Chapter 3

DRIVERS OF EGYPT'S EXCEPTIONALISM IN NUTRITION

This study argues that Egypt's exceptionalism in both the double burden of malnutrition and the growth-nutrition disconnect has been driven by four main, interacting developments: (1) the rapid nutrition transition—particularly the adoption of calorie-rich, unbalanced diets in combination with an increasingly sedentary lifestyle; (2) the succession of economic crises and increase in poverty over the past decade; (3) the expansion of the national food subsidy system; and (4) the underinvestment in nutrition-sensitive infrastructure and public services and nutrition-specific interventions. The following four sections explore these four potential drivers in detail.

Nutrition Transition and Implications for Malnutrition

A part of the two nutritional challenges that Egypt is facing may be attributable to the nutrition transition, which is present throughout most of the developing world; but it may not explain why they are extremely pronounced in Egypt. The nutrition transition refers to the shift in dietary patterns and physical activity levels that coincides with growing household income and other changes in economy, technology, demography, and epidemiology, and leads to changes in nutritional status and related diseases patterns (Popkin 1993, 1998, 2001). Hence, the nutrition transition describes a natural process in human history that is mainly driven by economic growth and transformation. The pace of the nutrition transition that developing countries go through today is much faster than what currently developed countries faced decades ago, mainly due to more rapid progress in technological advances and urbanization (Popkin 2002a, 2002b).

Five phases with distinct dietary and physical activity patterns have been differentiated, with each phase usually stretching over several generations

(Popkin 1993, 1994).[1] Today, most developing countries (and, still, several developed countries) are in the fourth phase, characterized by increasing degenerative diseases. Some of their governments—including the Egyptian government—struggle to set incentives that enable their people to overcome this phase and enter into the fifth phase, characterized by rising behavioral change in diet and lifestyle. Globally, developing countries are likely to bear the major burden of the nutrition transition in the coming decades (Schmidhuber and Shetty 2005).

Nutrition Transition in Developing Countries

In the course of economic development, undernutrition decreases with growing income at declining marginal rates (Figure 2.5; Smith and Haddad 2002; Haddad et al. 2003). At the same time, overnutrition increases with growing income in developing countries (and still in some developed countries). The relationship between overnutrition and income follows a bell-shaped curve over the entire process of the nutrition transition, with overnutrition being most prevalent during the fourth phase (Mendez, Monteiro, and Popkin 2005; Garrett and Ruel 2005; Ezzati et al. 2005). Ezzati et al. (2005) show that the mean BMI of a country's population increases rapidly until its GDP per capita reaches about I$ (international dollars) 5,000, then flattens and

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1 Popkin (1994) identifies the following five phases of the nutrition transition:
1. Collection of food: The diet is typical for hunter-gatherer populations. It is high in carbohydrates and fiber and low in fat, especially saturated fat. The proportion of polyunsaturated fat in meat from wild animals is significantly higher than in meat from modern domesticated animals. Activity patterns are very high, and little obesity is found among hunter-gatherer societies.
2. Famine: The diet is much less varied—compared to that in the first phase—and is subject to larger variations and periods of acute food scarcity. These dietary changes likely lead to nutritional stress and a reduction in stature (the reduction is estimated to be about 4 inches). At later stages of this phase, social stratification intensifies, and dietary variation increases according to gender and social status. The types of physical activity change, but there is little change in activity levels during this period.
3. Receding famine: During this phase, the consumption of fruits, vegetables, and animal protein increases, and starchy staples become less important in the diet. Activity patterns start to shift, and inactivity and leisure become part of the lives of more people.
4. Degenerative diseases: The diet is high in total fat, cholesterol, sugar, and other refined carbohydrates; low in polyunsaturated fatty acids and fiber; and often accompanied by an increasingly sedentary life. This results in increased prevalence of obesity and contributes to degenerative diseases.
5. Behavioral change: The diet resembles more the dietary pattern of hunter-gatherer societies (phase 1) rather than that of societies characterized by degenerative diseases (phase 4). Compared to the diet in phase 4, it is characterized by the increased intake of fruits and vegetables, complex carbohydrates, and reduced intake of refined foods, meats, and dairy products. This dietary pattern likely emerges because of an increasing desire to prolong health and prevent degenerative diseases. It is associated with a new understanding of physical activity and fitness for promoting good health.

starts decreasing at about I$12,500 for women and I$17,000 for men. Webb and Block (2012) estimate that every 10 percent increase in per capita GDP is accompanied by a 3.2 percent decrease in the prevalence rate of stunting among children under five years of age, as well as by a 4.4 percent increase in the prevalence rate of obesity in the same age group. Thus, countries emerging from poverty typically experience rising rates of overnutrition along with declining rates of undernutrition, with overnutrition rising faster than undernutrition declines.

In the wake of rapid economic growth and transformation together with urbanization and technological advance (particularly in transportation and communications) in recent decades, the nutrition transition has progressed quite rapidly in some middle-income countries such as Egypt, Mexico, and China (Popkin et al. 2012; Rivera et al. 2002, 2004; Shetty 2013). The adoption of diets low in fiber and high in fat, sugar, and animal protein and of Western eating habits (such as convenience foods and fast foods), combined with an increasingly sedentary lifestyle that lacks physical exercise, has pushed up overnutrition rates (Mistry and Puthussery 2015; Ng and Popkin 2012). Drewnowski and Popkin (1997) show that an average country's national income level correlates positively with the share of energy from fats and sugar in the average diet and negatively with the average share of dietary energy from carbohydrates (mainly provided by staple foods).

Over recent decades, the costs of diets high in dietary fats and sugar have plummeted relative to household income, so fatty and sugary diets have become much more available to the poor. For example, in 1962, an average diet containing 20 percent of energy from fats was typical for a country with a GNP per capita of US$1,475, whereas the same diet was associated with a GNP per capita of only US$750 in 1990 (Drewnowski and Popkin 1997; Popkin 2002a). Urbanization has also contributed to improved accessibility of calorie-laden diets and rising rates of overnutrition (Drewnowski and Popkin 1997; Mendez, Monteiro, and Popkin 2005).

The consumption of refined grains, fats, animal products, sugar, and processed food is much higher in urban areas compared to rural areas, which can be explained by higher urban market penetration of these foods and lower prices in urban areas—at least, in real terms (Popkin 1999). In addition, people's physical work load and hence their energy expenditure for income generation has fallen substantially, thanks to technological advances. For example, the level of occupational physical activity among adults 18–55 years of age in China dropped by 46 percent for women and 35 percent for men between 1991 and 2006 (Ng, Norton, and Popkin 2009).

At the same time, physical exercise to burn surplus energy and body fat is uncommon among many developing countries' populations, especially among females. In the MENA region, the highest proportions of physically inactive people live in Egypt, Saudi Arabia, Iran, and the smaller Gulf States (Musaiger and Al-Hazzaa 2012). For example, 70 percent of the Egyptian adult population has less than 10 minutes of physical activity per day, compared to 31 percent in Syria. The physically inactive population accounts for 68 percent in Saudi Arabia, 67 percent in Iran, and 65 percent in Kuwait. In Saudi Arabia, 74 percent of women are physically inactive, compared to 61 percent of men. The gender gap is even wider in Iran, where 76 percent of the female adult population and 59 percent of the male adult population are physically inactive (Musaiger and Al-Hazzaa 2012).[2] A comparative study of 129 Egyptian adolescent females finds that the groups of overweight and obese girls spent significantly longer hours watching TV than the group of normal-weight girls (Youssef et al. 2010).

As a consequence, the risk of obesity and related NCDs such as type 2 diabetes, coronary heart disease, stroke, hypertension, and some cancers have sharply increased in the developing world. Globally, the prevalence of obesity among adults (20 years of age and older) nearly doubled between 1980 and 2008, reaching 14 percent among women and 10 percent among men (Finucane et al. 2011; Stevens et al. 2012). Contrary to popular belief, most deaths due to NCDs occur in low- and middle-income countries rather than in high-income countries. For example, low- and middle-income countries exhibit more than 80 percent of all cardiovascular and diabetes deaths (which is in part because they lack prevention and treatment capacities) (WHO 2011).

The MENA and LAC regions have experienced the fastest growth in mean BMI among adults since 1980, reaching rates similar to those of North America. The mean BMI of women (20 years of age and older) increased by 1.1 kilograms per square meter (kg/m^2) per decade and that of men (20 years of age and older) by 0.9 kg/m^2 per decade in the MENA region. The mean BMI growth among women and men averaged 1.3 kg/m^2 and 1.0 kg/m^2 per decade, respectively, in Central Latin America and 1.4 kg/m^2 and 0.8 kg/m^2 per decade in Southern Latin America, compared to 1.2 kg/m^2 and 1.1 kg/m^2 per decade in North America (Finucane et al. 2011).[3] Accordingly, the preva-

2 Musaiger and Al-Hazzaa (2012) do not report gender-specific prevalence rates of physical inactivity for Egypt.

3 "Central Latin America" includes Colombia, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, and Venezuela. "Southern Latin America" includes Argentina, Chile, and Uruguay.

lence rates of NCDs and resulting mortality rates in several MENA and LAC countries have become major public health concerns.

In the MENA region, Egypt has one of the highest rates of mortality from cardiovascular diseases and diabetes among women, with 384 deaths per 100,000 women (under age 70), and a moderately high rate among men, with 427 deaths per 100,000 men (under age 70) (WHO 2011). In comparison, Brazil (226 female deaths and 304 male deaths), China (260 female deaths and 312 male deaths), Mexico (217 female deaths and 258 male deaths), and the United States (122 female deaths and 191 male deaths) have lower cardiovascular disease and diabetes mortality rates. Deaths related to NCDs have been projected to increase worldwide by 15 percent between 2010 and 2020, with the greatest increases in the MENA region, Africa south of the Sahara, and Southeast Asia, all exceeding 20 percent (WHO 2011).

Trends in Food and Macronutrient Availability in Egypt

Between 1970 and 2011, total food consumption in Egypt—approximated by per capita food availability—increased, especially for sources of carbohydrates and animal protein.[4] The per capita availability of calories increased from about 2,270 kilocalories per day (kcal/d) in 1970 to about 3,560 kcal/d in 2011—an increase of 57 percent (Table 3.1). The per capita availability of total protein even increased by 67 percent and that of fat by 39 percent. These increases in macronutrient availability came along with a total increase in the per capita availability of cereals of 48 percent, of sugars of 97 percent, and of meat and fish of 253 percent.

Data from FAO's Food Balance Sheets (FBS) indicate three major shifts in Egyptians' food and macronutrient availability since 1970. The period of the first shift runs through the early 1980s (Figure 3.1). It is characterized by a rapid increase in total per capita calorie and fat availability. The increase in total calorie availability was mainly due to increased availability of cereals, sugars, and edible fats and oils, suggesting little diet diversification into nonstaple foods overall. The available calories from cereals, sugars, and vegetable

4 Due to a lack of sufficiently long time-series data on household food consumption (computable from household surveys), this section is based on food and macronutrient availability data as reported in the Food Balance Sheets (FBS) database (FAOSTAT 2014). Accordingly, a country's per capita supply of food that is available for human consumption—hereafter "food availability"—is calculated as the residual of the total quantity of foodstuffs produced and imported minus the total quantity exported, used for livestock feed and seed, put to manufacture for food and nonfood uses, and lost during storage and transportation. The total quantity of foodstuffs is then adjusted for any changes in stocks. Quantities of available per capita food were converted into levels of calorie, protein, and fat availability by applying appropriate food composition factors for all primary and processed products (FAOSTAT 2014).

TABLE 3.1 Per capita food and macronutrient availability in Egypt, and changes over time

	1970	1981	1994	2011	1970–1981 (%)	1981–1994 (%)	1994–2011 (%)	1970–2011 (%)
Food groups								
Cereals (g/d)	466	605	691	691	30	14	0	48
Meat & fish (g/d)	40	63	80	143	56	27	78	253
Milk & dairy products (g/d)	92	101	107	177	10	6	65	94
Vegetables (g/d)	344	398	388	565	16	–2	46	64
Sugars (g/d)	42	76	79	83	80	3	6	97
Edible fats & oils (g/d)	23	38	24	24	64	–36	1	6
Macronutrients								
Calories (kcal/d)	2,272	3,002	3,259	3,557	32	9	9	57
from cereals, sugars, vegetable oils (kcal/d)	1,818	2,462	2,651	2,668	35	8	1	47
Protein (g/d)	61.3	75.6	88.5	102.6	23	17	16	67
Fat (g/d)	46.0	66.8	55.5	64.1	45	–17	16	39

Source: Authors' calculation based on data from FAOSTAT (2014).

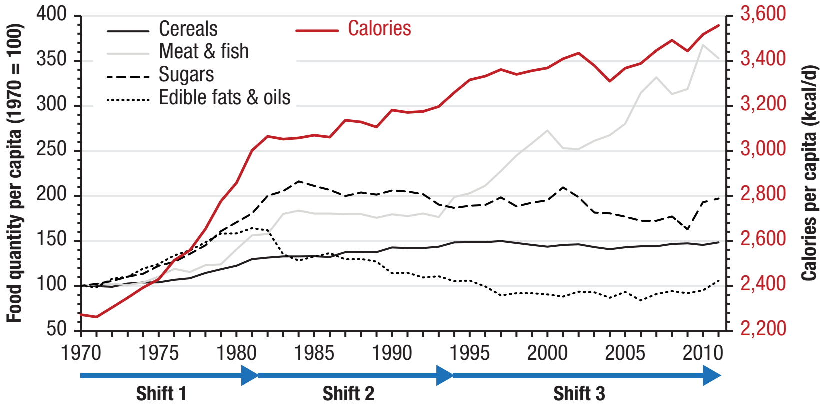
Note: g/d = grams per day; kcal/d = kilocalories per day.

Food availabilities are expressed in primary equivalences (hence including processed commodities). The food group "cereals" corresponds to the food group "cereals—excluding beer" in the Food Balance Sheets (FAOSTAT 2014); "meat & fish" corresponds to "meat" plus "offals," "fats, animals, raw," and "fish, seafood"; "milk & dairy products" corresponds to "milk—excluding butter"; "vegetables" corresponds to "vegetables"; "sugars" corresponds to "sugar & sweeteners"; and "edible fats and oils" corresponds to "butter, ghee" plus "vegetable oils."

oils increased by 35 percent per capita between 1970 and 1981, while total per capita calorie availability increased by 32 percent (Table 3.1). The per capita availability of cereals increased by 30 percent, that of edible fats and oils by 64 percent, and that of sugars by a vast 80 percent. In addition, the per capita availability of meat and fish increased by 56 percent—from a low level in 1970; most of the increase occurred within a few years around 1980 (Figure 3.1).

The period of the second shift runs from the early 1980s to the mid-1990s. It is characterized by a slowdown of the rapid increase in per capita calorie availability in the 1970s, stagnation of the increases in per capita availability of sugars and of meat and fish (for most of the period), and a decrease in the per capita availability of edible fats and oils back to the level in 1970 (Figure 3.1). Along with the decrease in the per capita availability of edible fats and oils, the per capita availability of dietary fat decreased—although more moderately (Table 3.1). The per capita availability of cereals continued to increase, with a total increase of 14 percent between 1981 and 1994, and the per capita availability of vegetables remained roughly constant.

FIGURE 3.1 Trends in food and calorie availability in Egypt, 1970–2011



Source: Authors' representation based on data from FAOSTAT (2014).

Note: kcal/d = kilocalories per day.

