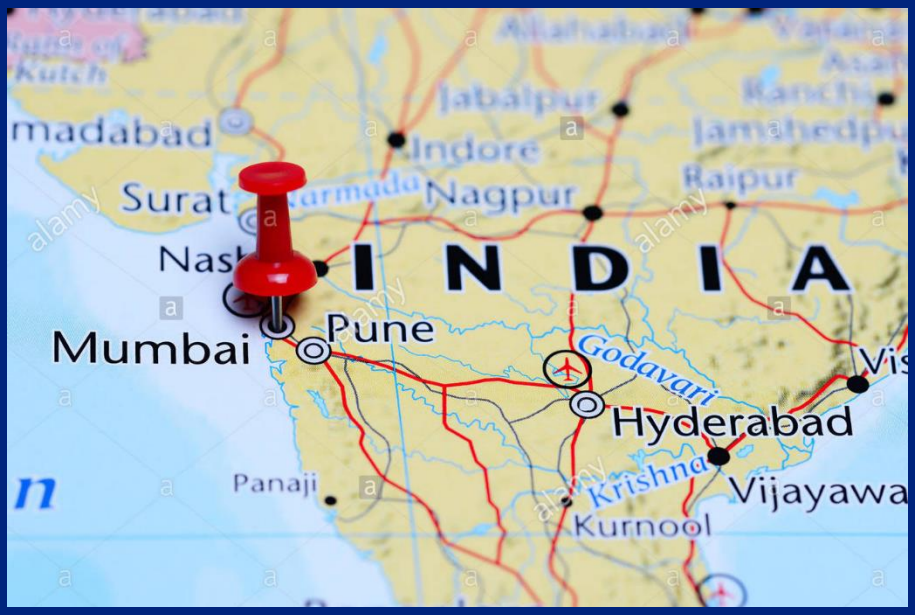

This report compiles secondary data on the nutrition situation and from a stakeholder mapping in Pune, India to inform the new partnership between Birmingham, UK and Pune on smart nutrition

Pune

Nutrition situation and stakeholder mapping

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Abbreviations

ANC	ante-natal care
DFID	Department for International Development
IYCF	Infant and Young Child Feeding
MAD	minimum acceptable diet
MAM	moderate acute malnutrition
MCHN	Maternal and Child Health and Nutrition
M&E	monitoring and evaluation
MQSUN+	Maximising the Quality of Scaling Up Nutrition Plus
PLW	pregnant or lactating women
PNC	post-natal care
SAM	severe acute malnutrition
TA	Technical Assistance
UNICEF	United Nations Children's Fund
VfM	value for money
WASH	water, sanitation and hygiene

About BINDI

The Birmingham India Nutrition Initiative (BINDI) is a 'Nutrition Smart City' initiative which involves the development of policies and practices through a learning partnership between Birmingham, UK and Pune, India.

In the first 18-month phase, The Food Foundation will work with local authorities in both cities to design the partnership, based on citizen engagement and evidence from elsewhere around the globe. The BINDI will create a platform to enable joint learning, experience sharing and piloting of specific initiatives.

The initiative aligns with Sustainable Development Goals 2 (Zero Hunger), 5 (Gender Equality) and 12 (Responsible Consumption and Production) and the Smart City movement which involves a collaboration between local government, academic institutions and business towards creating more liveable cities. Birmingham and Pune will work together to establish 'Smart Nutrition' as a key topic on the Smart City agenda in both cities. The BINDI will share its learning experience through national and international networks including the Milan Urban Food Policy Pact (MUFPP), Core Cities (UK) and the Smart City Mission (India).

The initiative is led by The Food Foundation and funded by the Tata Trusts and the UK Department for International Development (DFID) through its Maximising the Quality of Scaling Up Nutrition Plus (MQSUN+) project. MQSUN+ provides technical expertise in multisectoral nutrition policy and programming to DFID and Scaling Up Nutrition countries.

Executive Summary

This report serves two purposes for the BINDI project: to summarise the nutritional situation and to map the key project stakeholders. It focuses on Pune, one half of the BINDI partnership.

Pune is a large city in India with a vibrant reputation that has established itself as one of the leading 'smart cities' in India. The aim of the BINDI project is to apply the principles of 'smart cities' to nutrition through a partnership with Birmingham, and thus Pune is well-placed to lead on 'smart nutrition cities'.

As with the rest of India, the district of Pune faces multiple nutrition challenges at the same time, including undernutrition, overweight, chronic diseases and micronutrient deficiencies. Nearly a quarter of children in Pune are stunted, and roughly the same percentage respectively are wasted and underweight. At the same time, a third of adults in Pune are overweight or obese, and this has been increasing over time. Half of children between 6 and 59 months of age have anaemia. There is limited data on childhood obesity and exclusive breastfeeding rates in Pune, but less than 10% of children 6 to 59 months were recorded as consuming an 'adequate diet' in the National Family Health Survey.

Contributing factors to this complex nutrition situation include household food insecurity, changes to the diet and to the food environment – including increasing access 'obesogenic' foods and environments – and changes to agricultural production.

Pune and India have several initiatives in place seeking to address nutrition challenges, many of which are coordinated through the Integrated Child Development scheme and its system of Anganwadi community centres. Most of the current initiatives seek to address undernutrition, however Pune has recently launched a new initiative on childhood obesity.

The key stakeholders for this project in Pune come from a range of sectors, but principally include the Pune Municipal Corporation, other public authorities, local researchers and experts and local and national civil society organisations.

Methodology

The situation analysis in this report emerges from a literature review, internet search and through dialogue with officials in the Pune Municipal Corporation. The Food Foundation team conducted literature review and internet searches for each form of malnutrition (e.g. 'undernutrition and Pune'). Where possible official government statistics were the preferred source of information for prevalence of malnutrition in Pune. This data is collected at the Pune District level rather than the Pune City level. Once the Food Foundation team drafted an initial report of findings, officials at the Pune Municipal Corporation reviewed it and provided additional sources of data and information.

The stakeholder mapping is based on interviews with stakeholders in Pune and a stakeholder workshop organised by Pune Municipal Corporation in July 2018.

Background

> *"After Indian independence, the city grew remarkably in connection with the city's regional and agricultural embedding, the national policy for the diversification of industries and the existing renowned educational facilities." (Butsch* et al.*, 2017).*

Pune is the name of a city and a district in the Indian state of Maharashtra, located in the west of India. The city is situated in the foothills of the western coastal mountains about 100 miles southeast of Mumbai. It is the eighth-largest city in India with a population of 4 million people. It has been referred to as the "Oxford of the East" due to the presence of multiple universities, and being a "cultural capital" in Maharashtra (Kelkar, 2008). It is part of an "urban development corridor stretching from Ahmedabad via Mumbai to Pune" (Butsch *et al.*, 2017).

