0.238** & 0.238** & 0.238** \\ \hline 0.0306* & (0.15) & (-0.0140 & (-0.01$		· ·	~ -		0
$\begin{array}{ c c c c c c } \hline Total serving & Total serving & Total serving & Total serving \\ \hline Total serving & 0.117^{**} & 0.0822^{**} & 0.0484 & -0.0026 \\ \hline 0.0505 & (2.23) & (1.15) & (-0.08) \\ \hline 0.0505 & (2.23) & (1.15) & (-0.08) \\ \hline 0.028^{***} & (-0.0140 & (-0.0140) \\ \hline 0.0918 & (-1.16) & & & & & & & & & & & & & & & & & & &$		(1)	(2)	(3)	(4)
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NCR         -0.715*** (-6.38)           Bom         -0.839*** (-7.61)           Kol         -0.918*** (-7.61)           Chen         -0.918*** (-7.78)           Chen         0.398*** (3.77)           Constant         2.671*** (19.60)         2.327*** (16.71)         2.630*** (16.84)         3.216*** (20.27)           N         1001         1001         1001         1001					(1.32)
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Bom         -0.839***           Kol         (-7.61)           Kol         -0.918***           Chen         (-7.78)           Constant         2.671***         2.327***         2.630***           (19.60)         (16.71)         (16.84)         (20.27)           N         1001         1001         1001         1001					(-6.38)
Kol	Bom				-0.839***
Kol        0.918*** (-7.78)           Chen         0.398*** (3.77)           Constant         2.671*** (19.60)         2.327*** (16.71)         2.630*** (16.84)         3.216*** (20.27)           N         1001         1001         1001         1001					(-7.61)
Chen         2.671***         2.327***         2.630***         3.216***           Constant         (19.60)         (16.71)         (16.84)         (20.27)           N         1001         1001         1001         1001	Kol				-0.918***
Chen         0.398***           Constant         2.671***         2.327***         2.630***         3.216***           (19.60)         (16.71)         (16.84)         (20.27)           N         1001         1001         1001         1001					(-7.78)
Constant         2.671*** (19.60)         2.327*** (16.71)         2.630*** (16.84)         3.216*** (20.27)           N         1001         1001         1001         1001	Chen				0.398***
Constant $2.671^{***}$ (19.60) $2.327^{***}$ (16.71) $2.630^{***}$ (16.84) $3.216^{***}$ (20.27)N1001100110011001					(3.77)
(19.60)         (16.71)         (16.84)         (20.27)           N         1001         1001         1001         1001	Constant	2.671***	2.327***	2.630***	3.216***
N 1001 1001 1001 1001		(19.60)	(16.71)	(16.84)	(20.27)
	N	1001	1001	1001	1001

Box 1 (continued)

Table A Regression Results on Impact of Demographics on Intake of Fruits and Vegetables

z-statistics in parentheses: \**p* < 0.05, \*\* *p* < 0.01, \*\*\**p* < 0.001

# 4.2.5 Reasons for Shortfall

All respondents were asked to give the reasons for the shortfall in intake of fruits and vegetables. This was a multiple choice question and respondents could give more than one reason. Out of 1001, 398 respondents (39.76 percent of the sample) cited more than one reason for the shortfall in their intake of fruits and vegetables.

Figure 3 shows that lifestyle was the most important reason for the shortfall (52.15 percent of respondents cited lifestyle issues), followed by seasonal availability (25.77 percent of respondents) and high prices (20.68 percent of respondents). Respondents across all age groups and occupations referred to lifestyle as a key reason for shortfall, but more so among students and respondents in NCR (52.94 percent of students and 78 percent of NCR residents reported lifestyle as reason for shortfall in intake of fruits and vegetables).

Interestingly, 54.68 percent of those who consumed tobacco and 54.39 percent of those who consumed alcohol cited lifestyle as the key reason for not meeting the WHO recommended daily intake of fruits and vegetables.