Food availabilities are expressed in primary equivalences (including processed commodities). The food group "cereals" corresponds to the food group "cereals—excluding beer" in the Food Balance Sheets (FAOSTAT 2014); "meat & fish" corresponds to "meat" plus "offals," "fats, animals, raw," and "fish, seafood"; "milk & dairy products" corresponds to "milk—excluding butter"; "vegetables" corresponds to "vegetables"; "sugars" corresponds to "sugar & sweeteners"; and "edible fats and oils" corresponds to "butter, ghee" plus "vegetable oils."

The third shift occurred in the period since the mid-1990s (to 2011) and is mainly characterized by rapidly increasing per capita availability of animal-source foods, meat and fish in particular (Table 3.1; Figure 3.1). Despite this overall rapid increase, the per capita availability of meat and fish in 2001–2002, 2008, and 2011 dropped below the level of the preceding year, which may reflect the impact of recent crises (Ahmed 2014; Negro-Calduch et al. 2013; see below). Per capita meat and fish availability in 2011 still exceeded the (low) level in 1970 by more than 250 percent and the level in 1994 by 78 percent. Over the period 1994–2011, the per capita availability of cereals stabilized at around 148 percent of the 1970 level. The per capita availability of sugars fluctuated around 197 percent of the 1970 level, with little increase between 1994 and 2011. After its drop to the 1970 level in 1994, the per capita availability of edible fats and oils stabilized at just below that level (until 2010). During the period of the third shift, the per capita availability of vegetables increased at a rate that is more than double the rate during the period of the first shift. Yet this increase is still much below the increase in per capita availability of animal-source foods between 1994 and 2011.

Altogether, these trends during the third shift suggest that the average Egyptian diet has just started to move toward more micronutrient-rich foods since the mid-1990s. It appears that—under the current conditions—there is still a long way to go until the majority of the Egyptian population enters the fifth phase of the nutrition transition, characterized by a rising behavioral change in diet and lifestyle: along with increasing per capita availability of animal-source foods, the per capita availabilities of protein, fat, and even calories (although at a lower rate than those of protein and fat) increased between 1994 and 2011 (Table 3.1).

Granted, the precise values of food and macronutrient availability provided by the FBS should be treated with some caution, given data gaps in the underlying statistics and well-known methodological limitations (Gabbert and Weikard 2001; Nubé 2001; Smith 1998; Svedberg 1999, 2002). For example, the per capita calorie availability from the FBS seems to significantly overstate the average per capita calorie consumption as derived from household surveys. Based on data from the National Food Consumption Survey conducted by the Egyptian National Nutrition Institute, Galal (2002) finds that the average per capita calorie consumption in 1998 was about 2,620 kcal/d, which is more than 700 kcal/d below the FBS value (≈3,340 kcal/d). Lower survey-based consumption values may be largely due to food waste occurring within the household, which is not accounted for in the FBS (FAOSTAT 2014).[5]

Nevertheless, the trends in Egypt's food consumption patterns and total calorie consumption implied by the FBS data seem to be plausible and are consistent with results from survey-based food consumption and nutrition data. For example, considering the period from 1980 to 2013, Ng et al. (2014) find the largest increase globally in the national prevalence rate of obesity among women 20–49 years of age for Egypt. Moreover, our data from the DHSs between 2000 and 2008 (MOH, El-Zanaty and Associates, and Macro International 2008; MOHP, NPC, and ORC Macro 2000; MOHP et al. 2003; MOHP et al. 2005) suggest that the prevalence rates of overweight and obesity among women in the same age group have stabilized in the 2000s.[6]

Economic Crises and Poverty in Egypt

When we search for drivers of Egypt's nutritional challenges and especially the high prevalence of chronic child undernutrition, (income) poverty may appear as an obvious potential key factor. Globally, chronic child undernutrition is

5 Within the household, food waste occurs during storage, in meal preparation, and as plate-waste. Some food is also misused by feeding it to domestic animals.

6 See Tables A.1 and A.2 in the Appendix.

closely associated with household poverty (Brooks-Gunn and Duncan 1997; Black et al. 2008; Grantham-McGregor et al. 2007; Smith and Haddad 2000). In Egypt, the national poverty rate steadily increased between 2000 and 2011 (see below), as did the national prevalence rate of child stunting, at least between 2005 and 2011. Increasing child stunting prevalence has contributed to both the extreme double burden of malnutrition and the exceptional growth-nutrition disconnect. The steady increase in poverty and therewith household food insecurity has been widely attributed to a succession of economic crises (e.g., Ahmed 2014; Breisinger et al. 2013; WFP 2013), which hence have been deemed as key drivers of increasing child stunting rates as well (e.g., WFP 2013).

Since the late 1990s, Egypt has experienced at least four major economic crises, which seem to be reflected in the sudden slowdowns of increasing food and macronutrient availabilities (as discussed above). First, a series of economic shocks in the period 1997–2001 (including the Luxor terrorist attack in November 1997, the 2000–2001 economic recession in the European Union, and the September 11 terrorist attacks in the United States in 2001) slashed foreign currency earnings and prompted the government to gradually devalue the EGP from May 2000 onward and to finally adopt a free exchange rate floating system in January 2003 (Bolbol, Fatheldin, and Omran 2005). Second, the avian influenza outbreak in 2006 and the resulting mass culling of poultry affected a large proportion of small-scale farmers, who raised chicken for their own consumption and as source of household income (Ahmed 2014; Negro-Calduch 2013; Kavle et al. 2015a). Third, the global food, fuel, and financial crises of 2007–2009 increased domestic food and fuel prices and lowered foreign currency inflows substantially, given Egypt's heavy reliance on food and fuel imports and revenues from tourism, the Suez Canal, and petroleum exports (Ahmed 2014; Ianchovichina, Loening, and Wood 2014; Table 3.2). Globally, Egypt is the largest importer of wheat—the primary staple food. The three-year average import dependency ratio in 2007–2009 was about 41 percent for cereals, 38 percent for sugars, and 73 percent for edible fats and oils (Table 3.2). Fourth, the political instability in the wake of the 2011 revolution further aggravated Egypt's macroeconomic problems (Ahmed 2014; Breisinger et al. 2013; Dahi 2012).

Association between Poverty and Chronic Child Undernutrition

Despite these crises, Egypt's GDP grew at an annual average rate of 4.6 percent—2.7 percent on a per capita basis—between 2000 and 2011 (Table 3.2). However, poverty steadily increased by 0.8 percentage points

TABLE 3.2 Key macroeconomic indicators for Egypt, 2000–2011

	2000	2001	2002	2003	2004
GDP growth (%)[a]					
Overall	5.4	3.5	2.4	3.2	4.1
Per capita	3.5	1.7	0.5	1.3	2.2
Balance of payments (million US$)[b]					
Current account balance	–33	614	1,943	3,418	2,911
Trade balance	–9,363	–7,517	–6,615	–7,834	–10,359
Exports	7,078	7,121	8,205	10,453	13,833
Petroleum	2,632	2,381	3,161	3,910	5,299
Share (%)	—	—	—	37.4	38.3
Food	—	—	—	597	792
Share (%)	—	—	—	15.3	14.9
Imports	16,441	14,637	14,820	18,286	24,193
Petroleum	—	—	—	2,550	3,975
Share (%)	—	—	—	13.9	16.4
Food	—	—	—	3,208	3,421
Share (%)	—	—	—	17.5	14.1
Services, net	5,588	3,878	4,949	7,318	7,842
Receipts	11,696	9,618	10,441	12,981	15,030
Tourism	4,317	3,423	3,796	5,475	6,430
Share (%)	36.9	35.6	36.4	42.2	42.8
Suez Canal	1,843	1,820	2,236	2,848	3,307
Share (%)	15.8	18.9	21.4	21.9	22.0
Transfers	3,742	4,252	3,609	3,934	5,428
Remittances, net	2,973	3,109	2,946	3,046	4,372
Food import dependency ratio (%)[c]					
Cereals	35.4	36.8	36.9	31.3	27.6
Meat & fish	26.6	23.6	18.0	15.6	17.1
Milk & dairy products	8.1	7.2	5.5	5.8	6.2
Vegetables	0.0	0.1	0.1	0.1	0.1
Sugars	22.5	28.0	33.2	28.0	40.2
Edible fats & oils	79.2	71.3	61.7	55.5	79.4

Source: Authors' calculation based on data from the following sources: [a] World Bank (2014); [b] Central Bank of Egypt (2014); [c] FAOSTAT (2014).

Note: — = data not available; GDP = gross domestic product.

The annual values of the balance of payments accounts refer to the first half of the specified calendar years and the preceding half years.

The import dependency ratio is calculated as import quantity as a percentage share of total domestic supply quantity. The total domestic supply quantity is calculated as the sum of domestic production quantity and import quantity minus export quantity. Food availabilities are expressed in primary equivalences (including processed commodities).

2005	2006	2007	2008	2009	2010	2011	Annual average
4.5	6.8	7.1	7.2	4.7	5.1	1.8	4.6
2.6	4.9	5.2	5.3	2.9	3.3	0.1	2.7
1,752	2,269	888	–4,424	–4,318	–6,088	–10,146	
–11,986	–16,291	–23,415	–25,173	–25,120	–27,103	–34,139	
18,455	22,018	29,356	25,169	23,873	26,993	25,072	
10,222	10,108	14,473	11,005	10,259	12,136	11,225	
55.4	45.9	49.3	43.7	43.0	45.0	44.8	44.7
587	944	1,151	1,092	1,343	1,422	1,234	
5.7	9.3	8.0	9.9	13.1	11.7	11.0	11.0
30,441	38,308	52,771	50,342	48,993	54,096	59,211	
5,359	4,128	9,561	7,032	5,161	9,262	11,775	
17.6	10.8	18.1	14.0	10.5	17.1	19.9	15.4
2,951	4,153	6,207	5,898	6,791	9,494	10,983	
9.7	10.8	11.8	11.7	13.9	17.6	18.5	14.0
8,191	11,498	14,966	12,502	10,339	7,878	5,585	
17,438	20,456	27,211	23,801	23,563	21,873	20,872	
7,235	8,183	10,827	10,488	11,591	10,589	9,419	
41.5	40.0	39.8	44.1	49.2	48.4	45.1	41.8
3,559	4,170	5,155	4,721	4,517	5,053	5,208	
20.4	20.4	18.9	19.8	19.2	23.1	25.0	20.6
5,547	7,061	9,338	8,247	10,463	13,137	18,408	
4,975	6,261	8,377	7,632	9,509	12,384	17,776	
36.2	38.2	43.1	37.2	42.1	49.4	46.3	38.4
19.9	21.5	22.6	15.9	16.1	23.0	17.6	19.8
6.9	5.4	5.8	9.4	8.9	13.0	24.1	8.9
0.1	0.2	0.1	0.2	0.2	0.4	0.5	0.2
37.7	39.6	35.8	44.8	33.1	37.1	43.1	35.3
78.5	80.5	62.3	82.4	74.2	87.0	84.0	74.7

The food group "cereals" corresponds to the food group "cereals—excluding beer" in the Food Balance Sheets (FAOSTAT 2014); "meat & fish" corresponds to "meat" plus "offals," "fats, animals, raw," and "fish, seafood"; "milk & dairy products" corresponds to "milk—excluding butter"; "vegetables" corresponds to "vegetables"; "sugars" corresponds to "sugar & sweeteners"; and "edible fats and oils" corresponds to "butter, ghee" plus "vegetable oils."

The import dependency ratios of the food groups "meat & fish" and "edible fats & oils" are calculated as weighted averages of the import dependency ratios of their subgroups, using the relative shares in the domestic supply quantity as weights.

annually, from a low rate of 16.7 percent in 2000 (Table 3.3). The prevalence rate of child stunting increased by 0.6 percentage points annually, from 24.6 percent in 2000 (Table 2.2). The national poverty rate hence rose faster than the national prevalence rate of child stunting (by 50 percent compared to 34 percent).

Nevertheless, poverty remained less prevalent than child stunting in 2011. Unlike in Egypt, poverty is more prevalent than child stunting in most developing countries, according to data from World Bank (2014). Income inequality in Egypt declined from 2000 to 2011 (Table 3.3), which is unusual given rising poverty going along with high economic growth. With a Gini coefficient of about 0.34 in 2000, Egypt's income inequality was already quite low by regional and international standards, which appears to be at odds with Egyptians' perception of income inequality (Verme et al. 2014).[7] Yet Egypt and other MENA countries had low incidences of poverty and income inequality, at least throughout the 1980s and 1990s, due to high remittances from international migration and high public-sector (government) employment partially as a means of social protection (Adams and Page 2003; Hassine 2012). In addition, the Egyptian government considerably expanded food subsidies throughout the 2000s to mitigate the impacts of the economic crises on the poor (see below).

Government policies may also partly explain differences in subnational trends and patterns between poverty incidence and child stunting prevalence. Similar to the prevalence of child stunting, poverty rose faster in urban areas than in rural areas, although the urban-rural gap has been less pronounced. Between 2000 and 2011, the poverty rate increased by 66 percent in urban areas and 47 percent in rural areas; the child stunting rate increased by 81 percent in urban areas and only 13 percent in rural areas. In urban areas, the prevalence rate of child stunting hence increased over-proportionately relative to the poverty rate. Accordingly, income inequality in urban areas declined from 2000 to 2011, whereas it remained roughly constant in rural areas (Table 3.3). Nonetheless, income inequality in Egypt has been lower in rural areas than in urban areas. This is consistent with other developing countries in the MENA region (Adams and Page 2003) but different from developing countries in other world regions such as China (Chang 2002; Yang 1999) and many African countries south of the Sahara (Sahn and Stifel 2003).

7 A comprehensive study of Egypt's inequality (Verme et al. 2014) finds that the HIECS expenditure data—which underlie the official poverty and inequality estimates—are of good quality, and alternative measurements of inequality yield similar estimates to the official ones, presented in this book.

TABLE 3.3 Poverty and income inequality and annual average change in poverty, 2000–2011

	2000	2005	2009	2011	2013	2000–2011 (percentage points)
Poverty rate (%)						
Total	16.7	19.6	21.6	25.2	26.3	0.8
Urban	9.2	10.1	11.0	15.3	17.6	0.6
Rural	22.1	26.8	28.9	32.3	32.4	0.9
Poverty rate (%), by region and residential area						
Metropolitan	5.1	5.7	6.9	9.6	15.7	0.4
Lower Egypt	10.3	14.5	14.2	15.1	15.9	0.4
Urban	6.2	9.0	7.3	10.3	11.7	0.4
Rural	11.8	16.7	16.7	17.0	17.4	0.5
Upper Egypt	29.7	32.5	36.9	44.5	42.6	1.3
Urban	19.3	18.6	21.3	29.4	26.7	0.9
Rural	34.2	39.1	43.7	51.5	49.4	1.6
Income inequality (Gini coefficient)						
Total	0.344	0.323	0.307	0.316	0.298	
Urban	0.368	0.349	0.336	0.349	0.326	
Rural	0.233	0.233	0.224	0.236	0.236	

Source: Provided by Heba El-Laithy, based on data from CAPMAS and WFP (2011).

Note: Following the official definition, poverty and income inequality are derived from household expenditure data.