The urban population in India is increasing, and the majority of Pune (district) is now urban (61%) – it is the fifth most urbanised district in Maharashtra. Migration from rural to urban areas has increased as the population seeks better livelihoods, as urban areas are offering more and diverse occupational opportunities and increasing education facilities. Pune (city) is entirely urbanised (Krishnamurthy, Mishra and Desouza, 2016). Population growth in Pune (city) is expected to slow to from 3% (2007-2012) to 2% (2022-2027) (Butsch *et al.*, 2017). Nineteen percent of the population are in their youth (15-24 years) and 67% are in the working age group (15-59) (Smart Cities Mission India, 2016).

In Maharashtra, 18% of the population was estimated to be in poverty in 2011-12 (Government of Maharashtra, 2015). In Pune (district), wealth and income are "distributed unevenly" by caste group and class, and there is a growing divide between the poor and the upper and upper middle class. These inequalities are borne out in access to infrastructure (drinking water and toilets), and Pune shows a higher correlation between caste status and access to infrastructure (drinking water and toilets) than other large cities in India (Sidhwani, 2015). In Pune (city) 36% of the population live in slums and the literacy rate is 90% (Pune Municipal Corporation, 2015; Smart Cities Mission India, 2016).

The main industries in the city of Pune are automobile part manufacturing, the Indian Air Force, information technology and education. The average per capita income is 88,341 Rs. (2004/5), compared to an average in the urban areas of the state of 60,431 and an average of 35,947 in urban areas of India. Twenty percent of the population are professionals, compared to 12% in the state and 9% in all urban areas of India; only 0.3% of the population work in skilled agriculture or fisheries–compared to 3% and 4.6% in the urban areas of Pune and India respectively. The unemployment rate is 3% (2011/12) (Smart Cities Mission India, 2016).

The infrastructure in Pune (city) is well developed. Almost all households in Pune (city), including in the slums, have access to tap water from treated sources and electricity (99% and 98%), but only 76% of households have toilet facilities. Thirty-nine percent of households have a computer/laptop, and a quarter of these have access to the internet, which is significantly higher than urban areas in the State and in India (Smart Cities Mission India, 2016).

The PMC is the local government, with 157 elected representatives. It is led by the mayor and the municipal commissioner (Smart Cities Mission India, 2016). The Municipal Corporation has set an aim to make Pune a 'Smart City' that is 'the most liveable city in India' (punesmartcity.in) and, in 2015, developed a Smart City strategy.

> *"…the goal of the Smart City Mission in India is to create cities with smart physical, social, institutional and economic infrastructure including clean technology use, widespread information and communication technology reliance, financing via public private partnerships and private sector investments, improved citizen consultation and 'smart' or e-governance initiatives" (Butsch* et al.*, 2017).*

> *"Leveraging its rich cultural and natural heritage, strong human capital and strong business environment as key strengths, Pune aspires to become the most liveable city in India by solving its core infrastructure issues in a 'future proof' way and by making its neighbourhoods beautiful, clean, green and liveable."*(Pune Smart City Development Corporation Limited, 2018)

Nutrition Situation Analysis

Malnutrition in All its Forms

The Dietary Guidelines for Indians from the National Institute of Nutrition set out broad guidelines for what Indians should be eating. This guidance was revised in 2011, is endorsed by the Ministry of Health and is used by the general public and health/nutrition professionals. The guidance is summarised into a pyramid with four layers: cereals/legumes (consume adequately), vegetables and fruit (eat liberally), animal source foods and oils (eat moderately) and highly processed foods (eat sparingly) (National Institute of Nutrition, 2011).

Undernutrition

Data from the National Family Health Survey (2015/16) reports data on child undernutrition in both Maharashtra state and Pune (district) (International Institute for Population Sciences & ICF, 2017). In Maharashtra state, child malnutrition is typically higher in rural areas than urban. Compared to the state level, child undernutrition in prevalent to a lesser extent in Pune (District) but still found in nearly a quarter of children under 5. However, compared to the State level, apart from child underweight child undernutrition is equally or more prevalent in urban than rural areas of Pune (District). Though the figures in Table 1 are stark, it is important to note that Maharashtra has seen a 15% decline in stunting between 2006 and 2012 (Haddad, 2014).

The National Family Health Survey (2015/16) also reports on underweight in adults. In Pune (District), adult underweight is more prevalent in rural areas, and significantly more prevalent amongst women than men. Adult underweight is less prevalent in Pune (District) than at the State level.

Table 1: Child and Adult Undernutrition (%) from the National Family Health Survey 2015/16.

	India – Rural	India – Urban	India - Total	Maharashtra – Urban	Maharashtra – Rural	Maharashtra - Total	Pune (District) – Urban	Pune (District) - Rural	Pune (District) - Total
Children under 5 who are stunted	31	41	38	29	38	34	22	23	22
Children under 5 who are wasted	20	22	21	25	26	26	27	19	23
Children under 5 who are severely wasted	8	7	8	10	9	9	10	8	9
Children under 5 who are underweight	29	39	36	31	40	36	24	28	26
Women with below normal BMI	16	27	23	17	30	24	15	23	18
Men with below normal BMI	15	23	20	15	24	19	9	14	11

(International Institute for Population Sciences & ICF, 2017, 2018a, 2018b)

Chronic Diseases

In Maharashtra and Pune (District) data on adult overweight/obesity and select indicators of non-communicable diseases are available from the National Family Health Survey (2015/16). In contrast to the underweight data presented above, overweight and obesity are more prevalent in urban areas compared to rural. It is prevalent to roughly the same levels amongst men and women. However, men have a significantly higher prevalence of raised blood pressure than women.

Compared to the survey done in 2005/6, the rates of overweight and obesity have increased significantly in Maharashtra. In 2005/6, 15% of women and 12% of men in Maharashtra were overweight or obese; this has increased to 23% and 24% in 2015/16.

Table 2: Adult Overweight and Indicators of NCDs from the National Family Health Survey 2015/16.

	India – Rural	India – Urban	India - Total	Maharashtra – Urban	Maharashtra – Rural	Maharashtra - Total	Pune (District) – Urban	Pune (District) - Rural	Pune (District) - Total
Women who are overweight or obese	31	15	21	32	15	23	22	23	30
Men who are overweight or obese	27	14	19	31	16	24	27	19	33
Women with high blood sugar	7	5	6	6	4	5	5	5	5
Men with high blood sugar	9	7	8	7	5	6	5	2	4
Women with above normal, high or very high blood pressure	10	9	9	10	9	9	7	9	8
Men with above normal, high or very high blood pressure	15	13	26	18	15	16	14	13	14

(International Institute for Population Sciences & ICF, 2017, 2018b, 2018a)

The National Family Health Survey does not report data on levels of childhood overweight or obesity. However, a few studies have been conducted in Pune (city and district) assessing overweight and obesity amongst children. For example, a cross-sectional survey conducted between 2007 and 2011 on 1281 school children aged 10-15 years old in Pune (city) found that 10% of participants were overweight an additional 6% were obese (based on measured height and weight) (Ghonge *et al.*, 2017). The study also collected self-reported data on physical activity, sedentary behaviour, dietary intake and family history of overweight and obesity. Of these, sedentary behaviour, more frequent consumption of "junk food", high calorie diet and family history of obesity were associated with prevalence of overweight/obesity. However, it is not clear how the dietary intake data was collected.