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Figure 3 Reasons Given by Respondents for Not Being Able to Meet the WHO Recommended Intake of Fruits and Vegetables (in Numbers)

Note: "Others" includes dietary restrictions

# 4.2.6 Level of Awareness

The survey found that 95 per cent of the respondents were aware of the benefits of consuming fruits and vegetables. The survey respondents felt that the top three benefits of consuming fruits and vegetables were: (a) good for health (b) source of essential minerals and vitamins (c) good for blood circulation and improve digestion. Thus, they were able to get a positive linkage between consumption of fruits and vegetables with good health. However, very few of them were aware of phytonutrients drawn from fruits and vegetables. Further, only 11 percent were aware of the WHO recommendation of consuming at least 400 grams or five daily servings of fruits and vegetables. Students were the least aware about the WHO recommendation. Only 2.94 percent of the students interviewed were aware of the WHO recommended daily intake of fruits and vegetables. Around 50 percent of those aware of the WHO recommendations had educational qualifications of post-graduate and above.

Respondents were asked about the primary source of information about the benefits of having fruits and vegetables.<sup>9</sup> Print and electronic media (83.3 per cent respondents), medical journals (37.26 percent respondents and medical practitioners (31.3 per cent respondents) were key sources of information.

## 4.2.7 Health Status

Given that consumers were able to link the benefits of consumption of fruits and vegetables with good health, the respondents were asked to report about their health. Health of an individual was evaluated in two ways — (a) perception-based (how would they *rate* their physical health), and (b) actual incidence of illness/health problem (whether they *suffer* from any illness or health related problem).

(a) Perception about Health

Respondents were asked to report their current state of health on a scale of 1 to 5 (1 being "very healthy and feel excellent", and 5 being "very poor health and feeling very bad"). Majority of the respondents gave a rating of 2 or "I am reasonably healthy and feel very good". Since none of the respondent reported a health rating of 5, the responses have been tabulated for health ratings 1-4 as given in Table 2. Overall, the urban Indian consumers

<sup>&</sup>lt;sup>9</sup> This was a multiple-choice question.

perceived their health to be above average. If the rating of 1 and 2 were added, 69.63 per cent of the sample perceived their health to be very good or excellent. While there were variations in perception across age groups and by occupation, there were hardly any variations in health perception across income groups and diet types.

Haalth Dating	Demonstrate of Desmondants	To	Total Intake			
Health Rating	Percentage of Respondents	in serving	in grams	in grams		
1	16.08	3.48	278.4	121.6		
2	53.55	3.35	268	132		
3	25.67	3.75	300	100		
4	4.70	4.21	336.8	63.2		

 Table 2
 Intake of Fruits and Vegetables by Health Rating

Table 3 shows that the perception of being "very healthy and feeling excellent" is highest among the respondents in the 18-25 years age group (38.05 percent of respondents in the 18-25 years age group reported a health rating of 1 as compared to 6.25 percent of respondents in the greater than 60 years age group). Incidentally, this group had the highest shortfall in intake of fruits and vegetables as per the WHO recommendations (see Table 1). Thus, the perception of being "very healthy and feeling excellent" was not related to the intake of fruits and vegetables, particularly among the young age groups. Comparing by occupations, Table 4 shows that while homemakers had a higher intake of fruits and vegetables compared to students, they reported a lower health rating.

Overall, reported health rating of 1 and 2 depend on number of factors, including actual incidence of illness, whether he/she does physical activities, his/her ability to interact in the society, etc. Further, a person may be consuming fruits and vegetables for curative purposes, rather than to reduce the risk of an illness.

Table 3         Health Rating within Age Groups (in Percentage)						
Health Rating	18-25 years	25-35 years	35-50 years	50-60 years	> 60 years	
1	38.05	22.00	10.21	6.33	6.25	
2	52.21	63.67	54.71	34.81	45.83	
3	8.85	13.00	32.20	42.41	37.50	
4	0.88	1.33	2.88	16.46	10.42	

•	0.00					
4	0.88	1.33	2.88	16.46	10.42	
	Table 4	Health Rating b	y Homemakers an	d Students		
	Homemaker			Student		
Health Rating	Percentage of respondents	Total Intake (in servings)	Perce	entage of respondents	Total Intake (in servings)	
1	7.30	3.59	41.18	3	2.89	
2	42.06	3.45	47.06	5	3.04	

Behavioural risk factors such as tobacco and alcohol consumption did not seem to affect health perceptions of the respondents. The respondents consuming tobacco and alcohol were equally likely to perceive themselves as healthy relative to those not consuming these products.

3.75

4.11

10.29

1.47

2.86

2.00

(b) Illness/Health Related Problems

39.06

11.59

A respondent may perceive his/her health to be very good or excellent but may have health problems. To investigate this, respondents were asked to identify illness or any health related problems they may be suffering

3

4

from an indicative list (see Figure 4).<sup>10</sup> Out of the 1001 respondent sample, 57.64 percent reported to not suffer from any health issue. Thus, we found a strong linkage between perception of health and self-reporting of illness.