There were also several differences between the regional prevalence of child stunting and poverty that were persistent, at least between 2000 and 2011 (Table 2.1 and Table 3.3). The gap between Lower Egypt and Upper Egypt was much less pronounced for the prevalence of child stunting than for poverty. While poverty was less prevalent in the Metropolitan areas than in Lower and Upper Egypt and far below the national average, the prevalence of child stunting in the Metropolitan areas was higher than in Lower Egypt and much closer to the national average. The relatively low poverty rates in Lower Egypt and the Metropolitan areas were likely due to a concentration of government investments in these regions that pulled up the local economies, as well as insufficient social protection in lagging areas in Upper Egypt (World Bank 2007).

Finally, and most importantly, child stunting was common among both the poor and the rich. And, as discussed above, the gap between the poorest and the richest quintiles in child stunting prevalence diminished throughout the 2000s, so the prevalence rate among the poorest and richest was relatively similar in 2011 (Figure 2.6). Correlation analyses based on the 2011 HIECS data (CAPMAS and WFP 2011) reveal that children's HAZs are only very weakly correlated with household income indicators. The correlation coefficients for reported per capita income and per capita total expenditure, when transformed into logarithms, take values of below 0.045 across the total, urban, and rural samples. These coefficients are even statistically insignificant at the 10 percent level for the urban sample, and the coefficient for per capita income is statistically insignificant for the rural sample.[8] Correlation analyses based on data from the 2000, 2003, 2005, and 2008 DHSs (MOH, El-Zanaty and Associates, and Macro International 2008; MOHP, NPC, and ORC Macro 2000; MOHP et al. 2003; MOHP et al. 2005) confirm the low association found in the 2011 HIECS data. Overall, the 2005 DHS data show the highest—though still low—correlation coefficients between child HAZ and household wealth (measured by an asset wealth index), which amount to 0.133 for the total sample, 0.113 for the urban sample, and 0.111 for the rural sample.

Thus, although the increase in the prevalence of child stunting between 2000 and 2011 was accompanied by an increase in poverty at the national and—to a lesser extent—the subnational levels, low child HAZ has been only weakly associated with low household income at the individual level. This finding suggests that there were other factors—in addition to household poverty—that contributed to a high and growing prevalence of child stunting between 2000 and 2011. It may also imply that the social protection policies in place had at least fewer mitigating effects on child stunting than on poverty.

Household Food Insecurity and Coping Strategies

Along with rising poverty, Egypt experienced deteriorating household food security due to losses in household purchasing power in the course of the succession of economic crises. Between 2009 and 2011, the proportion of Egyptians who were income poor and had poor food consumption (in terms of inadequate dietary diversity, calorie deficiency, or both) increased from 14.0 percent to 17.2 percent, according to a study based on HIECS data and published by the World Food Programme (WFP 2013). It is believed that the expansion of the food subsidies in response to the economic crises in the 2000s were critical in protecting many people from even larger losses in purchasing power (Al-Shawarby and El-Laithy 2010; Breisinger et al. 2013; WFP

8 The coefficients are statistically insignificant when using household income and expenditure per capita in linear terms.

2013). Using estimates from a mixed demand model for policy simulations, Ramadan and Thomas (2011) find that cereal price increases at a rate similar to the ones experienced in 2007–2008 (by about 50 percent) would decrease total food expenditure by 10.5 percent among the lowest income quartile in rural areas and by 9.2 percent among the lowest income quartile in urban areas if there were no Baladi bread and flour subsidies. The averted losses for the total rural and urban populations would be 8.7 percent and 6.9 percent of total food expenditure, respectively.

The WFP study reports that 74.7 percent of the households who experienced an economic shock in the two years prior to the survey in 2011 stated that the most significant shock was a rise in food prices, with increases of 77.0 percent in rural areas and 72.1 percent in urban areas. To cope with this loss in purchasing power, households adopted coping strategies that may have had negative effects on nutrition in the longer term. The reported dominant strategies included more reliance on less expensive and less preferred foods (88.4 percent among poor households and 81.6 percent among non-poor households), reduction in the daily consumption of meat and fish (72.4 percent among poor households and 67.4 percent among non-poor households), and reduction in meal portions (41.7 percent among poor households and 43.8 percent among non-poor households) (WFP 2013). As a consequence, household dietary diversity declined as reliance on cheap calorie-rich foods—especially among the poor—heightened. The proportion of households with poor dietary diversity increased from 33.3 percent in 2009 to 35.1 percent in 2011 (WFP 2013).

Decreased dietary diversity, reduced meat and fish consumption, reduced vegetable and fruit consumption, and increased consumption of sugary foods were also found in the 2008 DHS data, compared to the 2005 DHS data (Kavle et al. 2015a). Kavle et al. (2015a) relate these changes in the diets of young children and their mothers to the 2006 avian influenza outbreak and the following food and fuel price crisis. They argue that the observed increase in the prevalence of child stunting in Lower Egypt between 2005 and 2008 can partly be explained by a decline in dietary diversity, and particularly by sugary foods being substituted for more nutritious foods. Sugary foods were increasingly available and easily affordable during this period, thanks in part to the expansion of food subsidies (see below).

Thus, economic shocks and increasing food insecurity do not necessarily lead to reduced calorie intake and declining overweight and obesity because households tend to reduce their consumption of relatively expensive, micronutrient-rich foods first. For example, evidence from the 1998

Indonesian economic crisis suggests that affected people may largely maintain and partly even increase their consumption of basic staple foods and calorie intake levels, despite considerable losses in household purchasing power (Headey, Ecker, and Trinh Tan 2014). There is also evidence from high- and middle-income countries that shows that overweight and obesity can even be positively associated with household food insecurity, especially among beneficiaries of food assistance and social welfare programs (Dinour, Bergen, and Yeh 2007; Kuku, Garasky, and Gundersen 2012; Mohd Shariff and Khor 2005).

Food Subsidies and Nutritional Implications

Egypt has a long history of food subsidies. Food subsidies have been a main pillar of the Egyptian social safety net along with fuel subsidies and relatively minor social benefits. The high prevalence of chronic child undernutrition, as well as the high prevalence of overnutrition among children and women, implies that the food subsidy system was ineffective in reducing at least these forms of malnutrition. Moreover, in combination with the general phenomenon of the nutrition transition, the design of the food subsidy system and its modifications over time may have contributed to preventing common nutritional progress and even aggravating Egypt's two nutritional challenges (as we will explain in the following).

In Egypt, food subsidies have been a popular political instrument, particularly to mitigate the expected impacts of high food prices during economic crises. Although the food subsidies may have helped to raise the purchasing power of poor people and to prevent more rapid rises in poverty in recent years, they may have incentivized overconsumption of calorie-rich foods and favored shifts toward less balanced diets (diets having less diversity and bioavailable micronutrient contents). Both may have had adverse nutritional effects.

The long-standing, continuous existence of the food subsidy system at a large scale may have led to an internalization of calorie-rich and unbalanced diets into common food habits. Certainly, the food subsidy system was never designed to tackle malnutrition, but interventions in food markets—and their modifications—naturally have critical implications for people's food consumption preferences and hence their nutritional status. In other words, food subsidies and their reforms are unlikely to be neutral with regard to nutritional outcomes.

Past discussions on reforming the Egyptian food subsidy system were focused on implications for the fiscal budget and poverty reduction/prevention. However, nutritional concerns—at least related to overnutrition—and the consequences for public health and related economic costs seem to have never played a notable role, either in the political or in the public debate. This section therefore draws particular attention to the potential nutritional implications of Egypt's food subsidy system. Especially after the revolution in 2011, reforming the food subsidy system was deemed politically challenging due to the potential economic and social impacts conjectured. It was believed that many Egyptians consider food (and fuel) subsidies as the only notable social benefits they receive from the government, and most of them perceive the subsidies as their legitimate civil right (Ghoneim 2013; Sachs 2012). Nonetheless, critical modifications of the food subsidy system were undertaken (and the fuel subsidies were cut back) recently—quietly and without sparking notable civil unrest (probably because of the presence of a new strong government backed by a large majority of the population, and because of people's desire for stability in the aftermath of the 2011 revolution).

History of the Egyptian Food Subsidy System until May 2014

Started in 1941, Egypt's food subsidy system is one of the oldest food subsidy systems still in existence in the world. It provides food at subsidized prices to the vast majority of the population. Despite several modifications, the subsidization of Baladi bread, cooking oil, and sugar has been the centerpiece of the system continuously since 1945. Until May 2014, the food subsidy system consisted of two separate programs—the Baladi bread (and flour) program and the ration card program.

Baladi bread subsidies were introduced in 1941 under the reign of King Farouk I as universal consumer subsidies (Ahmed et al. 2001). To maintain the subsidies, the government since then has intervened in wheat marketing by controlling the supply chain through purchasing domestic wheat at prices often above the world market price; transacting the bulk of wheat imports; handling most of wheat transportation and storage; selling wheat to processors at fixed prices (below the world market price); operating flour mills, bakeries, and, most of all, Baladi bread outlets; providing fuel subsidies to private wheat processors; fixing the price of Baladi bread; and issuing compulsory regulations meant to ensure Baladi bread's quality. These quality regulations relate to issues such as loaf size, flour extraction rates, and, more recently, iron fortification amounts (Alderman, von Braun, and Sakr 1982; Coelli 2010).

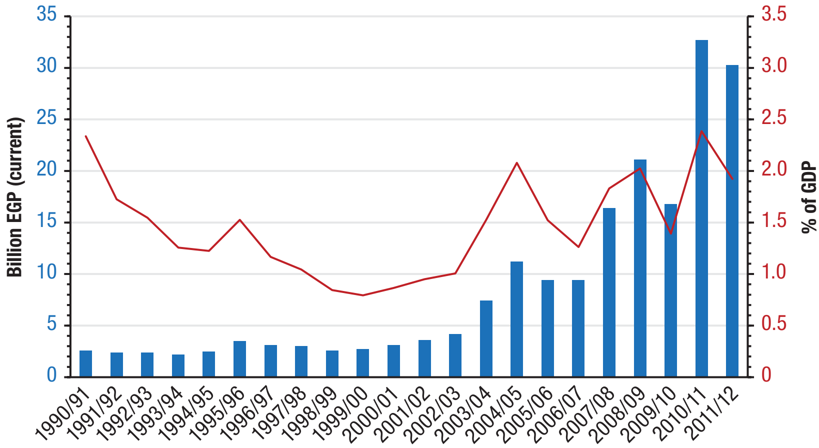
In 1945, near the end of World War II, the government of King Farouk I also introduced the ration card–based subsidies. The program was designed as a temporary measure with the purpose of ensuring the supply of necessary goods to the whole population and therewith helping people to cope with the scarcity and inflation resulting from the war (Ahmed et al. 2001; Ali and Adams 1996; WFP 2008). Household rations were issued for basic foods, including cooking oil, sugar, and tea, and for some nonfood necessities such as kerosene and coarse cotton textiles (Ahmed et al. 2001). Until May 2014, beneficiaries received fixed quotas of food items—noted on the ration card—at fixed prices (determined by the government). The difference between the subsidized price and the market price has been covered by the public budget—before and after the 2014 reform (see the next section). Both the Baladi bread (and flour) program and the ration card program have been the responsibility of the Ministry of Supply and Internal Trade (MSIT, as it is termed today), and since 2005 they have been managed by the General Authority for Supply Commodities.

After World War II, the ration card program remained in place as a policy instrument for promoting social equity and political stability and for mitigating adverse effects of economic reforms and structural adjustments. Under the rule of President Gamal Abdel Nasser (1956–1970), a social contract between the government and the people was concluded that explicitly stated the government's mandate to ensure a basic food supply to all Egyptians (Ahmed et al. 2001). Under the early rule of President Anwar Sadat (1970–1981), the ration card program was expanded by subsidizing additional foods, including beans, lentils, rice, yellow maize, chicken, frozen meat, and frozen fish, adding up to a total of 18 food items (Ahmed et al. 2001; Ali and Adams 1996). The expansion was associated with significant increases in the supply of animal products and sugar and a sharp rise in the availability of calories, marking the first aforementioned shift in Egypt's food supply patterns (Figure 3.1).

However, the food subsidies quickly became fiscally unsustainable in the wake of rising international food prices in the early 1970s. The fiscal burden peaked in 1975/1976, when food subsidies accounted for 16.9 percent of total public expenditures and 9.4 percent of national GDP (Alderman, von Braun, and Sakr 1982). In 1977, the government attempted to cut back on the total costs of food subsidies through reducing subsidies for some food items (including Fino bread and Fino bread flour, rice, sugar, and tea), which sparked heavy, violent riots (Alderman 1986; Ahmed et al. 2001). Thereupon, the reform attempt was rescinded hastily, and the subsidy system was even further expanded. The government increased the value of the existing subsidies and introduced the distribution of bread flour in rural areas for baking bread at home (Ahmed et al. 2001).[9] In the 1980s and early 1990s, food

9 Accordingly, we term the program after this point "bread and flour program."

FIGURE 3.2 Costs of the Egyptian food subsidy system



Source: Authors' representation based on data from MOF (2014); Central Bank of Egypt (2014); and World Bank (2014).
Note: EGP = Egyptian pounds; GDP = gross domestic product.
Years listed are Egyptian fiscal years. Egypt's fiscal year starts on July 1 and concludes on June 30.

subsidies were cut back quietly, gradually, and moderately through a series of reforms under the rule of President Hosni Mubarak (1981–2011). The costs of the food subsidy system were kept under EGP 3.5 billion between 1990/1991 and 2001/2002 and steadily decreased relative to Egypt's GDP, except for the spike in 1995/1996 (Figure 3.2).

The ration card program underwent a major structural reform in 1981 by the introduction of a targeting mechanism. A main aspect of the structural reform was that all ration-card-holding households were divided into two categories according to their income status, and subsidy rates were issued accordingly. Poor households received green cards that enabled them to purchase food rations at full-subsidy rates, and better-off households received red cards that enabled them to purchase rations of sugar, cooking oil, rice, and tea at reduced-subsidy rates (Adams 2000; Ahmed et al. 2001; Gutner 2002). Green ration cardholders were also eligible for additional quotas of those four items at the reduced-subsidy rates. This dual system persisted until the food, fuel, and financial crisis in 2007–2009.

The reform of the Baladi bread subsidy began three years later and was carried out with minimal publicity. In 1984, the price of Baladi bread was increased from 1 to 2 Egyptian piasters (EGP 0.02), and the price was increased again to 5 Egyptian piasters (EGP 0.05) in 1989 (Al-Shawarby and

El-Laithy 2010). The mandatory loaf size was reduced in two steps, from 168 grams (g) to 160 g in 1984 and to 130 g in 1991; the 1991 mandatory loaf size officially still applies today. The price of Baladi bread has also been fixed since 1989 and has led to a mounting burden for the public budget. In real terms, the price of Baladi bread dropped 5.9-fold between 1989 and 2011 (taking the reduction of loaf size into account).

Other reforms to the food subsidy system in the late 1980s and 1990s included the gradual reduction of the number of beneficiaries under the ration card program by abolishing the automatic inclusion of newborns on the household ration cards and removing persons who died or moved abroad; gradual reduction of both the quotas of subsidized foods and the subsidy rates under the ration card program; and phasing out of subsidies for some food items such as Fino bread and its flour, chicken, meat, fish, and tea in 1991–1992 and Shami bread and its flour in 1996 (Adams 2000; Ahmed et al. 2001; Gutner 2002; Trego 2011). The gradual reform process was successful in fiscal terms. The costs of the food subsidies declined from around 15 percent of total government expenditures in 1980 to 6 percent in 2000 without sparking major civil unrest, probably partly because of tight state control (Trego 2011). Moreover, the rapid rise in the (over)supply of calories throughout the 1970s was slowed down considerably (Figure 3.1), possibly through creating a disincentive for food wastage (considering that the calories available for human consumption were far above reported calorie consumption).