A similar survey conducted on 536 students from the same age range in a school in rural Pune (district) found that 7% of participants were overweight and an additional 4% were obese (Kurlekar, Oka and Khare, 2016). Though cross-sectional in nature and without multiple time points for comparison, these two studies suggest that childhood overweight and obesity are higher in urban areas of Pune (district) compared to rural. This pattern was also present in the adult obesity data described above from the National Family Health Survey.

Amongst adolescents aged 12-15 in Pune (City), one study of 1652 students found that 6% were overweight and an additional 5% were obese. However it is not clear how the height/weight data for this study was collected (Arora, Shinde and Patwardhan, 2017).

Micronutrient Status

The National Family Health Survey (2015/16) also reports on key indicators of micronutrient deficiency and treatment. Vitamin A supplementation is slightly higher in Maharashtra state than in Pune (district). The two areas are roughly equivalent in terms of anaemia for women, but slightly higher amongst men in Pune (district) than Maharashtra state, though it is important to note that anaemia can have multiple causes beyond micronutrient deficiency, for example, infection and inflammation are important causes as are genetic blood disorders. Reducing levels of anaemia is a priority for the Indian government who have launched specific programmes to address it, as will be described below.

Table 3: Indicators of Micronutrient Deficiencies from the National Family Health Survey 2015/16.

	India – Urban	India – rural	India-total	Maharashtra – Urban	Maharashtra – Rural	Maharashtra - Total	Pune (District) – Urban	Pune (District) - Rural	Pune (District) - Total
Micronutrient Supplementation									
Children vitamin A supplementation in last 6 months (9-59 months)	63	59	60	72	69	71	61	59	60
Micronutrient Deficiencies									
Children with anaemia (6-59 months)	56	60	59	54	54	54	53	59	53
Non-pregnant women with anaemia (15-49 years)	51	54	53	48	48	48	51	50	50
Pregnant women with anaemia (15-49 years)	46	52	50	49	50	49	n/a	n/a	40*
All women who are anaemic (15-49 years)	51	54	53	48	48	48	50	49	50
Men who are anaemic (15-49 years)	18	25	23	16	20	18	18	16	17

**Low sample size, unweighted sample of 25-49 cases*

(International Institute for Population Sciences & ICF, 2017, 2018a, 2018b)

In a survey of 600 adolescent girls in Pune (City), the majority were consuming less than the recommended number of calories per day and were also consuming below the recommended levels of micronutrients. This survey was cross-sectional in nature, with the dietary data assessed using a series of 24-hour recalls on three non-consecutive days. Data from the recalls were assessed according to the Adolescent Micronutrient Quality Index, and fasting blood samples were also taken (Chiplonkar and Tupe, 2010).

Another study of 2100 children aged 5-7 in Pune (City) assessed dietary intake by giving their parents a questionnaire on dietary patterns and food habits. The dietary assessment in this study was not very robust, but it gives further indication that dietary quality amongst children in Pune (City) needs improvement. This was particularly notable for vegetable consumption, as the survey found that only 5% of young children in Pune consume green leafy vegetables daily (Mukherjee and Chaturvedi, 2017).

Other Indicators

Breastfeeding and healthy diet in early life are strongly correlated with improved health outcomes which carry into later life. The National Family Health Survey reports on breastfeeding rates as well as "adequate diet" for young children less than 59 months. In Maharashtra breastfeeding rates are higher in rural areas compared to urban. Rates of children under 59 months consuming an "adequate diet" in terms of frequency and diversity range from 3% to 14%. However, the data on breastfeeding and diet adequacy for Pune (District) is more limited than for Maharashtra. These are worrying figures, as the transition from breastfeeding to complementary foods is a key intervention period for preventing malnutrition across the life course.

Table 4: Other Indicators Relevant to Nutrition from the National Family Health Survey 2015/16.

	India – Urban	India – Rural	India - Total	Maharashtra – Urban	Maharashtra – Rural	Maharashtra - Total	Pune (District) – Urban	Pune (District) - Rural	Pune (District) - Total
Children under age 3 breastfed within one hour of birth	43	41	23	55	60	58	54*	70	62
Children under age 6 months exclusively breastfed	52	56	55	51	61	57	n/a	n/a	n/a
Breastfeeding children age 6-23 months receiving an adequate diet	10	8	9	7	4	5	n/a	3*	4
Non-breastfeeding children age 6-23 months receiving an adequate diet	17	13	14	14	10	12	n/a	n/a	n/a
All children age 6-23 months receiving an adequate diet	12	9	10	9	5	7	n/a	7*	8

** Low sample size, unweighted sample of 25-49 cases*

(International Institute for Population Sciences & ICF, 2017, 2018a, 2018b)