Among those that reported a health issue, 52.12 percent reported only one health issue, 42.69 percent reported two to three health issues and 5.19 per cent reported more than three health issues. Figure 5 shows that poor vision was the most common health issue (34.43 percent respondents suffering from at least one health issue reported poor vision), followed by high blood pressure (24.53 percent) and bone weakness (19.34 percent).





Further, it was observed that the average intake of fruits and vegetables was higher for those suffering from at least one health related problem, which also confirmed that, in India, fruits and vegetables are often taken as curative (to recover from ill-health) rather than preventive (to prevent the incidence of illness).

4.2.8 Physical Activity

Respondents were asked whether they did any physical activities such as running, brisk walking, yoga, etc. during the week. Only 402 (40.16 percent) out of 1001 respondents reported that they do some form of physical activity. This is a cause for concern as a majority of urban Indians are not doing any physical activity. Out of those who do some form of physical activity, 25.12 percent of the respondents reported that they were "very healthy and feeling excellent", as compared to only 10.02 per cent of those that did not engage in any form of physical activity (see Table 5). However, intake of fruits and vegetables was not very different for those doing some form of physical activity relative to those not doing any physical activity.

	Physical Activity		No Physical Activity	
Health Rating	Percentage of respondents	Total Intake (in servings)	Percentage of respondents	Total Intake (in servings)
1	25.12	3.50	10.02	3.43
2	48.51	3.46	56.93	3.29
3	21.64	3.65	28.38	3.80
4	4.73	4.42	4.67	4.07

Table 5	Health	Rating	hv	Physical	Activity
Lanc S	incantin	maune	N 9	I II y SICAL	ACHILLY

<sup>10</sup> The severity of diseases has not been evaluated for the purpose of this study.

It is interesting to note that in spite of the shortfall in intake of fruits and vegetables by the WHO recommendation, and a low level of physical activity among the urban Indian consumers, majority perceived their health to be very good and excellent and less than 43 percent of the sample reported any health issue. There are several reasons for this. First, majority of the survey respondents (79.42 percent of the sample) were below the age of 50 years. Thus, urban middle and high income young consumers perceived themselves to be in good health and they also reported few incidences of diseases, which imply that their health was actually good. Second, many Indian consumers do not undergo regular health check-ups and may not be aware of the presence of a disease. Third, a typical Indian diet is rich in phytonutrients due to the inclusion of spices such as ginger, garlic, turmeric, etc. (Rao B. S. N., 2003; Krishnaswamy K., 2008) The survey found that all respondents consumed spices on a daily basis with turmeric (99.1 percent), cumin seeds (98.9 percent) and ginger (93.3 percent) being the top three spices that were consumed. Thus, the spices used in a typical Indian diet may compensate for the shortfall in intake of fruits and vegetables. Fourth, the shortfall in nutrient intake through fruits and vegetables can be compensated through other sources such as consumption of health/nutritional supplements (Bailey et al., 2011; Burnett-Hartman et al., 2009).

4.2.9 Consumption of Health/Nutritional Supplements

The survey found that the consumption of health/nutritional supplements was low among the urban Indians. Out of the sample of 1001 respondents, only 213 consumed health/nutritional supplements (21.28 percent). Analysis also revealed that a larger proportion of respondents consuming health/nutritional supplements reported to be "very healthy and feeling excellent", as compared to those not consuming health/nutritional supplements (see Table 6). Thus, there is a positive linkage between consumption of health/nutritional supplements and perception of above average health.

	Consume Health/Nutritional Supplements		Do not Consume Health/Nutritional Supplements	
Health Rating	Percentage of respondents	Total Intake	Percentage of respondents	Total Intake
	recentage of respondents	(in servings)	Percentage of respondents 14.97 57.23 24.24	(in servings)
1	20.19	4.11	14.97	3.24
2	39.91	3.84	57.23	3.26
3	30.99	3.91	24.24	3.69
4	8.92	3.89	3.55	4.43

 Table 6
 Health Rating by Consumption of Health/Nutritional Supplements

# 5. Conclusion and Policy Recommendations

Ensuring nutrition security is now a key concern for fast growing developing countries such as India that have a large young population. The survey of urban Indian consumers presented in this paper reveals that there is a shortfall in average daily consumption of fruits and vegetables against the WHO recommended quantity of daily servings, which is required to prevent diet related chronic diseases and micronutrient deficiencies. A more alarming finding is that students and young Indians have the highest shortfall in consumption of fruits and vegetables. Since India is one of the largest producers of fruits and vegetables in the world, this raises an essential policy question of whether Indian consumers have access to the country's production.