In the 2000s, the government increasingly focused on better controlling the fiscal costs by improving efficiency through better targeting mechanisms and reducing leakages and losses along the supply chains (WFP 2008). The rapidly growing costs of the Baladi bread and flour program attracted particular reform attention. Al-Shawarby and El-Laithy (2010) and Coelli (2010) attributed large potential for optimizing the Baladi bread and flour subsidies to improving wheat trade and storage practices, utilizing economies of scale in mills and bakeries, better geographic targeting toward the residential areas of the needy population, and moving the subsidies to the end of the bread supply chain so as to eliminate incentives to leak flour to the black market.

Although the government managed to reduce leakages in the Baladi bread chain from 41 percent of total output in 2004/2005 to 31 percent in 2008/2009 (Al-Shawarby and El-Laithy 2010), the costs of the program surged in the 2000s, and particularly during the food, fuel, and financial crises of 2007–2009, partly due to high prices for imported wheat (Figure 3.2). The national government also phased out the national Baladi flour subsidy, although some governors managed to achieve continuation of the subsidy in their governorates. To improve the efficiency of the ration card program, the government considered implementing proxy means tests to monitor and evaluate the eligibility of ration cardholders; the tests' intended implementation was expected to reduce administrative costs, too. Electronic smart cards have, starting in 2005, gradually replaced the existing ration card booklets (Al-Shawarby and El-Laithy 2010). However, the government did not succeed in improving the cost-effectiveness of the ration card program. Leakages actually increased from 27 percent to 31 percent for cooking oil, increased from 19 percent to 20 percent for sugar, and stagnated at 11 percent for rice between 2004/2005 and 2008/2009 (Al-Shawarby and El-Laithy 2010). To the best of our knowledge, proxy means tests were never implemented—at least not to revoke ration cards from households in noncompliance with eligibility criteria.

In the course of the recent crises, reforming the food subsidy system has been proven to be difficult due to Egyptians' economic situation and the political sensitivity of such reforms, so urgently needed structural changes were abandoned. Instead, the government often used food (and fuel) subsidies to mitigate adverse household welfare effects and calm civil unrest, particularly during the food, fuel, and financial crises of 2007–2009 and the political uprising in 2011 and thereafter (Breisinger, Ecker, and Al-Riffai 2011; Bush 2010). High economic growth in the 2000s and resulting tax revenues enabled Egypt's government to be somewhat generous in public spending. Since 2003, the government has gradually rolled back the fiscally successful reforms made to the ration card program in the 1980s and 1990s. Sparked by rising inflation after the EGP devaluation, violent riots prompted the government to increase the quotas for rice, sugar, and cooking oil in mid-March 2004 and to reduce the subsidy prices a few days later. In addition, the ration card program was broadened by adding subsidized macaroni, beans, lentils, and ghee, which, however, were again removed from the ration card in April 2006 (Al-Shawarby and El-Laithy 2010).

Starting in mid-2007, the government expanded the coverage of the ration card program to include vulnerable households: the ration card program was opened to all households that received benefits from the national social insurance program in June 2007; persons born between 1988 and 2005 and living in households with existing ration cards were added to the ration cards in January 2008; and in 2009 the ration card program was progressively opened to specific household categories, including single women with dependents, pensioners, and temporary (low-income) workers and unemployed people (Al-Shawarby and El-Laithy 2010; Hannusch 2008).

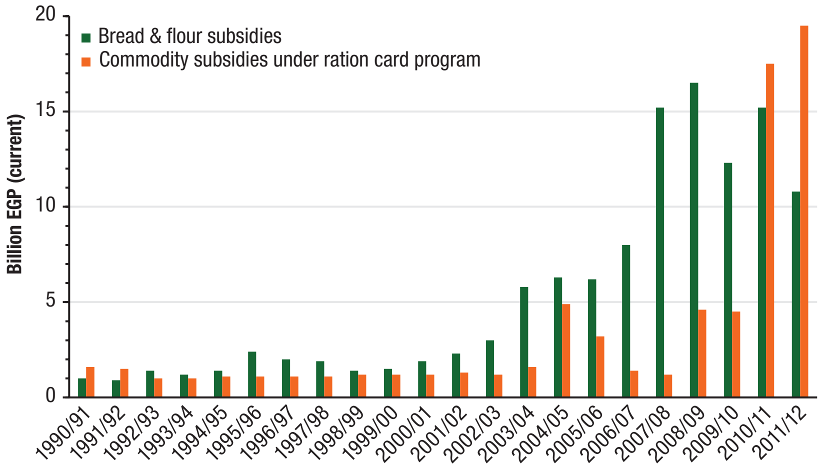
In June 2008, the dual ration card system was phased out, and all holders of reduced-subsidy ration cards received full-subsidy ration cards. Moreover, the subsidy prices of the additional quotas were adjusted downward to match the subsidy prices of the regular quotas in three steps, namely in May 2008, August 2008, and July 2010. As a consequence of these expansions, the costs of the ration card program shot up, exceeding EGP 15 billion in 2010/2011. For the first time after 1991/1992, the costs of the ration card program in 2010/2011 exceeded the costs of the Baladi bread and flour program, which made up the bulk of the food subsidies in the second half of the 2000s, with a maximum share of 93 percent in 2007/2008 (Figure 3.3).

In 2011, the government issued a large number of new household ration cards, expanding the coverage of the ration card program considerably. The number of beneficiary households increased by almost 5.0 million (41.4 percent), from 11.9 million in July 2010 to 16.9 million in November 2011 (MSS 2010; MSIT 2014a). In return, the government reduced the number of registered beneficiary individuals among the existing beneficiary households (likely by removing some "ghost" household members from the ration cards), although to a much lower extent. The total number of individual beneficiaries increased by almost 2.9 million people, from 63.4 million in July 2010 to 66.3 million in November 2011 (MSS 2010; MSIT 2014a). Hence, the beneficiary population increased by 4.6 percent in 2011, which, in fact, marks a lower annual increase than during the period 2004–2010, when the number of beneficiaries increased at an annual average rate of 8.2 percent. However, the number of household ration cards increased by only 2.4 percent annually between 2004 and 2010 (MSS 2010; MSIT 2014a). It implies that, during this period, the ration card program was expanded more rapidly among existing beneficiary households—by including additional household members—than new beneficiary households were admitted to the program. The 2011 increase in the coverage of the ration card program is not (fully) reflected in our 2011 HIECS data (CAPMAS and WFP 2011), because most of it occurred after the survey's data collection period. The econometric analysis in the next chapter therefore reflects the situation before this program expansion.

The Recent Reform of the Egyptian Food Subsidy System (June 2014 to May 2015)

Since the end of the recent revolution—marked by the adoption of a new constitution in January 2014 and the election of President Abdel Fattah El-Sisi in May 2014—Egypt's food subsidy system has undergone fundamental

FIGURE 3.3 Costs of the bread and flour subsidy program and the ration card program



Source: Authors' representation based on data from CAPMAS (2013).
Note: EGP = Egyptian pounds.
Years listed are Egyptian fiscal years. Egypt's fiscal year starts on July 1 and concludes on June 30.

changes, and further critical modifications have been announced. The reform of the food subsidy system was issued by Ministerial Decree in June 2014 and includes five key changes:[10]

First, the new subsidy system is administered through electronic smart cards, with one per household. These smart cards are needed for accessing all subsidized products—including Baladi bread. The switch from paper-based (booklet) ration cards to smart cards is expected to be completed soon, as announced in early April 2015. The costs of the new smart cards are EGP 2, of which half has to be paid by the beneficiary household.

Second, the quota-based ration card program was phased out and replaced by a voucher-based program. Each beneficiary household receives a monthly cash allotment on the smart card, which can be redeemed for any (prepackaged) quantity of the subsidized commodities. This allows beneficiaries to better align the benefits with their needs compared to the old ration card program, where each household received fixed quotas of a few subsidized food items (cooking oil, sugar, rice, and black tea). Still, the allotment amount per

10 MSIT announces modifications to the food subsidy system on its website or its Facebook page (which are the main sources for this subsection).

household depends on the number of registered household members, similar to the quotas that were granted previously. The allotted monthly amount is EGP 15 per registered person, plus EGP 7 per registered person for the month of Ramadan. Unused amounts cannot be carried over to the following month.

Third, the basket of subsidized commodities expanded substantially, and the beneficiary contribution increased considerably. Since the introduction of the new subsidy system, the specific selection of subsidized commodities has changed twice. Many of the currently subsidized commodities were already included in the expanded ration card program of the 1970s (and thereafter)—which, however, quickly became fiscally unsustainable. As of January 2015, the basket of subsidized foods includes pasta, flour, beans, lentils, milk, various white cheeses, and frozen beef, chicken, and fish, in addition to—as under the pre-June 2014 subsidy system—sugar, (several types of) cooking oil, and rice.[11] It also includes nonfood necessities such as soap, washing machine detergent, and cleanser. Several of these commodities are offered in different package sizes. At the end of 2015, MSIT stated that it intended to increase the number of subsidized commodities to 100.

When purchasing the subsidized commodities, the beneficiaries need to contribute a small cash copayment out of pocket in addition to the amount that is deducted from the smart card. This out-of-pocket copayment does not exceed 10 percent of the card deduction for all commodities and is less than 5 percent of the deduction for most commodities. The prices of the subsidized commodities—including the amount deductible from the ration card and the beneficiary copayment—remain fixed at below-free-market prices but are amended as deemed necessary by MSIT. The prices of the traditional subsidized food items went up significantly, albeit from very low levels. At the time of the implementation of the new system in June 2014, the kilogram-price (including the amount deducted from the smart card and the beneficiary copayment) for subsidized sugar increased from EGP 1.25 to EGP 4.40—or by 252 percent; for subsidized cooking oil from EGP 3 to EGP 7.35—or by 145 percent; for subsidized rice from EGP 1.5 to EGP 2.4—or by 60 percent; and for subsidized black tea from EGP 13 to EGP 15 (for the largest package size)—or by 15 percent. Hence, the subsidy amount per registered person fell by EGP 10.9 (from EGP 25.9 to EGP 15) for a household with four or fewer registered household members during a regular month.[12] This change is esti-

11 See Table A.9 in the Appendix.

12 The subsidy amount per registered person before the reform is calculated based on the allotted quotas under the old system.

mated to reduce the annual costs of the ration card program by EGP 123.9 (US$17.35) per beneficiary—or, by about 40 percent—if other conditions remain the same. The subsidy prices were raised further between June 2014 and May 2015.

Fourth, Baladi bread subsidies are no longer universal, and bread purchases are no longer unrestricted. In August 2014, MSIT announced that Baladi bread has to be purchased on smart cards (or temporarily on specific bread distribution cards until the introduction of smart cards was completed). Hence, it restricted the access to smart-card holders and thereby ended the era of universal bread subsidies in Egypt—73 years after its introduction. For each registered household member, beneficiary households receive a quota of 150 bread loaves per month. The daily purchase is restricted to a maximum of 40 loaves per registered person (with a minimum number of 5 loaves per purchase). Unused "bread points" on the smart card can be used, within the first 10 days of the following month, for purchases of other subsidized commodities. The Baladi bread price at the outlets remains fixed at EGP 0.05 per loaf. Since February 2015, the bread points can also be used for purchases of Fino bread, which was already part of the subsidy system in the 1970s and 1980s (and removed in the early 1990s). Fino bread sells at EGP 0.25 per package of 5 loaves (equivalent to the Baladi bread loaf price). The entire bread quota of 150 loaves per month can be distributed between Baladi and Fino bread as desired. In some parts of rural Egypt, the bread points can also be used for purchasing Baladi bread flour for baking bread at home. The monthly flour quota is restricted to a maximum of 10 kg per registered person.

Fifth, the bread subsidy was moved to the end of the production chain to reduce leakage—as proposed by Al-Shawarby and El-Laithy (2010), among others. Specifically, the fixed flour price for bakeries was lifted and flour purchase quotas for bakeries were removed so that bakers could purchase any amount of flour at market prices. The state covers the production costs of Baladi bread and transfers an agreed cost price, plus a profit margin per each bread loaf sold, to the baker's bank account on a daily basis. Existing regulations on Baladi bread production remain in place (e.g., 130 g per bread loaf, 1,160 loaves from one 100 kg flour bag). Specific regulations on Fino bread production have not been published as of June 2015.

Thus, these fundamental changes to the food subsidy system imply the end of the dual subsidy system of a separate bread (and flour) program and food ration program and mark a shift toward a more flexible voucher-based system with better means of government control. With the introduction of the new system, the government increased the beneficiary population, possibly to also admit households that have benefited from the Baladi bread program but were excluded from the ration card program, such as many of the poor households. The total number of active ration cards reached 18.2 million by the end of December 2014—an increase of 7.7 percent from the number of cards in November 2011. The electronic system also allows the government to easily exclude households through voiding their smart card, to remove "ghost" household members or illegitimate beneficiaries, and to add newly registered newborns. The total beneficiary population reached 70 million in December 2014—80 percent of the total population, including 6 million newly registered children born between 2006 and 2011. More recently, the government has made efforts to reduce the number of beneficiaries. For example, with the support of popular Egyptian actors, MSIT has run a campaign that encourages households with incomes high enough not to rely on subsidized foods to return their cards voluntarily. MSIT also has run awareness campaigns to educate people about the modalities of the new system, its intended purpose, and related people's rights.

This reform was implemented after the collection of the HIECS data that underlie the analysis of this study. While the empirical analysis in the following chapter reflects the situation before the 2014–2015 reform, its findings do provide important insights and lessons that may help in shaping future food assistance policies in Egypt and other countries.

Characteristics of the Egyptian Food Subsidy System (under Study)

Until June 2014, Egypt's food subsidies were issued through two separate programs—the Baladi bread and flour program and the food ration program.[13] The Baladi bread and flour subsidy was a universal subsidy, so the benefits were available to everybody (in unrestricted amounts), in principle. Baladi bread was available to all consumers at specific bread outlets for EGP 0.05 per loaf. It was distributed on a first-come, first-served basis, and there were no

13 The bread and flour program included several different types of breads in the past, including Baladi, Tabaki, Fino, and Shami breads. At the time of 2010–2011 HIECS data collection (CAPMAS and WFP 2011), the production of Tabaki bread was semi-subsidized. However, Tabaki bread made up approximately only 15 percent of the total annual production quantity of subsidized bread (ECES 2010). The production of Tabaki bread was subsidized mainly through subsidizing energy costs of Tabaki bread bakeries and providing half-subsidized Tabaki bread flour to the bakeries. Hence, the subsidy amount per loaf was much lower for Tabaki bread than Baladi bread. Tabaki bread was sold in the free market at prices of EGP 0.10 for a small loaf of 85 g (Mansour 2012)—that is, more than twice the price of Baladi bread. Because of the relatively low supply of Tabaki bread, its distribution through the free market, and the relatively low subsidy rate for Tabaki bread production, this study omits the Tabaki bread subsidy.

regulations on the maximum number of Baladi bread loaves handed out per person. However, the geographic location of the Baladi bread outlets—with a higher concentration in poor neighborhoods—may have served to some extent as a self-targeting mechanism of the Baladi bread subsidy. Further, often long queues at the outlets and perceptions of the bread as having an inferior taste and texture may have discouraged some households—for example, those with high incomes and time constraints—to regularly consuming Baladi bread.