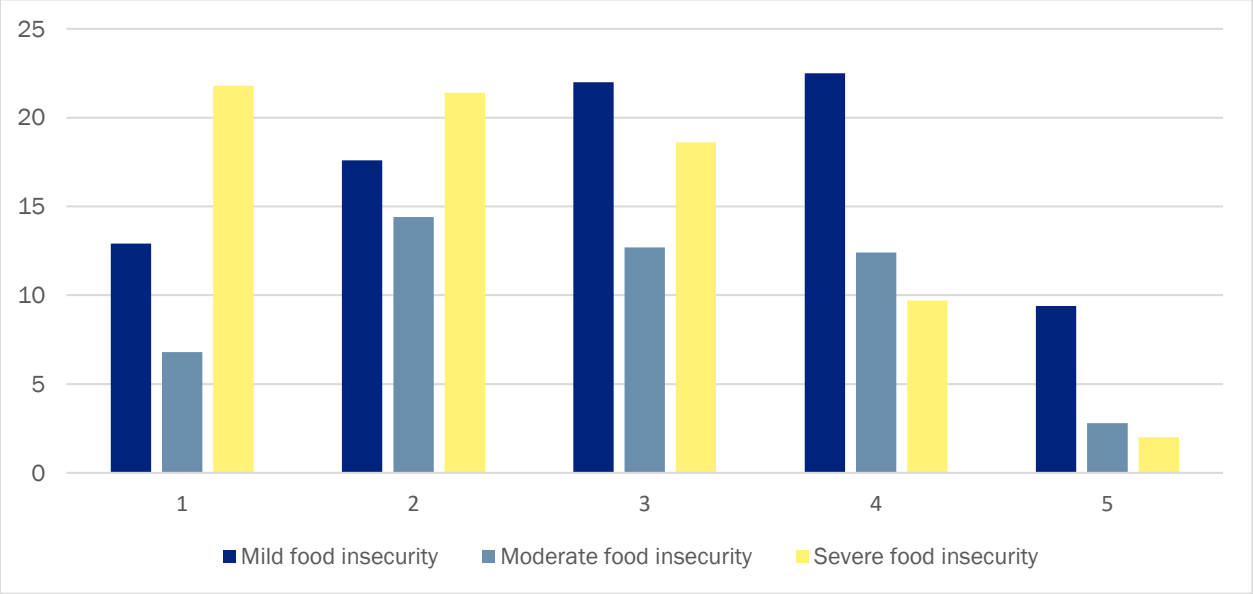
Causes of Malnutrition in Pune

Food Insecurity

Data from the Comprehensive Nutrition Survey in the State of Maharashtra India (2012) shows that 13% and 12% of households in the State are severely or moderately food insecure, respectively. The survey had a sample size of 2630 households. Household food insecurity was measured using the Household Food Insecurity Access Scale (HFIAS), which is tailored for use in low income countries. It asks respondents 9 questions to assess whether they had experienced food insecurity in the last month. Severe food insecurity would mean that a household had "no food to eat or have to starve day and night," whereas moderate food insecurity would indicate a household frequently experienced a "limited choice: and had to "eat lesser quantity (sic) of food" (Unisa *et al.*, 2016).

In the urban areas of Maharashtra, including Pune (city), there is a clear gradient in food insecurity prevalence by wealth quintile (Figure 1) (Unisa *et al.*, 2016).

Figure 1: Food Insecurity Prevalence by Wealth Quintile



(Unisa et al., 2016).

The survey also found that children living in moderately to severely food insecure households have lower dietary diversity. Dietary diversity is a key indicator for nutritional status as there is evidence that it is correlated with sufficient nutrient intake (Arimond and Ruel, 2004). It was measured using a 21-item food frequency questionnaire of the last 24 hours; the 21 items were grouped in to 7 food groups. A child's diet was then categorised by how many of these 7 food groups it contained, which was used as an indicator of dietary diversity (Chandrasekhar *et al.*, 2017).

Severe food insecurity was also associated with higher odds of a child (6-23 months) being severely stunted, underweight or wasted, and dietary diversity was significantly associated with childhood stunting and underweight. The majority of children in the survey (75%) were fed two food groups or fewer (Chandrasekhar *et al.*, 2017).

In Pune (District), data from the Comprehensive Nutrition Survey showed that 42% of households in Pune reported worrying about insufficient food availability/intake, with 15% of household being moderately food insecure and an additional 10% severely food insecure. This is roughly equivalent to the state as a whole, though moderate food insecurity is higher in Pune (district) than Maharashtra (Unisa *et al.*, 2016).

Gender Inequality

As in the rest of India the status of women in Maharashtra is much lower than that of men. Whilst the sex ratio at birth in the state has improved considerably in recent years it is still seven points lower than the national average at 902 girls per 1000 boys (2011-2013). However, research conducted by UNFPA (2011) shows that whilst there is a preference for sons amongst women and men, discrimination against daughters is not as profound as in other Indian states. Almost 40% of women ages 20-24 years are married before age 18, an important nutritional risk factor for women and their offspring. Women's workforce participation is low at 31% (UNFPA & International Center for Research on Women, 2015).

Agricultural production challenges

In Maharashtra state, agriculture represents 5% of GDP. It is the third largest state producing maize, total coarse cereals and sunflower, and the second largest in total pulses, soybeans, sugarcane and cotton (Directorate of Economics and Statistics, 2015). Fifteen percent of households in Pune (district) are involved in agriculture (POSHAN, 2017).

Food grain production per person has declined 45% since the 1960s. In the inland western region of Maharashtra, which is where Pune (district + city) is located, it has decreased by 54%. These declines have been attributed to increasing population and decreasing amount of land used in production (Tagade, 2011).

As Pune (city) has urbanised, and had increasing population growth, the availability of natural resources to sustain this population has not kept pace (Butsch *et al.*, 2017). Pune's fresh water comes from the Mula and Mutha rivers and is dependent on the rainfall during monsoon season filling up catchment dams. Domestic water use in urban Pune (district) has increased with population growth, but water from the dams is also needed for industrial energy and irrigation. Agricultural areas in Pune (district) increased 4% between 1989 and 2009, placing further demands on the water supply (Butsch *et al.*, 2017).

However, as more of the population moves into urban areas, the percent of agricultural land in Pune (district) is predicted to decrease 8% by 2028. This will have positive impacts on water use, but it may negatively affect food availability and sufficiency in the district (Butsch *et al.*, 2017).

Changing food environment (obesity)

Healthfulness of the Food Environment

In 2016 the Access to Nutrition Index, which profiles the health and nutrition profiles of food and beverage companies, conducted a 'spotlight' analysis on the Indian context. They found that "taken as a whole, the largest food and beverage manufacturers in India are falling far short of what they need to do to help fight the enduring and mounting double burden of malnutrition in India". Only a small proportion of the foods and beverages sold by the top 10 companies in India were found to be of a "high nutritional quality" (Access to Nutrition Index, 2016).

Eating Out of Home

Food and grocery sales account for 60-65% of the total retail market in India, of which 70% of sales come from 'unorganised' or informal outlets. The 'food retail sector' in India has been growing at a rate of 15% per year (KPMG, 2016).

Eating out is more common amongst younger, more affluent populations in India. When Indian consumers eat out, they prefer to eat-in (rather than get delivery/take out), and they most frequently do so at full service and quick service or fast food restaurants, which account for 73% of food service sales. In a study of the food environment in Delhi, most full service and fast food restaurants were of Indian rather than Western cuisine. Most food service sales (two-thirds) also remain in the 'unorganised' sector, however 'organised' or larger/multinational outlets are looking to expand in India. In a study of 100 participants in two cities in India, participants reported eating fast food on average three times per month. The primary motivations cited for eating fast food were taste and convenience (Prabhavathi, Krishna Kishore and Ramesh Kumar, 2014).

In Pune, fast food brands are very prominent on the high street including McDonalds, KFC, Dominos and others. Moreover, delivery services such as Uber Eats are also widely advertised.

Increasing fast food consumption has been linked with increasing obesity in India. Density of full service and quick service restaurants in Delhi has been associated with increased prevalence of obesity, however this association was attenuated when socioeconomic status was taken into account (Patel *et al.*, 2018). In a multi-study country of fast food consumption amongst adolescents, 60% of those surveyed in India reported eating fast food 'frequently or very frequently', meaning once or twice per week or three times or more per week. The study included 72,900 children globally, and showed a positive association between more frequent fast food consumption and a higher body mass index (Braithwaite *et al.*, 2014).