One of the reasons for the shortfall is seasonality in the availability of fruits and vegetables. Globally, fruits and vegetables have seasonal availability. The problem of seasonal availability can be mitigated by establishing a modern processing and storage facility, along with a sophisticated supply chain. The government, through appropriate policies, can encourage investment in areas such as cold storage, pack houses and food processing units. The government policy should focus on developing the supply chain from farmers to consumers. Precisely, the government should identify the gaps in the food supply chain and address those gaps.

Further, fruits and vegetables are not available in India in different formats such as fresh, cut and frozen, which makes it difficult for consumers to consume fruits and vegetables when they are out of home. Processing not only enables the availability of the product in different formats, it also increases the shelf-life of the produce. While the government has announced that food processing is a priority sector, and has created a dedicated ministry — Ministry of Food Processing Industries for the same, food processing in India is only around 2 percent of the produce due to barriers such as fragmented supply chain and traditional retailing. Recently, the government liberalised foreign direct investment in horticulture. This is a step in the right direction as it can help to bring in global best practices in agriculture for fruits and vegetables, thereby, improving productivity in this sector. However, India is one of the few countries that continue to have restrictions on foreign direct investment in multi-brand retail, which restricts the establishment of a backward supply chain from retailers to processors and farmers.

The middle and upper income Indian consumers referred to the high prices of fruits and vegetables as one of the main reasons for low consumption. India is the largest producer of a number of fruits and vegetables, yet, the country faces food price inflation, which is adversely impacting consumption. Several factors ranging from multiple intermediaries in the supply chain, restrictions in inter-state movement of agricultural produce, and restrictions on import are causing this food inflation. Policy measures such as the removal of inter-state restrictions on movement of fruits and vegetables can help to stabilise prices across states.

The survey also showed that the level of awareness among the consumers is low. As India is rapidly urbanising, people are moving away from their homes and facing increasing work pressures. Accordingly, these consumers may not have the time to eat the desired quantity of fruits and vegetables. Moreover, they may be replacing fruits and vegetables by other products that are unhealthy. This can lead to nutrition deficiencies. The government can help to raise awareness about the benefits of fruits and vegetables consumption in the WHO recommended quantity through appropriate campaigns. Since young Indians are more likely to fall short of the WHO recommended intake, it is important for the government to create awareness in schools and universities. Further, government funded schools and colleges can be encouraged to serve fruits and vegetables in their daily diet. Additionally, there is a need to raise awareness that different combinations of fruits and vegetables offer different types of phytonutrients and it is important to have an appropriate mix in the diet. Awareness of the benefits of consuming fruits and vegetables in the WHO recommended quantity will help in raising the consumption of fruits and vegetables, especially among the young population.

While Indians perceive themselves to be healthy, the level of physical activity is low. This is also linked to their low level of awareness about how to remain healthy and measures to prevent NCDs. As the numbers of death incidences due to NCDs in India are rising, it is important for the government to raise awareness about prevention of these diseases through physical activities. More recently, the Indian government has started to promote yoga as a form of physical activity for this purpose.

In India, the intake of health/nutritional supplements is low. The low consumption of health/nutritional supplements can be attributed to the absence of proper policy guidance regarding ingredients, intake quantity and intended purpose (such as curative, preventive etc.) of the available health/nutritional supplements in the Indian market. In the absence of proper policy guidance, the consumers stand to bear the health risk of these products. To

address this issue, the Food Safety Authority of India has come up with the draft guideline — Draft Food Safety and Standards (Food or Health Supplements, Nutraceuticals, Foods for Special Dietary Uses, Foods for Special Medical Purpose, Functional Foods, and Novel Food) Regulations, 2015,<sup>11</sup> which provides the definition, criteria, packaging and labelling requirements, among others, for health/nutritional supplements. This guideline should be implemented at the earliest.

To conclude, while consumption decisions are personal, the government through appropriate policies can increase the supply of fruits and vegetables and level of awareness among consumers, which in turn can help build a healthy nation.

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