Since maintaining a high spatial coverage of Baladi bread bakeries and outlets for supplying the local population in remote areas is costly, the government also subsidized flour for baking Baladi bread at home. Principally all consumers without restrictions could purchase subsidized Baladi bread flour directly from warehouses, usually in a 25 kg sack (at a price of EGP 0.55 per kg). With the exception of the four metropolitan governorates (Cairo, Alexandria, Port Said, and Suez), consumer warehouses for Baladi bread flour were located in all governorates until the mid-1990s (Ahmed et al. 2001). Then the government started progressively to close consumer warehouses in parts of the country with high coverage of Baladi bread bakeries and outlets, so at the time of the 2011 HIECS data collection, only households in some governorates in Upper Egypt consumed subsidized Baladi bread flour.

Unlike the Baladi bread and flour subsidies, the food subsidies under the ration card program were restricted to households with valid ration cards. Each beneficiary household received fixed-quantity quotas of highly subsidized foods that were determined based on the number of family members registered on the card. From April 2006 to May 2014, ration cardholders were eligible to purchase high quantities of specific rice, sugar, cooking oil, and black tea at very low prices (see below).

The principal goal of the food subsidy system was to ensure affordability of a basic diet for all Egyptians by controlling the price of the main staple food—(Baladi) bread—and for the needy by controlling the prices of key basic food items such as rice, sugar, and cooking oil, particularly during times of economic hardship. As discussed above, the food subsidy system is considered to have large poverty-mitigation effects. However, the food subsidy system has also long been heavily criticized for its inefficiencies (e.g., Ahmed et al. 2001; Ahmed and Bouis 2002; Alderman, von Braun, and Sakr 1982; Alderman and von Braun 1984; Al-Shawarby and El-Laithy 2010; Löfgren and El-Said 2001; Kennedy and Alderman 1987).

From a national food security perspective, the main problem with the Baladi bread and flour program was the vast diversion away from intended uses, including waste throughout the supply chain (in storage, transportation, processing, and marketing) and within households (using bread as animal or fish feed and selling flour and bread on the black market) (Coelli 2010; ECES 2010; Al-Shawarby and El-Laithy 2010). The main problem with the food ration program was the poor targeting of the people in need (Ghoneim 2013; Al-Shawarby and El-Laithy 2010). Using data from 2008/2009, Al-Shawarby and El-Laithy (2010) estimate that up to 73 percent of the food subsidy costs could be saved by eliminating leakages and narrowing the coverage.

The coverage of Egypt's subsidy system has indeed been broad. Our 2011 HIECS data (CAPMAS and WFP 2011) suggest that 84.1 percent of all Egyptian households consumed Baladi bread, flour, or both over a 15-day recall period, while 75.0 percent purchased only Baladi bread, 3.7 percent purchased only Baladi flour, and 5.5 percent purchased both Baladi bread and flour.[14] Among poor households, 90.4 percent consumed Baladi bread or Baladi flour or both, compared to 82.7 percent among the non-poor households. Thus, the effectiveness of the self-targeting mechanisms appears to have been rather low, and the program seems to have even excluded some of the needy population, given that 9.7 percent of the poor seem to have had no access to the subsidized bread or flour. According to our 2011 HIECS data (CAPMAS and WFP 2011), 68.4 percent of all households had ration cards, and almost all of them (98.1 percent) also purchased subsidized oil, sugar, rice, or tea with the cards during the 15-day recall period between January and June 2011. The coverage estimated from the 2011 HIECS data is consistent with the coverage available from official sources, according to which 11.9 million households—an estimated 66.7 percent of all households—had ration cards in late 2010.[15] The number of ration cards considerably increased in 2011, reaching 16.9 million in November. Moreover, according to our 2011 HIECS data, 12.7 percent of all households who did not have a ration card consumed subsidized rice, sugar, cooking oil, or black tea, which they might have bought on the black market.

14 The Central Agency for Public Mobilization and Statistics (CAPMAS) of Egypt granted us access to data from 11,802 households of the 2010–2011 HIECS (CAPMAS and WFP 2011). They account for 48.7 percent of the total sample size (24,224 households), were all surveyed in the first half of 2011, and are considered to be representative (at the presented levels) by CAPMAS. Nonetheless, the (nutrition-unrelated) estimates presented in this report may slightly deviate from estimates presented in official reports consulting the full sample.

15 The percentage coverage of 66.7 percent is calculated from the number of ration cards reported by MSS (2010) (11.932 million in mid-2010), total population estimates reported by CAPMAS (2014) (79.618 million at the end of 2010), and average household size derived from our 2011 HIECS data (4.452 persons) (CAPMAS and WFP 2011).

TABLE 3.4 Allocation of food ration cards by income quintile and poverty status in Egypt

	Income quintile					Poverty status		
	Quintile 1 (poorest)	Quintile 2	Quintile 3	Quintile 4	Quintile 5 (richest)	Poor	Non-poor	Total
Households holding ration cards (%)								
Total	72.2	71.7	67.7	67.9	62.4	79.6	65.8	**68.4**
Urban	61.7	60.3	61.4	62.5	54.2	72.2	58.4	**59.9**
Rural	75.1	77.1	75.0	74.6	76.4	82.6	73.4	**75.7**
Family members registered on household ration card as proportion of actual household members (%)								
Total	90.4	101.2	114.2	127.4	166.9	98.8	124.4	**119.0**
Urban	93.8	112.4	118.2	144.3	181.9	99.3	134.2	**129.6**
Rural	89.0	95.6	106.7	117.3	149.5	98.6	116.4	**111.7**

Source: Authors' calculation based on data from CAPMAS and WFP (2011).

The ration card program suffered from a considerable misallocation of the subsidies, which primarily benefited rich urban households with ration cards (Table 3.4). According to our 2011 HIECS data, 20.4 percent of poor households had no ration cards and hence were excluded from the benefits of the program. In contrast, 65.8 percent of non-poor households had ration cards. Granted, the proportion of households with ration cards was somewhat higher overall among poorer income quintiles than richer income quintiles and among the rural population than the urban population. Nevertheless, richer households and urban households with ration cards had access to larger per capita amounts of subsidized foods because they had more family members registered on the ration card (given that the quotas are allocated based on the number of registered persons). In fact, among the middle- and higher-income quintiles in both urban and rural areas, there were more family members registered on the household ration cards than actually lived in the households. This illegitimacy is higher among higher-income households. Accordingly, urban households in the highest income quintile with ration cards are eligible for food rations (at full-subsidy rates) that amount, on average, to more than 180 percent of the actual legitimate quotas. On the contrary, not all members of urban households in the lowest income quintile and of rural households in the two lowest income quintiles with ration cards are registered. This misallocation likely resulted from a lack of oversight and enforcement of eligibility criteria such that, for example, young adults who left their parental households, as well as persons who died, stayed on the households' ration cards. Also, households may have been deliberately engaged in overreporting of household members.

Dietary Incentives and Nutritional Implications of the Egyptian Food Subsidy System

Since the introduction of the ration card program in 1945, the food items that have been continuously subsidized at high rates are sugar and cooking oil, in addition to (Baladi) bread. White rice and bread flour in rural areas have been subsidized since the 1970s. All these foods are rich sources of carbohydrates. Until May 2014, micronutrient-rich foods were rarely subsidized in Egypt, with the exception of pulses, meats, and fish in the 1970s and pulses occasionally thereafter. Vitamin-rich vegetables and fruits, however, were never subsidized. Hence, it has been argued that the (old) food subsidy system incentivized beneficiaries to consume an unhealthy diet that is too rich in calories and insufficient in micronutrients and therewith contributed to today's high prevalence of overweight/obesity, micronutrient deficiencies, and related NCDs (Asfaw 2006, 2007a, 2007b; Austin, Hill, and Fawzi 2013; Galal 2002; Kilpi et al. 2013; Musaiger 2011; Thow et al. 2010). Given that micronutrient deficiencies and inadequate child feeding practices are among the main causes of child stunting (Branca and Ferrari 2002; Rivera et al. 2003; Walker et al. 2007), the food subsidy system may have also contributed to the high and growing prevalence of child stunting, as the food subsidy system was gradually expanded in the 2000s. Hence, the food subsidy system may be a driver of both the double burden of malnutrition and the growth-nutrition disconnect.

The potential direct effects of the food subsidy system on malnutrition may occur through two interlinked dietary effects. Both effects emerge from the system's market intervention for lowering the prices of calorie-rich and micronutrient-poor/empty foods such as bread (and bread flour), cooking oil, sugar, and rice.

The first effect is that both the Baladi bread and flour program and the food ration program lowered the costs of becoming overweight/obese through incentivizing overconsumption of cheap, calorie-rich foods. The price of Baladi bread has been fixed at EGP 0.05 since 1989. Hence, in real terms, the Baladi bread price has declined substantially over time. In 2011, the Baladi bread price was below 20 percent of the 1989 price (taking the reduction of loaf size from 160 g to 130 g in 1990 into account). While the price of Baladi bread in 1990 was 3.2 US cents per loaf, it was only 0.8 US cents per loaf in 2011. The foods on the ration card have been highly subsidized, too. Our estimates based on the 2011 HIECS data (CAPMAS and WFP 2011) suggest

TABLE 3.5 **Monthly quotas and prices of foods subsidized under the ration card program in Egypt**

	Cooking oil	Sugar	Black tea	Rice
Quota per registered person (kg)	0.50	1.00	0.05	n.a.
Additional quota per registered person (kg), with maximum allowance of 4 persons	1.00	1.00	n.a.	2.00
Subsidy price (EGP/kg)	3.00	1.25	13.00	1.50
Average market price (EGP/kg)	8.00	5.50	31.25	3.50
Average subsidy rate (%)	62.5	77.3	58.4	57.1

Source: Authors' presentation based on data from MSS (2012) and CAPMAS and WFP (2011).

Note: EGP = Egyptian pound; kg = kilogram; n.a. = not applicable.

The average market price is the median price reported for market purchases in our 2011 HIECS data (CAPMAS and WFP 2011). The true market price of the subsidized foods may be slightly lower because of the lower quality of the subsidized foods compared to the respective free-market foods.

that the average subsidy amount accounted for 57 percent to 77 percent of the free-market price, with sugar having the highest subsidy rate (Table 3.5).

From a nutrition point of view, the quotas for the subsidized foods were too high when compared to common recommendations for healthy diets. For example, an average four-person household with all members registered for food rations was eligible to receive 6 kg of cooking oil, 8 kg of sugar, and 8 kg of rice per month (Table 3.5) as well as 3.1 loaves of Baladi bread (weighing 130 g) per person per day (according to official 2011 production guidelines for supplying the entire population; MSIT 2014c). If the household fully utilized these quotas, the subsidized foods provided the household with about 1,960 kcal per capita per day. This calorie allotment exceeds the minimum requirements of the average Egyptian four-person household by 6.4 percentage points if its members have low physical activity levels (the allotment equals 87.7 percent of the minimum requirements if household members have moderate physical activity levels). Of these calories, about 1,250 kcal (68.1 percent) come from the subsidized cereals (Baladi bread and rice), about 440 kcal (24.1 percent) from cooking oil (which admittedly may not be all ingested when used for frying), and about 260 kcal (13.4 percent) from sugar (in addition to the consumption of other sugary products such as soft drinks, sweets, honey, and dried fruits). Such cheap calories may incentivize overconsumption and give rise to weight gains, as explained in the next subsection in detail.

Our 2011 HIECS data also suggest that the subsidized food quantities at least met—or even exceeded—the demand of the vast majority of the beneficiary households in the ration card program. Only 7.7 percent of the beneficiary households who consumed subsidized cooking oil purchased additional quantities of free-market cooking oil. For sugar and rice, 9.6 percent and 22.6 percent, respectively, of households receiving subsidized quotas of these goods purchased additional quantities on the free market. This holds even though the quality of the subsidized products is considered to be inferior compared to the nonsubsidized substitutes sold in the free market and despite the fact that not all household members are registered on the ration card in 27.7 percent of all beneficiary households.

The second effect emerges from consumer preferences for foods based on relative prices and substitution of foods in response to relative price changes. Through subsidizing only calorie-rich and micronutrient-poor/empty foods, Egypt's old food subsidy system lowered the costs to a household of a low-diversified, unbalanced diet relative to a diversified diet that is well balanced over food groups and provides essential micronutrients in sufficient amounts. As the prices of the subsidized foods were fixed, and the prices of free-market foods increased particularly rapidly during economic crises, the resulting loss in real incomes encouraged households to shift their diet toward more calorie-rich and micronutrient-poor foods. As food prices in the free market stay high, households tend to stick to unbalanced diets, increasing the risk of micronutrient deficiencies. The underlying consumer behavior is explained in the next subsection.

Persistent large cost differences between micronutrient-rich and micronutrient-poor diets may entail permanent changes in consumer food preferences. Unlike a lack of dietary energy, micronutrient deficiencies do not create a feeling of hunger, and mild deficiencies show no obvious symptoms, so micronutrient deficiencies are often not detected by the individual or family members. With growing income, households may allocate only small shares of the additional budget to diversify their diet and may use most of it for increasing consumption of foods with low nutritive value but high consumer satisfaction, such as fast food and soft drinks (or for satisfying nonfood needs). The food consumption patterns of households with young children in Egypt are explored in the last subsection.

For Egypt, Asfaw (2007b) finds that the odds of being overweight are 80.8 percent higher for micronutrient-deficient mothers than for non-deficient mothers (keeping all other variables constant). In addition, data on child feeding practices from the 2005 and 2008 DHS confirm that many young Egyptian children receive an inadequate diet and that diets have worsened (MOH, El-Zanaty and Associates, and Macro International 2008; MOHP, NPC, and ORC Macro 2000; MOHP et al. 2003; MOHP et al. 2005). In 2008, only 40.6 percent of nonbreastfed children in the age group

6–23 months and 27.8 percent of children in the same age group who had ever been breastfed consumed fruits or vegetables rich in vitamin A during the 24 hours prior to the survey, compared to 48.4 percent and 37.0 percent in 2005 (El-Zanaty and Way 2006, 2009). In contrast, sugary food was given to 55.8 percent of the nonbreastfed children and 41.6 percent of the breastfed children in 2008, and to 39.6 percent and 26.5 percent of nonbreastfed and breastfed children, respectively, in 2005.

Indeed, the prevalence of micronutrient malnutrition is high in Egypt and has increased. For example, anemia, which is predominantly caused by dietary iron deficiency in Egypt (as malaria—the other main cause of anemia globally—is not prevalent), increased considerably in the first half decade of the 2000s. Egypt showed prevalence rates among preschool children that mark anemia as a severe public health problem according to international standards set by the World Health Organization (WHO). The 2005 DHS data suggest that 39.6 percent of all nonpregnant women 20–49 years of age and even 48.6 percent of all children ages 6–59 months are anemic.[16]

The Mechanism of Food Subsidy Effects on Nutrition in Egypt

Consumer theory offers an explanation for the mechanism through which the Egyptian food subsidy system potentially affects beneficiaries' nutrition. It suggests that food subsidies influence consumers' food choice through two separable effects of price changes—income and substitution effects (Timmer, Falcon, and Pearson 1983). First, the reduction in the prices of subsidized foods causes real purchasing power to increase when household incomes stay constant. This increase in real incomes will cause consumption of most commodities—including food—to increase (with the exception of inferior goods). Second, even if the increase in real incomes were to be offset by real income losses due, for example, to food price shocks, the change in relative prices would still cause consumers to adjust the composition of their commodity bundle toward higher consumption of the foods that have become relatively cheaper if consumers' demand for these foods is not fully satisfied. In a country with food subsidies, this means an increased consumption of subsidized foods (if subsidy quotas allow) if other conditions remain the same.