Food Marketing

Globally, increased exposure to marketing for unhealthy foods has been associated with increased risk of a less healthy diet and obesity, particularly amongst children. In India, food marketing can be seen on television, on average, 15 times per hour. More than 90% of these advertisements are for foods high in fat, sugar and/or salt (Kaushal and Dudeja, 2017).

Grocery Shopping

The grocery shopping market in India is changing. Most outlets remain small corner stores called *kirana stores*, however large, organised grocery retailers are increasing in India. *Kirana stores* have the advantage of being very local and accessible, but larger grocery stores are providing an increasing variety of products, including international products (Zameer and Mukherjee, 2011). The growth of supermarkets in India, however, has been limited as consumers continue to shop more frequently at their local stores. This is particularly true amongst urban residents with lower levels of income (The Economist, 2014).

The market for online food retail is small in India, accounting for only 2% of total sales, but is projected to grow (KPMG, 2016). Indian-based outlets such as Big Basket, which operates in Pune, function as online grocery retailers and feature a wide variety of fresh food and produce, international brands and processed food products. However online grocery shopping in other markets, such as in Europe and the US, has typically been used by customers with more disposable income including two-income households. Thus, whilst increasing opportunities for online shopping diversify the ways in which people

can access their food service provided, these opportunities may not be equally accessible to all in society. This is reflected in Big Basket's website, which operates in English and offers a number of higher cost imported goods (Sharma Punit, 2017).

Changing diet

India, like much of Asia, is undergoing a nutrition and epidemiological transition, characterised by a shift away from traditional diets and increasing prevalence of non-communicable diseases, fuelled in part by rapid urbanisation and change of lifestyles (Shetty, 2002; Anoop *et al.*, 2011; Dang and Meenakshi, 2017). In Maharashtra, non-communicable diseases increased 25% between 1990 and 2006 (Kholi, Goli and Doshi, 2014).

Over the past 50 years, the diet in India has changed significantly, with the average Indian eating on average 400 calories more than they did in the 1960s, and with a bigger proportion of calories coming from sugar and fat, dairy and eggs and produce (National Geographic, no date). The consumption of processed foods and sugary drinks—key drivers of non-communicable diseases and obesity—has increased noticeably in Asia (Baker and Friel, 2014).

A recent systematic review of dietary patterns in India found 11 distinct patterns, or ways, in which people in India were eating. The diet in Maharashtra is characterised by high levels of fruit, vegetables rice and pulse and is predominantly vegetarian. However, as further indication of the nutrition transition described above, many of the dietary patterns identified also included high fat, sugar and salt products along with increased meat consumption. Dietary patterns that were high in fat and sweets/snacks were found to be associated with increased risk of obesity and diabetes (Green *et al.*, 2016).

People living in urban areas of India like Pune (city) have decreased their share of total expenditure on food in total, and specifically on cereals, pulses and vegetables. In rural areas, the share of expenditure has also decreased in a similar pattern but remains higher than in urban areas (49% v 39%) (Government of Maharashtra, 2015).

In Pune (district), on average households spend 40% of their total expenditure on food. Over time, households in urban areas of Maharashtra, such as Pune (city), have decreased their overall proportion of expenditure on food (63% in 1972/3 to 38% in 2011/12), particularly on cereals (17% to 7%). In contrast, household expenditure on non-food items including fuel and clothing has increased from 36% to 62%. Per capita expenditure on vegetables and fruit remained steady between 2004/5 and 2011/12 at just over 9% and 7% of total food expenditure respectively (Government of Maharashtra, 2015).

Current Public Health / Food Interventions

National Nutrition Mission

The Government of India launched the National Nutrition Mission was launched in 2017 to better coordinate and strengthen the nutrition related schemes run by the Ministry of Women and Child Development. Its aim is to reduce undernutrition in children under the age of six, adolescent girls and pregnant and lactating women. It is a three-year programme that takes the life cycle approach and will have a focus on improving the efficiency and monitoring of existing nutrition schemes. States/UTs will be provided with a monetary incentivise for meeting a set of annual targets and goals.

The programmes to be monitored include:

- Targeted Public Distribution System (described below)

- *Anganwadi centres* providing programmes under the Integrated Child Development Programme (described below)
- Midday Meal programme (described below)
- Conditional cash transfers to pregnant and lactating women (Pradhan Mantri Matru Vandana Yojana)
- National Creche Scheme
- Scheme for Adolescent Girls
- National Health Mission
- The food fortification programme (use of fortified foods in the Integrated Child Development Programme)
- Various water and sanitation programmes: Swachh Bahrat Mission (water sanitation), the National Rural Drinking Water Programme and the Panchayati Raj Institutions (rural water/toilets)
- National Rural Livelihood Mission (focuses on promoting employment and skilled wage opportunities for poor rural households)
- Mahatma Gandhi National Rural Employment Guarantee Scheme (provides access to livelihood security through work in constructing Anganwadi centres)
- Urban local bodies (responsible for construction of Anganwadi centres and water sanitation in urban areas)
- Save SikshaAbhiyaan (education)
- Home-based Young Child Care (a new programme as part of the Mission. Will include home visits for children 3 to 15 months to provide advice on diet and feeding)

The NNM contains several components that are consistent with a smart cities approach, including its overarching aim of coordinating across multiple government programmes. A core component of the NNM is integrating information technology to enable monitoring of nutrition schemes through a mobile application and web-based dashboard. It will also incorporate a programme of citizen engagement through a call centre in which beneficiaries can provide feedback on challenges with the programmes.

Targeted Public Distribution System

Given the prevalence of food insecurity in Maharashtra State, the Targeted Public Distribution Scheme (TPDS) is an important food and public health intervention. India's National Food Security Act (2013) set the ambition for 75% of the rural population and 50% of the urban population in India to be participating in the TPDS. The TPDS provides subsidised food and fuel to people in poverty. Ration shops sell grains at reduced prices to beneficiaries who are below the poverty line.

Country-wide, almost 75% of the population is eligible to participate in TPDS. In Pune (district), 12.5% of households have access to the Public Distribution System (POSHAN, 2017). However, in Maharashtra, and therefore likely in Pune as well, more than 20% of eligible beneficiaries are not participating in the programme.

Using data from the India Human Development Survey, a 2016 report on the TPDS from NITI Aayog concludes that there have been "significant qualitative and quantitative changes in the PDS since its advent in the 1970s." However, the report also highlights "bureaucratic difficulties" with the programme,

and that despite increasing the number of households using the PDS the total grain consumed has remained stable. The impact of the TPDS was found to depend on fluctuations in the household's income – with the system having more of a beneficial impact when households have suffered "economic distress." The report also highlighted that households using the TDPS system do not necessarily increase their dietary diversity but use the benefit to obtain more calories from cereals without "increasing investments in other food groups." It concludes that the role of the TPDS in "skewing dietary composition of the households by increasing their cereal composition" "poses a critical problem", as it may be contributing to a rise in non-communicable diseases (NITI Aayog, 2016).