16 The latest available data that are nationally representative are from the DHS in 2005 (MOH, El-Zanaty and Associates, and Macro International 2008; MOHP, NPC, and ORC Macro 2000; MOHP et al. 2003; MOHP et al. 2005). For anemia prevalence rates, see Table A.10 in the Appendix. The calculated annual increases between 2000 and 2005 in the prevalence rates among nonpregnant women of 2.4 percentage points and among children of 3.7 percentage points appear to be too high, however, and therefore may leave some doubts about the accuracy of the anemia measurements in the 2000 DHS, 2005 DHS, or both.

The choice of the commodity bundle for consumption is constrained by household income—and thus by household ability to compensate food price shocks. According to consumer theory, a consumer chooses the composition of the bundle of food and nonfood commodities so as to maximize her total consumption utility subject to a budget constraint or so as to minimize her expenditures to achieve a certain level of consumption utility, assuming given commodity prices.

For the effects of food subsidies on household diets, substitution effects are of particular relevance when households experience—during food price crises, for example—real income losses and large price differences between subsidized and nonsubsidized foods. More specifically, when foods are normal (non-inferior) goods and food budget shares and prices are constant, applying food subsidies already incentivizes increased consumption of the subsidized foods by reducing their prices. The (positive) substitution effect resulting from the relative price changes reinforces the (positive) income effect resulting from reducing the costs of the consumption basket. Further, if now prices of only nonsubsidized foods increase, they become even more expensive than the subsidized foods. As a result, consumers have an incentive to substitute nonsubsidized foods with similar (but probably less preferred) subsidized foods: for example, consumers may substitute subsidized Baladi bread and rice (if subsidy quotas allow) for pasta and nonsubsidized types of rice. Yet, the (negative) income effect resulting from the increase in prices of nonsubsidized foods forces budget-constrained consumers to switch consumption to a commodity bundle that provides them with less utility. Rational consumers will choose the composition of this new commodity bundle so as to maximize total consumption utility. Regarding food consumption, this may entail reduced consumption of or abstention from some food items. Consumers tend to first reduce or relinquish the consumption of relatively superior foods such as animal-source products. For foods with price-elastic demand, consumers will over-proportionately reduce consumption in response to the price increase. They may use the resulting gain in real incomes for increasing consumption of cheaper—possibly subsidized—foods of another type, yielding an additional substitution effect. For example, Kavle et al. (2015a) argue that the increase in the consumption of sugary foods among children in Lower Egypt between 2005 and 2008 may have been the result of substituting these foods primarily for meat and fish in the course of the 2006 avian influenza outbreak and the following food and fuel price crisis. Increasing food subsidies may compensate for negative income effects resulting from price increases of nonsubsidized foods, but they do not prevent substitution effects to occur—instead they amplify them. Ramadan and Thomas (2011) find that a reduction in the price of subsidized sugar by 1 percent would increase sugar consumption by 0.12 percent and reduce meat and fish consumption by 0.39 percent.[17]

Given that these principles of consumer theory hold, the kinds of foods that are subsidized and hence their content of absorbable nutrients relative to that of nonsubsidized foods matter for the nutritional effects of food subsidies. As discussed above, Egypt's past food subsidy system provided subsidies only for foods that are dense in carbohydrates or fats and scarce/empty in absorbable micronutrients, which incentivizes overconsumption of cheap calories and unbalanced diets. Certainly, individual household preferences determine which foods will be included in household diets and thereby may alter the food subsidy effects at the household level. Moreover, the intrahousehold distribution of the available food affects the nutritional status of household members.

Ultimately, it is the nutrient intake relative to individual physiological requirements that determines individual nutritional outcomes. For adequate nutrition, the consumption of those nutrients that a person (most) lacks is decisive, while the overconsumption of some (macro)nutrients has adverse nutrition and health consequences. For example, low child HAZ and child stunting is often caused by insufficient consumption of absorbable micronutrients, especially zinc (Brown, Wuehler, and Peerson 2001; IZiNCG 2004), which are available in meat and fish, legumes, and some vegetables in high amounts and readily absorbable forms. Excess consumption of carbohydrates and fats—cheaply available from the subsidized foods—does not improve child growth but causes unhealthy weight gains and increases the risk of overweight/obesity and related NCDs in children and adults. Using a simple reduced-form regression model and data from the 1997 EIHS, Asfaw (2006) finds that a 1 percent decrease in the price of Baladi bread is associated with an increase in the average BMI of Egyptian mothers by 0.12 percent if other conditions remain the same. A 1 percent decrease in the price of subsidized sugar is associated with a 0.16 percent increase in mothers' BMI, whereas a 1 percent decrease in the price of fruits is associated with a 0.12 percent decrease in mothers' BMI (Asfaw 2006). Although the econometric model underlying these estimates does not permit causal interpretation of the relationship between food subsidies and nutritional outcomes, the results are

17 Ramadan and Thomas (2011) use a mixed demand model estimation based on data from the Egyptian Integrated Household Survey (EIHS) in 1997, when ration card quotas for sugar were smaller and prices of subsidized sugar higher than in 2011.

consistent with findings from developed countries, which show that high body weight and the prevalence of overweight/obesity are associated with low-priced calorie-rich foods (e.g., Bleich et al. 2008; Chou, Grossman, and Saffer 2004; Duffey et al. 2010).

Evidence on the causal effects of food subsidies on nutrient consumption and nutritional outcomes is very limited for developing countries and so far is missing for Egypt. Notable exceptions are Jensen and Miller (2011), who analyze the effects of a randomized program of staple food subsidies in China, and Kochar (2005) and Tarozzi (2005), who analyze the effects of India's food subsidy program. Unlike in Egypt, overconsumption of calories does not appear to be a considerable problem for the sample populations of all three studies; on the contrary, shortages of calorie-rich foods might have been a common threat to household food security for these studies' sample populations.

For poor households in two provinces of China, Jensen and Miller (2011), using experimental data they collected in 2006, find no positive and statistically significant effects of wheat and rice subsidies on the consumption of calories, protein, minerals, and vitamins. In fact, the wheat and rice subsidies may have had adverse nutritional effects for some households. The elasticity estimates are negative for all nutrients, though they are very small and statistically insignificant. Kochar (2005) finds that wheat and rice subsidies provided through the Indian Public Distribution System (PDS) had a statistically significant but quite small positive effect on household calorie consumption in rural areas of major PDS-beneficiary states in central and northern India between 1993 and 1999–2000. The estimated elasticity is 0.07. Tarozzi (2005) finds no statistically significant effect of rice subsidies on children's weight (relative to their age) in Andhra Pradesh, using health survey data from 1992–1993. However, as Kochar (2005) shows, the limited effect of India's food subsidy program is primarily due to low household take-up rates and low purchases of subsidized foods among these households. In Egypt, by contrast, the household take-up rate of the Baladi bread and flour program is high, and the household take-up rate of the ration card program is almost total, as shown above.

Food Consumption of Subsidized and Nonsubsidized Foods in Egyptian Families

Food consumption patterns provide an indication of the composition of household diets and therefore household preferences for more or less nutritious foods. The food expenditure and consumption section of the 2010–2011 HIECS (CAPMAS and WFP 2011) reports household expenditures for almost 300 food items—including subsidized foods and their nonsubsidized substitutes—consumed over a period of 15 days.[18] These HIECS data allow for calculating average food budget shares and estimating Engel curves, which describe how food expenditures change with increasing household incomes. Because this study is concerned with malnutrition among young children and their mothers, the samples that underlie the food budget shares and Engel curves presented in the following include only households in our 2011 HIECS dataset with children ages 6–59 months—referred to as "families." The analysis is conducted for urban and rural areas separately, given that there are substantial urban-rural differences in people's living conditions and food sourcing and the design and coverage of the food subsidy programs. The samples are identical to the household sample datasets that are used in the main empirical analysis presented in the next chapter.[19]

Food consumption patterns suggest that urban families spend on average significantly higher per capita amounts—but lower shares of their incomes—on food than do rural families (Table 3.6). Except in the case of subsidized foods, urban-rural differences in (absolute) food expenditures are partly due to differences in food prices, which are higher in urban areas than in rural areas, as the HIECS data suggest. Despite their higher absolute expenditure on food, urban families allocate on average 38.7 percent of their household income to food consumption, compared to 42.4 percent for rural families. Also, the variation in food budget shares among urban families is about twice as high as that among rural families. Urban and rural families devote the largest shares of their food budgets to the consumption of meat and fish. Meat and fish consumption accounts for more than 30 percent of both urban and rural food budgets, on average. Urban and rural families devote much lower food budget shares to the consumption of cereals (13.0 percent and 16.0 percent, respectively) and vegetables (around 12 percent for both urban and rural families). Among the considered food groups, the largest differences in food budget shares between urban and rural families exist for cereal consumption and the consumption of milk and dairy products. Urban families use considerably lower shares of their food budgets for the consumption

18 For foods households produce themselves and for food gifts, the 2010–2011 HIECS reports interviewees' estimated values. It also provides data on consumed quantities but only for some food items that are usually nonprocessed. Quantities are unavailable for 19.9 percent of all consumed food items in our 2011 HIECS dataset (CAPMAS and WFP 2011), which includes basic food items such as all types of bread and baked products, milk, and several other animal-source foods. Therefore, reliable, quantity-based food consumption patterns cannot be produced.

19 See the "Survey Data and Estimation Variables" subsection in the next chapter.

of cereals (by 3.0 percentage points) and higher shares for the consumption of milk and dairy products (by 3.4 percentage points). Compared to rural families, urban families also devote slightly larger shares of their food budgets to the consumption of meat and fish (by 0.7 percentage points) but slightly smaller shares to the consumption of vegetables (by 0.8 percentage points) and edible fats and oils (by 0.6 percentage points). Urban and rural families devote similar shares of their budgets to the consumption of sugars (3.7 percent) and legumes (1.8–1.9 percent).

Given that the prices of subsidized foods are identical in urban and rural areas, the food consumption patterns imply that urban and rural families consume similar per capita quantities, on average, of Baladi bread, flour, or both (Table 3.6). Urban families with ration cards consume significantly more of the foods that are subsidized under the ration card program than do rural families with ration cards. This is consistent with our finding that the per capita quotas are higher among urban ration cardholders (Table 3.4). To be specific, urban families with ration cards consume somewhat more subsidized rice and cooking oil and less subsidized sugar than rural families with ration cards. The lower consumption of subsidized sugar among urban families with ration cards might reflect their preferences for nonsubsidized, more refined sugar, because the average per capita consumption among urban families is higher than that among rural families (and sugar prices show no significant difference).

The subsidized foods make up large shares in food group expenditures (Table 3.6). Their shares in food group consumption if measured in food quantities or calories can be expected to be still larger. Consumers of subsidized foods would be making considerably higher expenditures for purchasing the same quantities or calorie amounts of these foods if there were no subsidies. In expenditure terms, Baladi bread and flour make up around 24 percent of the cereal consumption in urban and rural families, on average. Rice accounts for 32.7 percent of cereal consumption in urban families, and 29.7 percent in rural families. Among ration cardholders, most of the rice is subsidized rice, while the share of subsidized rice is higher in urban families than in rural families (by 4.3 percentage points). Most sugar and vegetable oil consumed by families with ration cards is subsidized. Subsidized sugar makes up around 72 percent of the sugar expenditure in both urban and rural areas, and subsidized cooking oil makes up 82.4 percent and 91.5 percent of vegetable oil expenditures in urban and rural areas, respectively. The share of subsidized cooking oil in all edible fats and oils consumed is significantly higher among urban families with ration cards than among rural families with ration cards (36.9 percent and 30.9 percent, respectively). Taken together,

TABLE 3.6 Per capita income and food consumption in urban and rural Egyptian families

	Urban		Rural		Difference (t-test)		
	Mean	Std. dev.	Mean	Std. dev.	Mean[c]		Std. err.
Income (EGP)	**230.3**	**166.7**	**172.2**	**81.0**	**58.1**	***	**5.29**
Food consumption (EGP)	**82.6**	**45.5**	**68.7**	**23.8**	**13.9**	***	**1.46**
Share of income (%)	38.7	10.7	42.4	10.5	–3.7	***	0.40
Cereals (EGP)	10.1	5.3	10.8	5.0	–0.7	***	0.19
Share of food consumption (%)	13.0	4.8	16.0	5.5	–3.0	***	0.19
Baladi bread & flour (EGP)	1.9	1.3	1.9	1.4	0.0		0.05
Share of cereal consumption (%)	24.0	18.7	24.1	21.5	–0.1		0.74
Rice (EGP)	3.3	2.5	3.5	3.3	–0.2	**	0.11
Share of cereal consumption (%)	32.7	17.6	29.7	19.5	3.0	***	0.69
Subsidized rice (EGP)[a]	0.9	0.7	0.7	0.7	0.2	***	0.04
Share of rice consumption (%)	59.0	44.9	54.7	45.6	4.3	*	2.50
Vegetables (EGP)	9.0	4.3	8.4	3.6	0.6	***	0.15
Share of food consumption (%)	11.7	4.1	12.4	3.8	–0.8	***	0.15
Legumes (EGP)	1.3	1.5	1.2	1.2	0.1	*	0.05
Share of food consumption (%)	1.8	2.0	1.9	1.8	–0.1		0.07
Meat & fish (EGP)	27.4	18.2	21.9	9.5	5.4	***	0.58
Share of food consumption (%)	32.5	8.5	31.8	7.9	0.7	**	0.31
Milk & dairy products (EGP)	10.2	8.6	5.8	4.2	4.4	***	0.27
Share of food consumption (%)	11.5	6.0	8.1	4.4	3.4	***	0.20
Sugars (EGP)[b]	3.0	2.3	2.5	2.0	0.5	***	0.08
Share of food consumption (%)	3.7	2.4	3.7	2.6	0.0		0.09
Sugar (EGP)	2.5	1.8	2.2	1.8	0.3	***	0.07
Share of sugars consumption (%)	87.4	20.4	87.2	20.0	0.2		0.76
Subsidized sugar (EGP)[a]	0.8	0.4	0.9	0.4	–0.1	***	0.02
Share of sugar consumption (%)	71.9	34.4	72.6	32.1	–0.8		1.87
Edible fats & oils (EGP)	6.0	3.7	5.5	3.1	0.5	***	0.13
Share of food consumption (%)	7.5	3.4	8.1	3.7	–0.6	***	0.13
Vegetable oils (EGP)	3.2	2.4	2.0	1.5	1.2	***	0.08
Share of fats & oils consumption (%)	54.5	23.3	41.1	24.5	13.4	***	0.89
Subsidized cooking oil (EGP)[a]	1.3	0.7	1.2	0.6	0.1	**	0.04
Share of vegetable oils consumption (%)	82.4	31.9	91.5	23.0	–9.2	***	1.64

(continued)

FIGURE 3.6 **Per capita income and food consumption in urban and rural Egyptian families, 2011 (continued)**

	Urban		Rural		Difference (t-test)		
	Mean	Std. dev.	Mean	Std. dev.	Mean[c]		Std. err.
Rice, sugar, vegetable oils (EGP)	9.0	4.9	7.7	4.7	1.3	***	0.18
Share of food consumption (%)	11.5	5.2	11.0	5.4	0.4	**	0.20
Subsidized rice, sugar, cooking oil (EGP)[a]	2.9	1.4	2.7	1.1	0.2	**	0.07
Share of rice, sugar, oil consumption (%)	64.9	34.4	63.1	34.0	1.8		1.90

Source: Authors' calculation based on data from CAPMAS and WFP (2011).