Programmes for Mothers and Young Children

The National Food Security Act also seeks to improve the health and quality of diets in India, particularly for mothers and young children through Integrated Child Development Services, the schools meals programme (Midday Meal Programme) and the Anaemia Mukt Baharat Strategy.

Integrated child development services programme

The Integrated Child Development Services (ICDS) programme is a national level welfare initiative run by the Commissioner of Women and Child Development. It aims to reduce malnutrition by providing supplementary food to children under the age of 6 and for pregnant and lactating women. It has been running since 1975, and now covers more than 60 million children and 12 million women. The programme also provides women and children with vitamin supplementation, health check-ups and education. These services are provided at *Anganwadi* community centres (Sachdev and Dasgupta, 2001). The programme was initially targeted to rural communities, but is increasingly important in urban areas as well (Kumar and Banerjee, 2015).

The food provided through the ICDS is determined at the State level, and thus varies across the country. However, the eligible women and children are provided with 300-600 protein-rich calories for 300 days a year, typically in the form of a cooked meal provided in the *Anganwadi*(Sachdev and Dasgupta, 2001).

In Maharashtra there are 553 ICDS programmes, provided through more than 110,000 Anganwadi. Of these, however, only 18% of them are in urban areas, with the majority in rural areas of the state. In Pune, there are more than 1000 Anganwadis, serving more than 100,000 children. The centres in Pune provide both take home rations for children and cooked food/breakfast. However in 2011, only 22% of mothers in the slums of Pune (city) received supplementary nutrition through an *Anganwadi* (Kumar and Banerjee, 2015).

A number of challenges with the ICDS have been raised, including poor infrastructure and low levels of coverage and participation. The staff who provide services in the Anganwadi have also been found to be overstretched and undertrained. The budget provided for ICDS by the central Government of India has also been reduced significantly in recent years. ICDS has also not been incorporated into the Smart City Initiative spearheaded by the Government of India (Kumar and Banerjee, 2015).

The Government of Maharashtra and Tata Trusts are currently working on a joint initiative to strengthen the ICDS in the Palghar district of Maharashtra. It is focused on improving the coverage of the ICDS services and on using information technology and data to improve the governance of ICDS programmes. This is a model which could be potentially explored for application in Pune (Tata Trusts, 2017).

Midday Meal Scheme

Following a Supreme Court mandate, since 2001 all government schools and schools that receive government assistance in India must provide a cooked meal for students. As a result, more than 100

million children in India are eligible for a free midday meal at school. The programme aims to reduce the prevalence of malnutrition, and meals need to provide a minimum of 450 calories and 12 grams of protein. It is provided to children up to school year 8 (13 years of age).

In Pune, children across 668 schools are provided with a midday meal by the Pune Municipal Corporation. It is funded through a mix of central and state government funds. A social audit of the Scheme in Pune (district) found a number of challenges with the programme, including inadequacy of the grain provided both in terms of quantity and quality, difficulty in maintaining records, and availability of drinking water (India Institute of Education, 2015).

Anaemia Mukt Baharat Strategy

The Anaemia Mukt Baharat Strategy aims to reduce anaemia in India by 3% between 2016 and 2022. It proposes a 6-part strategy, including supplementation, fortification, deworming, testing for anaemia, behaviour change campaigns and addressing non-nutritional causes of anaemia. It will be implemented through existing programmes such as the National Iron Plus Initiative and the Weekly Iron Folic Acid Supplementation programme.

Food Safety and Standards Authority India

The Food Safety and Standards Authority in India (FSSAI) has several relevant programmes and initiatives. FSSAI sits within the Ministry of Health and Family Welfare and is tasked with coordinating the food related work of various government departments and ministries.

In 2017, FSSAI launched the Safe and Nutritious Food Initiative, which provides a suite of guidance documents and trainings on improving the safety and nutrition of food at schools, in work places, at home and at religious gatherings. The programme uses a partnership approach and aims to engage stakeholders from across the food system in improving the safety and nutrition of food in multiple settings (FSSAI, 2017).

The Clean Street Food project aims to train street food providers in food safety and hygiene to improve the quality and safety of the foods they offer. Beyond improving food safety for consumers, the initiative aims to improve the popularity and business viability of street food vendors (Food Safety Standards Authority of India, 2017).

In 2018, FSSAI announced a new programme of restrictions on trans fatty acid use in Indian food products. Consensus was reached on reducing trans fatty acids to the level of less than 2% in fats and oils by 2022, and legislation is expected to this effect in late 2018 (Food Safety Standards Authority of India, 2018).

Pune Specific Initiatives

The Social Development Department of the Pune Municipal Corporation is responsible for administering social, economic and poverty alleviating initiatives in the city. This includes the Women and Child Welfare programmes described above. The Health Department oversees public health and medical services, including antenatal and postnatal care, and houses the Food and License Department.

Obesity has recently come onto the agenda of the Pune Municipal Corporation, and they have launched a programme aimed at improving obesity levels in the city. This includes awareness raising campaigns and lectures.

In addition to the programmes described above, Pune recently launched the Pune Food Hub, funded by a host of partners including the International Bank for Reconstruction and Development and the UK's Department for International Development. The Hub aims to "increase and improve the online presence of businesses associated with Food Processing Industry based in and around Pune." It is an online portal designed to "bridge the gap between the prospective entrepreneurs, the suppliers, the venders of the product, manufacturing equipment and the public who is interested in buying the finished product at very competitive prices." It is particularly focused on increasing the capacity of small and medium sized enterprises (http://punefoodhub.com/about)

Stakeholder Mapping

The stakeholder mapping exercise was conducted to enable PMC to identify levels of interest in the city partnership and potential implementation partners. This section divides stakeholders by sector and briefly describes their potential significance or involvement in BINDI.

Pune Municipal Corporation

Stakeholders in the Pune Municipal Corporation (PMC) are integral to the success of BINDI. PMC is the governing body of Pune. Relevant stakeholders are city officials with a broad remit over multiple areas, including the Mayor Mukta Tilak, Municipal Commissioner Saurabh Rao and the Additional Municipal Commissioner Sheetal Ugali. City leaders with subject matter expertise are also important stakeholders, such as Dr. Anjali Sabne, the Health Officer in charge of all PMC health services, and Anita Kani, the City Data Officer.

Other Public Authorities

Food Standards and Safety Authority India

Food Standards and Safety Authority India (FSSAI) are leading several national initiatives in support of food standards and safety. A year ago, they developed a framework to connect food into the smart city agenda being led from the Ministry of Urban Development. In practice it was difficult to gain traction on food with the smart city leaders – largely because their agenda and budget were pre-designated. The opportunity in Pune may offer a way into this agenda for FSSAI. Moreover, the chance to link this agenda to the Commonwealth Games may create opportunities to motivate other cities to get involved.