Note: EGP = Egyptian pound.

The full urban and rural samples include 1,130 and 1,911 households, respectively. Reported per capita income and consumption expenditures refer to a time period of 15 days.

[a] The values refer to ration cardholders. The urban and rural sample includes 453 and 1,171 households, respectively.

[b] Sugars include sugar, honey, and molasses.

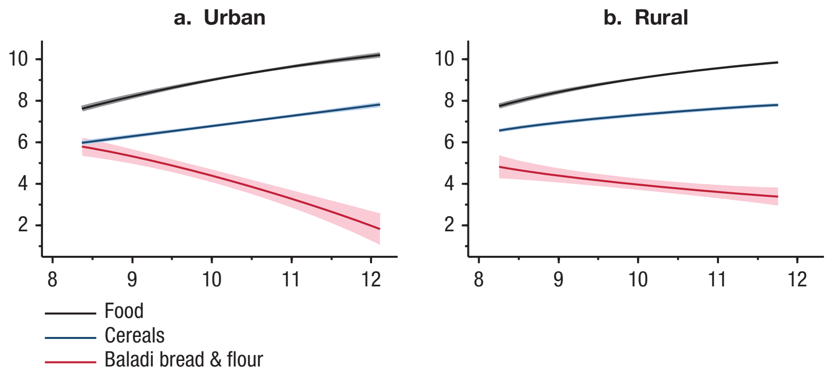
[c] ***, **, * Mean difference is statistically significant at the 1 percent, 5 percent, and 10 percent level, respectively. The t-tests are performed by accounting for unequal variances in the urban and rural samples.

the consumption of subsidized foods under the ration card program is significantly higher in absolute terms among urban beneficiary families than rural beneficiary families, while the share of subsidized rice, sugar, and cooking oil in the consumption of all rice, sugar, and vegetable oil is not significantly different between urban and rural beneficiary families.

Food consumption patterns change with increasing household incomes, because consumers make their food choices subject to budget constraints. Hence, food consumption differences between poor and non-poor Egyptians are likely. Egypt's food subsidy system has been deemed to be self-targeted to the poor—especially in urban areas—through subsidizing foods that are inferior goods (e.g., Adams 2000; Ali and Adams 1996; Al-Shawarby and El-Laithy 2010). Consumer theory suggests that inferior goods are consumed more (in both relative and absolute terms) by low-income than high-income households. Accordingly, it is believed that the Egyptian food subsidy system achieves inferiority through subsidizing only basic foods and product differentiation of the subsidized foods. Engel curves provide evidence on the validity of this assumption and on how much households spend on particular foods at different income levels.

Engel curves estimated based on the 2011 HIECS data (CAPMAS and WFP 2011) suggest that only Baladi bread (and flour) is an inferior food among families in both urban and rural areas. The per capita expenditures

FIGURE 3.4 **Engel curves for total food consumption, consumption of cereals, and consumption of Baladi bread and flour in Egyptian families**



Source: Authors' estimation based on data from CAPMAS and WFP (2011).

Note: Household income and expenditure values are expressed on a per capita basis, refer to a period of 15 days, are reported in Egyptian piasters, and are transformed into logarithms. The y-axis indicates household expenditure levels (in logarithms), and the x-axis indicates household income levels (in logarithms).

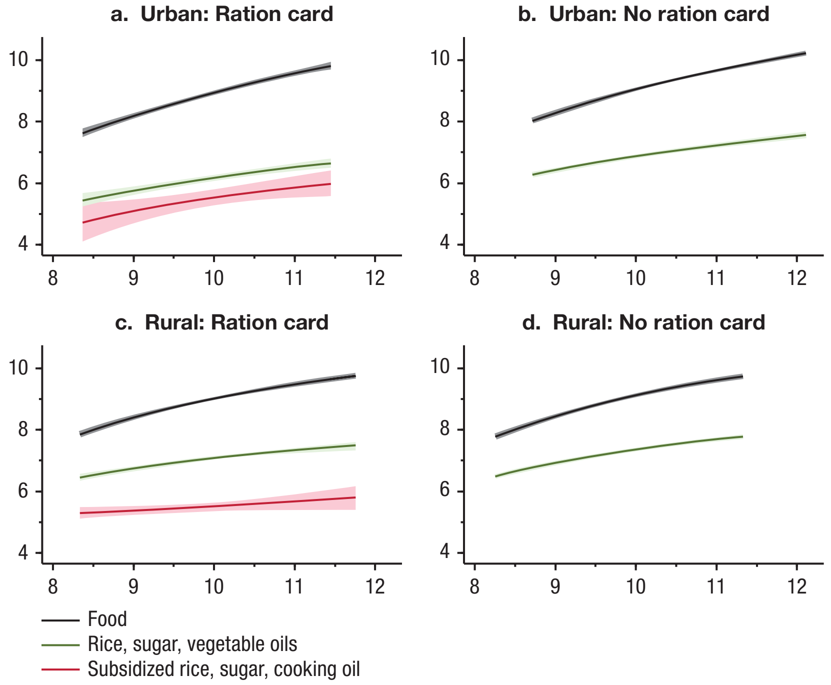
The Engel curves are estimated using fractional polynomial regressions of degree 1 and a robust estimator of variance. To control for possible spatial and temporal price differences, the regressions include binary variables indicating household location by governorate (aggregate) and the survey month. The presented curves connect the predicted expenditure values for reported household incomes (controlling for spatial and temporal price differences). The shaded areas around the curves mark the 95 percent confidence interval.

The urban and rural samples include 1,130 and 1,911 households, respectively. In the urban sample, the R-squared—indicating the overall statistical fit of the estimated regression model—is 0.689 for total food consumption, 0.407 for cereal consumption, and 0.104 for Baladi bread and flour consumption. In the rural sample, the R-squared is 0.626, 0.373, and 0.099, respectively.

for Baladi bread and flour are significantly lower among high-income families than low-income families, especially in urban areas (Figure 3.4). In contrast, the per capita expenditures for all food items subsidized under the ration card program are significantly higher among high-income beneficiary families than low-income beneficiary families in both urban and rural areas (Figure 3.5). Looking at the ration card foods separately, the per capita expenditures for subsidized rice and cooking oil are significantly higher, in urban areas, among high-income families with ration cards than among low-income families with ration cards (Figure 3.6, Figure 3.7, and Figure 3.8). Per capita expenditures also tend to be higher among high-income beneficiary families for subsidized rice and cooking oil in rural areas and subsidized sugar in urban and rural areas, although the regression coefficient of the income variable is statistically insignificant at the 10 percent level (Figures 3.6–3.8). Thus, the estimated Engel curves do not support the assumption of inferiority of any food

(text continued on page 78)

FIGURE 3.5 Engel curves for total food consumption; consumption of rice, sugar, and vegetable oils; and consumption of subsidized rice, sugar, and cooking oil in Egyptian families



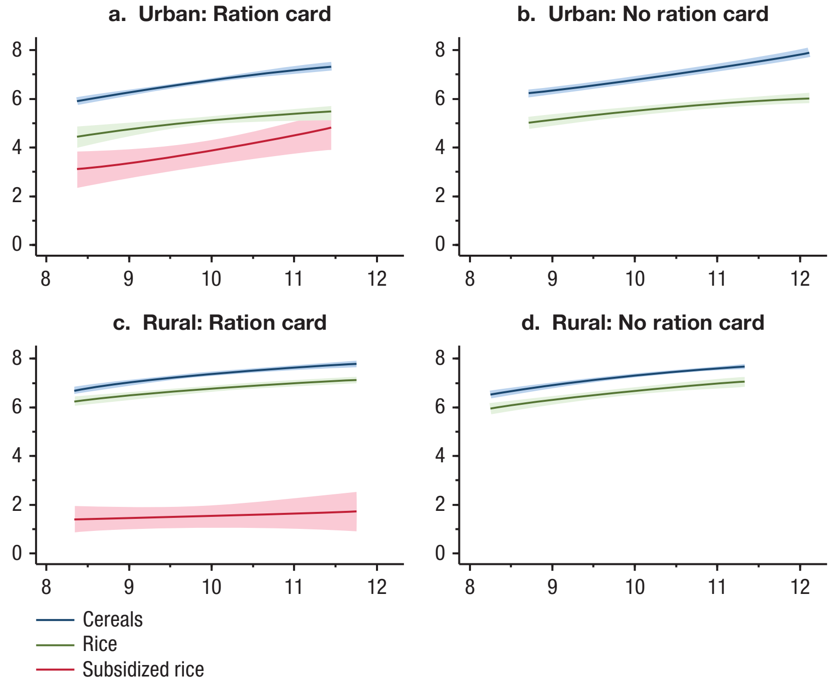
Source: Authors' estimation based on data from CAPMAS and WFP (2011).

Note: Household income and expenditure values are expressed on a per capita basis, refer to a period of 15 days, are reported in Egyptian piasters, and are transformed into logarithms. The y-axis indicates household expenditure levels (in logarithms), and the x-axis indicates household income levels (in logarithms).

The Engel curves are estimated using fractional polynomial regressions of degree 1 and a robust estimator of variance. To control for possible spatial and temporal price differences, the regressions include binary variables indicating household location by governorate (aggregate) and the survey month. The presented curves connect the predicted expenditure values for reported household incomes (controlling for spatial and temporal price differences). The shaded areas around the curves mark the 95 percent confidence interval.

The urban and rural samples of ration cardholders include 453 and 1,171 households, respectively. The urban and rural samples of non-cardholders include 677 and 740 households, respectively. In the urban sample of ration cardholders, the R-squared is 0.644 for total food consumption; 0.426 for consumption of rice, sugar, and vegetable oil; and 0.076 for consumption of subsidized rice, sugar, and cooking oil. In the urban sample of non-cardholders, the R-squared is 0.705 for total food consumption and 0.340 for consumption of rice, sugar, and vegetable oil. In the rural sample of ration cardholders, the R-squared is 0.610, 0.609, and 0.059, respectively. In the rural sample of non-cardholders, the R-squared is 0.658 and 0.487, respectively.

FIGURE 3.6 Engel curves for consumption of cereals, rice, and subsidized rice in Egyptian families



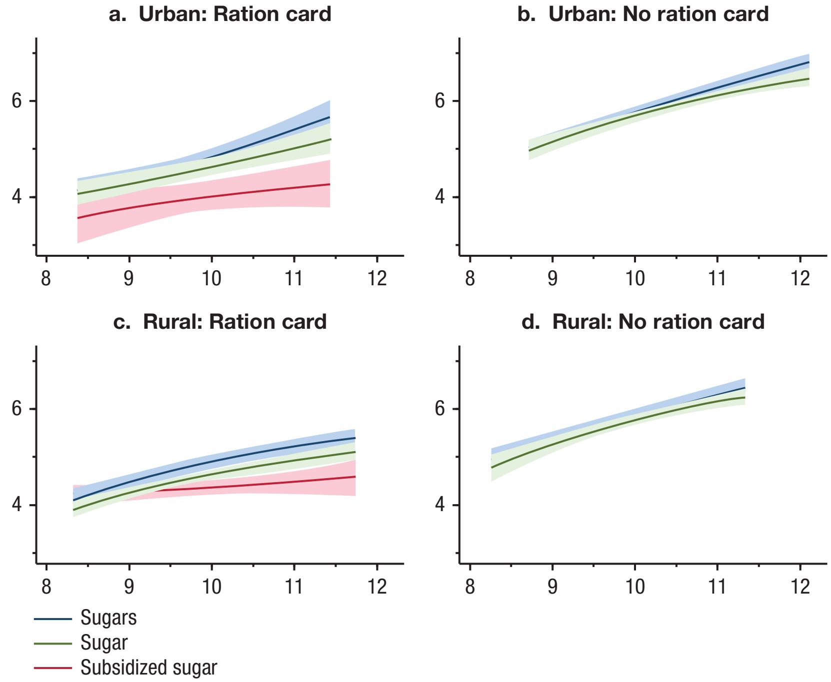
Source: Authors' estimation based on data from CAPMAS and WFP (2011).

Note: Household income and expenditure values are expressed on a per capita basis, refer to a period of 15 days, are reported in Egyptian piasters, and are transformed into logarithms. The y-axis indicates household expenditure levels (in logarithms), and the x-axis indicates household income levels (in logarithms).

The Engel curves are estimated using fractional polynomial regressions of degree 1 and a robust estimator of variance. To control for possible spatial and temporal price differences, the regressions include binary variables indicating household location by governorate (aggregate) and the survey month. The presented curves connect the predicted expenditure values for reported household incomes (controlling for spatial and temporal price differences). The shaded areas around the curves mark the 95 percent confidence interval.

The urban and rural samples of ration cardholders include 453 and 1,171 households, respectively. The urban and rural samples of non-cardholders include 677 and 740 households, respectively. In the urban sample of ration cardholders, the R-squared is 0.421 for cereal consumption, 0.518 for rice consumption, and 0.145 for subsidized rice consumption. In the urban sample of non-cardholders, the R-squared is 0.406 for cereal consumption and 0.512 for rice consumption. In the rural sample of ration cardholders, the R-squared is 0.406, 0.705, and 0.297, respectively. In the rural sample of non-cardholders, the R-squared is 0.341 and 0.594, respectively.

FIGURE 3.7 Engel curves for consumption of sugars, sugar, and subsidized sugar in Egyptian families



Source: Authors' estimation based on data from CAPMAS and WFP (2011).

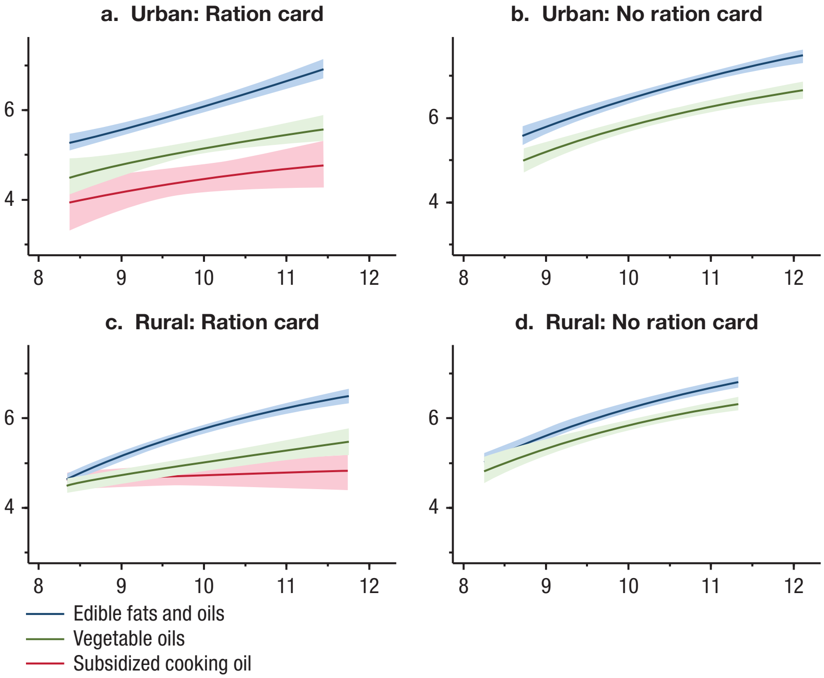
Note: Sugars include sugar, honey, and molasses.