FSSAI has launched a pilot of a clean street food hub in the home of the Prime Minister allowing for vendors to be geotagged and people to gain access about their credentials online. There is also interest in this approach in Pune.

The CEO of FSSAI is Pawan Agarwal.

Food and Drug Administration

The Food and Drug Administration regulates food and drug quality and standards. For food these standards are set by Food Safety and Standards Authority of India (FSSAI) and captured in the Food Safety and Standards Act 2006 and Rules and Regulations 2011. The FDA operates at state, division and district levels and inspects food businesses, including taking and analysing samples. They have the

powers to suspend the licences of food business operators if they are contravening the law. The FDA has a helpline where complaints can be filed. In Pune approximately 6-7 calls are made to this line each day. Businesses which are above 12 lakh INR turnover apply for a license to operate (of which FDA estimate there are 21,356 in Pune city) and smaller businesses must register to operate (of which FDA estimate there are 37,237 businesses).

Table 5: Relevant registered businesses by category.

Category	Licence	Registration	Total
Star Hotels	38	00	38
Hotels	1416	1203	2619
Restaurants	3048	894	3942
Catering Services	1185	00	1185
Club/canteen	496	467	963
Others (street food vendors)	747	6735	7482

(Food and Drug Administration in Pune, personal communication)

Over the period April-April 2017/2018 a total of 1410 inspections were made. The FDA has been doing considerable awareness raising amongst street vendors. FDA is currently introducing a new hygiene rating scheme (with 50 criteria) and is inspecting 1000 restaurants and hotels to issue them with a rating. Of these a further 250 will be declared as responsible places to eat based on 6 criteria which go beyond hygiene and include the nutritional quality of the food on offer.

The key stakeholder at the FDA in Pune is Mr. Shivaji Desai, Joint Commissioner (Food) Pune Division.

Other National Government Offices

Urban Development Ministry which has responsibility for the built environment and the development of commercial areas

Women and Child Development department which has responsibility for the Anganwadi centres and early child nutrition

Health Department which has responsibility for the provision of public health services

Ministry of Food Processing which promotes and supports the food industry

Department of Food and Civil Supplies responsible for the public food provision (e.g. PDS and Midday Meal Scheme)

British Government: Foreign and Commonwealth Office and British Trade Office Pune

Sangeeta Mehta, Senior Programme Manager, UK AID, Department for International Development, India

Alok Srivastava, Prosperity and Knowledge Economy Adviser, Foreign and Commonwealth Office (FCO), British Trade Office-Pune.

Researchers and Experts

Maharashtra Obesity Task Force

Dr. Jayashree Todkkar – a paediatrician focusing on bariatric surgery and convenes the Maharashtra Obesity Task Force which was set up in 2016 by the Public Health Department and has 17 members. It is focused on generating awareness about non-communicable diseases and suggesting ways to impose

curbs on companies making fast food. Dr. Todkkar works closely with the Rotary Club which is working with 7000 schools to promote healthy lifestyles and have developed a video to support this work.

Gokhale – Politics and Economics Institute

Gokhale does works on data and evaluation and they have a specific role in the National Family Health Survey and are also currently mapping the whole food network in Pune. Dr. Anjali Rao is leading a study of adolescent snacking behaviour in four populations: rural, urban, tribal and slums (See specific details in the Annex). She is currently a post-doctoral Research Fellow at Tufts University and will be moving to Gokhale shortly.

Ashoka Trust for Research in Ecology and the Environment

The Ashoka Trust is a non-profit research institute based in Bangalore. They are conducting research on agriculture's use of water from the Pune Catchment and interested in the impact of sugar cane and black grapes is having on water availability. This is being led by Dr. Abi Tamim Vanak, who is also looking into the impact of industrialised chicken production (east of Pune in Baramati) on natural predators, antibiotic resistance and the population of wild dogs. He is interested in how agricultural subsidies could better incentivise food production which support the environment and health.

Civil Society (Pune)

SNEH Foundation

SNEH Foundation is a non-government organisation, which was established in 2011 with the aim of assessing multifaceted social issues the suburbs of Pune. This includes malnutrition, early childhood education and maternal and child health. They took the first steps to address these complex challenges in the marginalised communities of Pimpiri Chinchwad Municipal Corporation (PCMC). Since then, SNEH Foundation has initiated multiple interventions and impacted lives of 10000+ kids and mothers in 15 communities in Pune and PCMC working closely with local and state government agencies, hospitals and corporates. Ms Shraddha Dev is the contact person at SNEH. Since 2014, SNEH Foundation, along with Tata, is working on eradicating Malnutrition in marginalised communities of PCMC and Pune by adapting the community-based management of acute malnutrition model endorsed by WHO and UNICEF. They also focus on anaemia. Impact analysis suggests that the approach is sustainable and effective.

SAMYAK's

SAMYAK is a Pune based Communication and Resource Centre on gender, masculinities, health and development. It works through collaborative partnerships and advocacy initiatives with voluntary and people's organisations, social and political groups, media and society at large, to promote gender equity and justice and to advocate human rights of all individuals. One of their current initiatives is a Women's health rights forum for urban poor in Maharashtra. Mr. Anand Pawar is the Director and contact person.

SATHI

SATHI works on health rights issues, through partnerships with civil society organisations, and facilitates advocacy at the local, district, state and national levels. Adopting a rights-based approach, SATHI works towards promoting the perspective that instead of substituting for public systems or replacing them, it is essential to make these systems accountable and effective through organised and sustained public actions. A major part of SATHI's work consists of action projects. However, right from its inception SATHI

has also been involved in systematic action research, basically research which culminates into advocacy and action. SATHI's strength lies in pitching various health issues at a local and national level in a manner that they acquire relevance and become important public issues. SATHI also has several publications to its credit- brochures, flyers, policy briefs, reports, training manuals, guidebooks- all written in simple and lucid language. The contact person is Dr. Arun Gadre.

Janaseva Foundation

Janaseva Foundation is a charitable trust that serves the society through diverse fields like health care, elderly care, disabled care, destitute care, education, vocational training and research, care and school education of street children, construction of toilets, village development etc. Its beneficiaries are elderly, sick, disabled, destitute, women, divorcees, poor youth etc. The contact person is Mr. Vinod Shaha.

The Foundation of Research in Community Health

The Foundation for Research in Community Health (FRCH) was established in 1975 as a non-profit voluntary organisation in the field of health care. FRCH carries out field studies and conceptual studies primarily in rural India to gain a better understanding of the factors, which affect health and health services. FRCH works to evolve, support and promote alternate models of health and medical care that are in keeping with the social, economic and cultural realities and can be implemented widely. FRCH's larger aim is to create a people's health movement. With staff from backgrounds ranging from medicine, nursing, sciences, social sciences, economics, management, documentation and administration and a force of primary-educated health trainers and health workers, all its projects seek to demystify medicine and emphasise the people's role in their own health care. The major themes underlying all the work of FRCH are:

- Strategies for effective and affordable health care within decentralised forms of governance
- Devising information and training for health and development at the grassroots
- Research and Analysis of India's public health policies and programmes
- Studying non-government efforts in health care
- Influencing the country's health policy reforms and
- Forming a nationwide network for health and health care

The contact person is Dr. Nerges Mistry.

Tathapi Trust 'Women and Health' Resource Development

Tathapi is a Women and Health resource organisation that partners with local, rural and urban NGOs, responding to community needs around gender equality, women and health, sexuality education, violence and self-help. The contact person is Mr. Aychut Borganokar.

Samavedana

Samavedana derives its name from two Sanskrit words, 'Samam' which means along with or together and 'Vedana' means suffering or pain. Samavedana means to totally empathise with the needy and to share his pain as if it were our own and to be their companion. Since its inception, Samavedana has helped hundreds of patients and saved their lives. It began with a focus on neurology and neurosurgery but Samavedana help is now available for almost all medical specialties. The contact is Ms. Preeti Damle (CEO).

Pune City Connect / Aundh Lighthouse

Works with groups of disadvantaged young people to provide them with skills development, building confidence and aspiration and work placements (including many in the catering sector).

Civil Society (India)

John Snow Inc, India

USAID is funding John Snow Inc (JSI) to implement a Building Healthy Cities initiative, which will work in partnership with Smart Cities initiatives and urban health coordination structures. It aims to achieve health goals and improve metrics in infrastructure and ICT projects, enhance interoperability of data systems and increase efficiency of multisector urban spending. The initiative began in 2017 and will run until 2020 and will be implemented in Indore (Madhya Pradesh) in addition to several cities outside of India. Building Healthy Cities aims to help Smart City citizens of every demographic have a voice in the process through integration of a mobile citizen reporting system. Their aims are to ensure health is appropriately accounted for within the Smart City context, to reduce the time and costs of producing data that can influence policy decisions, and to empower citizens to demand better health-related services. The contact is Dr. Damodar Bachani.

BAIF

BAIF's mission is to create opportunities of gainful self-employment for the rural families, especially disadvantaged sections, ensuring sustainable livelihood, enriched environment, improved quality of life and nutrition and good human values. This is being achieved through development research, effective use of local resources, extension of appropriate technologies and upgradation of skills and capabilities with community participation.

Diabetes Centre at KEM Hospital

India is experiencing a burgeoning epidemic of diabetes and related disorders. India is one of the diabetes capitals of the world because it has very large number of diabetic patients in any one country, only next to China.

The Diabetes Unit at the KEM Hospital and the KEM Hospital Research Centre is the first dedicated diabetes centre in Western India, started in 1987. It provides comprehensive diabetes care through the Pankuwar Firodiya Day-care Centre, and the Kamalnayan Bajaj Diabetology Research Centre which is specialised to investigate peculiarities of diabetes in Indians. It has described the novel finding that the small looking Indians are thin by BMI criteria but fat when measuring body fat, and that this characteristic is present at birth (Thin-fat Indian baby). Maternal nutritional and metabolic factors contribute. They also described that maternal vitamin B12 deficiency and excess folate levels are related to 'foetal programming' of diabetes. This offers a novel approach to reduce fatal programming of diabetes, a trial is now in progress in the adolescent girls and boys in the villages around Pune. Their research activities fit nicely with the activities of the KEM Hospital Research Centre which was started with the vision of improving the health of the population, especially mother and babies by promoting research and local self-sufficiency.

Next steps

This situation analysis provides the baseline context for the smart nutrition work in Pune, and an analysis of some of the key local stakeholders who could provide support to the work. The next steps will be to define in more detail the scope of the partnership and draw from this situation analysis the key indicators which could be used to track progress. This may require the development and monitoring of new forms of data not currently being tracked by the city on food environments and public food provision. Once the specific scope of the partnership has been defined along with the KPIs, the key local stakeholders who will be able to support the delivery will be determined.

Annex

Study on Snacking by Dr. Anjali Rao, Gokhale Institute

With economic and lifestyle transition, traditional food consumption pattern is changing particularly in dynamic cities like Pune. The demographics of Pune with in-migration, especially of students, resulting in important differences in consumption patterns, i.e. snacking and eating out. Studies show that the foods consumed at snack occasions account for a large proportion of overall diets amongst children (Piernas and Popkin, 2010; Shriver *et al.*, 2017) adolescents (Larson 2016) and adults (Nicklas, O'neil and Iii, 2014), replacing main meals composed of traditional staple foods. Often these snacks are calorie and fat dense thus their routine consumption can lead to development of obesity and related metabolic disorders (Nicklas, O'neil and Iii, 2014).

With this background Dr Rao's forthcoming study on snacking is aimed at identifying who are facing dual burden of diseases with simultaneous occurrence of under and over nutrition which is closely associated with change in dietary patterns. Review of Indian food patterns (for example by [Green *et al.*, 2016]) suggest close association between intake of snacks and risk of diabetes compared with traditional diets. She will study this in detail in the Pune context. Given the need for evidence linking dietary patterns with obesity related outcomes, she will try to fill in the research gap using primary and secondary data. She will look at drivers of snacking patterns, its contribution to the daily calorie consumption, its composition such as homemade and purchased snacks. Additionally, she will try to look at association of snacking pattern with nutritional indicators such as body mass index and waist circumference. Knowledge of snacking pattern is of special importance to public health policy makers as they have a dual duty of tackling problems related to under and over nutrition.

She plans to study association of snacking pattern with body mass index and waist circumference. She will develop a diagnostic report on the Urban and rural Food Systems utilising the primary data collected under the study and existing secondary data from Pune collected earlier and available survey data NSSO data. She will explore the policy options as well.

Study of food access

Geographic access to food resources remains a major area of research from the point of view of consumption of healthier diet. Existing evidence linking proximity to food establishments with body mass index has been lacking or inconclusive particularly in situation of thin market density and existence of single product outlets compared to multi-product ones (like the supermarkets). Many areas in the Pune district are characterised by this feature. A study will focus on disaggregated measures of access, for example, nutrient deserts in which only some types of food are available. The study will try to understand how the spatial access to food resources in rural and urbanising setting of Pune is changing and study its association with outcomes such as Body Mass Index (BMI). By defining the food environment, it measures access at a disaggregated product level to look for association with undernourishment through dietary diversity pathways.

Crop diversity and dietary diversity

A third study which is at inception stage will assess the link between crop diversity and dietary diversity.

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