Household income and expenditure values are expressed on a per capita basis, refer to a period of 15 days, are reported in Egyptian piasters, and are transformed into logarithms. The y-axis indicates household expenditure levels (in logarithms), and the x-axis indicates household income levels (in logarithms).

The Engel curves are estimated using fractional polynomial regressions of degree 1 and a robust estimator of variance. To control for possible spatial and temporal price differences, the regressions include binary variables indicating household location by governorate (aggregate) and the survey month. The presented curves connect the predicted expenditure values for reported household incomes (controlling for spatial and temporal price differences). The shaded areas around the curves mark the 95 percent confidence interval.

The urban and rural samples of ration cardholders include 453 and 1,171 households, respectively. The urban and rural samples of non-cardholders include 677 and 740 households, respectively. In the urban sample of ration cardholders, the R-squared is 0.156 for consumption of sugars, 0.149 for sugar consumption, and 0.055 for subsidized sugar consumption. In the urban sample of non-cardholders, the R-squared is 0.235 for consumption of sugars and 0.197 for sugar consumption. In the rural sample of ration cardholders, the R-squared is 0.143, 0.226, and 0.041, respectively. In the rural sample of non-cardholders, the R-squared is 0.148 and 0.149, respectively.

FIGURE 3.8 Engel curves for consumption of edible fats and oils, vegetable oils, and subsidized cooking oil in Egyptian families



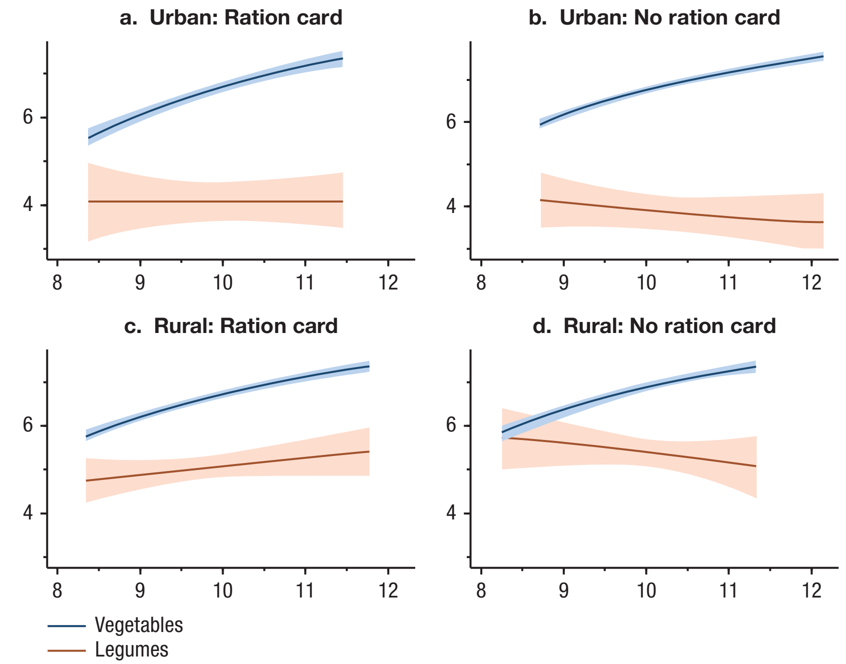
Source: Authors' estimation based on data from CAPMAS and WFP (2011).

Note: Household income and expenditure values are expressed on a per capita basis, refer to a period of 15 days, are reported in Egyptian piasters, and are transformed into logarithms. The y-axis indicates household expenditure levels (in logarithms), and the x-axis indicates household income levels (in logarithms).

The Engel curves are estimated using fractional polynomial regressions of degree 1 and a robust estimator of variance. To control for possible spatial and temporal price differences, the regressions include binary variables indicating household location by governorate (aggregate) and the survey month. The presented curves connect the predicted expenditure values for reported household incomes (controlling for spatial and temporal price differences). The shaded areas around the curves mark the 95 percent confidence interval.

The urban and rural samples of ration cardholders include 453 and 1,171 households, respectively. The urban and rural samples of non-cardholders include 677 and 740 households, respectively. In the urban sample of ration cardholders, the R-squared is 0.349 for consumption of edible fats and oils, 0.219 for consumption of vegetable oils, and 0.080 for subsidized cooking oil consumption. In the urban sample of non-cardholders, the R-squared is 0.328 for consumption of edible fats and oils and 0.235 for consumption of vegetable oils. In the rural sample of ration cardholders, the R-squared is 0.295, 0.193, and 0.104, respectively. In the rural sample of non-cardholders, the R-squared is 0.263 and 0.311, respectively.

FIGURE 3.9 Engel curves for consumption of vegetables and legumes in Egyptian families



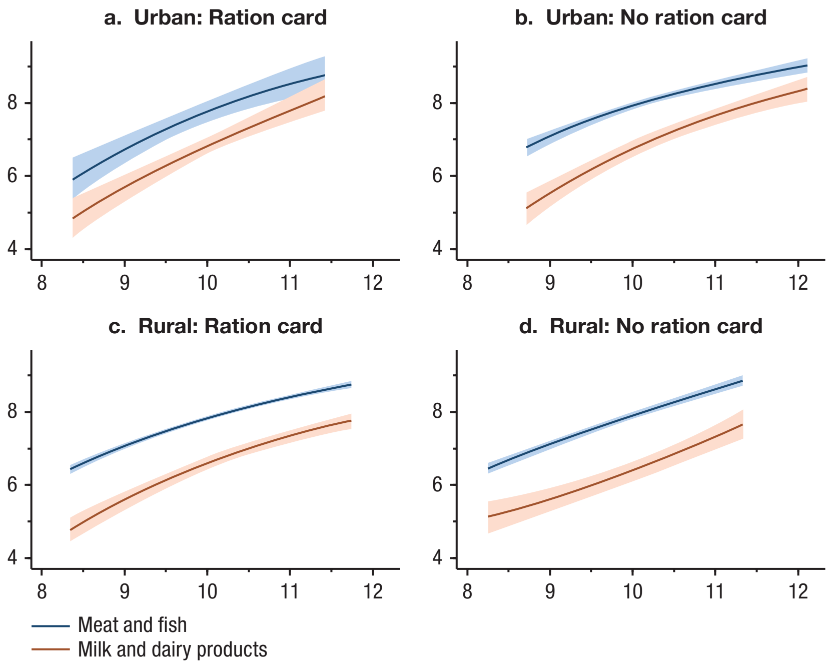
Source: Authors' estimation based on data from CAPMAS and WFP (2011).

Note: Household income and expenditure values are expressed on a per capita basis, refer to a period of 15 days, are reported in Egyptian piasters, and are transformed into logarithms. The y-axis indicates household expenditure levels (in logarithms), and the x-axis indicates household income levels (in logarithms).

The Engel curves are estimated using fractional polynomial regressions of degree 1 and a robust estimator of variance. To control for possible spatial and temporal price differences, the regressions include binary variables indicating household location by governorate (aggregate) and the survey month. The presented curves connect the predicted expenditure values for reported household incomes (controlling for spatial and temporal price differences). The shaded areas around the curves mark the 95 percent confidence interval.

The urban and rural samples of ration cardholders include 453 and 1,171 households, respectively. The urban and rural samples of non-cardholders include 677 and 740 households, respectively. In the urban sample of ration cardholders, the R-squared is 0.425 for consumption of vegetables and 0.191 for consumption of legumes. In the urban sample of non-cardholders, the R-squared is 0.427 for consumption of vegetables and 0.109 for consumption of legumes. In the rural sample of ration cardholders, the R-squared is 0.375 and 0.226, respectively. In the rural sample of non-cardholders, the R-squared is 0.376 and 0.168, respectively.

FIGURE 3.10 Engel curves for consumption of meat and fish and milk and dairy products in Egyptian families



Source: Authors' estimation based on data from CAPMAS and WFP (2011).

Note: Household income and expenditure values are expressed on a per capita basis, refer to a period of 15 days, are reported in Egyptian piasters, and are transformed into logarithms. The y-axis indicates household expenditure levels (in logarithms), and the x-axis indicates household income levels (in logarithms).

The Engel curves are estimated using fractional polynomial regressions of degree 1 and a robust estimator of variance. To control for possible spatial and temporal price differences, the regressions include binary variables indicating household location by governorate (aggregate) and the survey month. The presented curves connect the predicted expenditure values for reported household incomes (controlling for spatial and temporal price differences). The shaded areas around the curves mark the 95 percent confidence interval.

The urban and rural samples of ration cardholders include 453 and 1,171 households, respectively. The urban and rural samples of non-cardholders include 677 and 740 households, respectively. In the urban sample of ration cardholders, the R-squared is 0.227 for meat and fish consumption and 0.261 for consumption of milk and dairy products. In the urban sample of non-cardholders, the R-squared is 0.372 for meat and fish consumption and 0.310 for consumption of milk and dairy products. In the rural sample of ration cardholders, the R-squared is 0.384 and 0.342, respectively. In the rural sample of non-cardholders, the R-squared is 0.311 and 0.230, respectively.

subsidized under the ration card program—at least for households with children ages 6–59 months.

The estimated Engel curves also reveal no (clear) differences between families with and without ration cards regarding how their food expenditures change with increasing income (Figures 3.5–3.10). Per capita food expenditure, as well as per capita expenditures for all (considered) food groups, increases almost linearly among both urban and rural families with increasing per capita income. Thus, there is no tendency toward satisfaction of food demands at high income levels—not even in the case of basic foods such as cereals, sugars, and edible fats and oils. Nevertheless, there are obvious differences between food group expenditures in their income elasticity, as the slopes of the estimated Engel curves suggest. Consumption of milk and dairy products is most responsive to income changes, followed by meat and fish consumption; cereal consumption is the least responsive. Consumption of sugars, edible fats and oils, and vegetables are moderately responsive to income changes, and the income elasticities for these food group expenditures appear to be similar. The estimated Engel curves for legume consumption yield coefficients for the income variable that are statistically insignificant at the 10 percent level and therefore do not permit interpretation.

Finally, it should be noted that the estimated Engel curves and the consumption patterns of beneficiary and nonbeneficiary families do not allow for drawing conclusions on the (nutritional) effects of Egypt's food subsidies. The results may be driven by covariates that are systematically correlated with (non)participation in the food subsidy system or the received subsidy amounts and that are not controlled for. Such a systematic correlation can lead to biased estimates. This methodological problem will be addressed in the main empirical analysis, in the next chapter.

Nutrition-Beneficial Investments in Egypt

Besides insufficient and inadequate food intake, ill health—and specifically parasitic and diarrheal diseases—is a cause of chronic undernutrition, particularly among children (Black et al. 2008; Katona and Katona-Apte 2008; Stephenson, Latham, and Ottesen 2000; UNICEF 1990). Hence, an increasing disease burden as well as decreasing prevention and treatment of under- and overnutrition during the 2000s may have driven Egypt's double burden of malnutrition and growth-nutrition disconnect. Poor health conditions and lack of awareness thereof may be a consequence of underinvestment in nutrition-sensitive infrastructure and public services as well as in primary healthcare, including maternal and child health and nutrition interventions. The possible underinvestment may be due to the declining fiscal space in the public budget, which, in turn, may be due to the rising costs of the food subsidy system to some extent. Then, the Egyptian food subsidy system would have another—indirect—effect on nutritional outcomes, in addition to the hypothesized direct, diet-related effects. This indirect effect would arise from the allocation of the available public budget to the food subsidy system, which cannot be used for alternative and more nutrition-beneficial investments. Because the main empirical analysis presented in the next chapter is concerned only with the potential direct nutritional effects, the following two subsections only briefly review key areas of possible underinvestment that lead to conditions that could contribute to Egypt's nutritional challenges, particularly chronic child undernutrition.

Nutrition-Sensitive Infrastructure and Public Services

Globally, many of the parasitic and diarrheal diseases that reduce food absorption and cause nutrient loss—including intestinal helminthiasis, schistosomiasis, and bacterial infections—enter the human body through ingestion of contaminated drinking water and food or direct contact with feces (Stephenson, Latham, and Ottesen 2000). Thus, living in conditions with poor access to safe drinking water and clean sanitation and in an environment with malfunctioning sewage systems and garbage removal increases the prevalence of infectious diseases and thus chronic undernutrition—especially among children. Children are often more directly exposed to these conditions (when crawling, exploring edibility of objects, and playing outdoors, for example) and have weaker immune systems during the first months of their lives.

Yet DHS data suggest that the coverage of improved sources of drinking water and sanitation facilities is high in Egypt—both in urban and rural areas (Table 3.7). The coverage increased steadily throughout the 2000s and more rapidly in rural areas, albeit from a lower rate. In 2008, 94.8 percent of all households received their drinking water from a tap piped inside their dwelling or building, with 98.8 percent of households in urban areas and 91.0 percent of households in rural areas receiving water in this way. These rates are quite similar to our rates calculated from the 2011 HIECS data (CAPMAS and WFP 2011). According to our calculations, 95.8 percent of all households, 99.0 percent of urban households, and 93.1 percent of rural households receive their drinking water from the tap. Throughout Egypt, the tap water is taken (almost exclusively) from the Nile and usually treated to reduce the risk of infection with waterborne diseases.

TABLE 3.7 Proportion of households in Egypt with improved drinking-water sources and sanitation facilities

	2000	2005	2008
Piped drinking water (%)			
Total	87.4	93.3	94.8
Urban	99.0	98.8	98.8
Rural	75.9	88.3	91.0
Flush toilet (%)			
Total	94.4	97.8	99.2
Urban	99.2	99.7	99.8
Rural	89.7	96.0	98.6

Source: ICF International (2014), based on DHS data.

Almost all households in urban and rural areas use flush toilets (Table 3.7). In 2008, modern flush toilets (which are directly connected to the drinking-water system, unlike tank or bucket flush toilets) were used by 48.5 percent of all households, 77.1 percent of urban households, and 21.8 percent of rural households. Again, these rates are very consistent with our rates calculated from the 2011 HIECS data, according to which 52.0 percent of all households, 79.0 percent of urban households, and 28.4 percent of rural households use modern flush toilets. In addition, most households are connected to a waste water system. According to the 2008 DHS, 89.8 percent of urban households and 37.0 percent of rural households are connected to the public sewer; 5.4 percent of urban households and 28.5 percent of rural households are connected to a vault; and 4.3 percent of urban households and 28.4 percent of rural households are connected to a septic system (El-Zanaty and Way 2009).

Thus, the risk of infection from inappropriate drinking water sources and sanitation within people's housing may be low. However, these statistics provide no information on the quality of the drinking water and waste water system and therefore on the risk of infection outside the home. For example, the waste water system includes open surface canals near houses that may leak into irrigation canals. As a result, humans may be regularly exposed to feces, and feces can easily enter the food chain. Especially in rural areas, some children swim in possibly contaminated canals, and domestic animals drink water from these canals.

Another source of pathogens is openly rotting waste and trash that comes in contact either with humans directly or with animals for human

TABLE 3.8 **Proportion of households by method of waste/trash disposal in Egypt**

	2005			2008		
	Urban	Rural	Total	Urban	Rural	Total
Collected from home (%)	53.6	26.4	39.5	46.5	28.2	37.0
Collected from street container (%)	32.8	4.4	18.0	34.4	3.5	18.4
Dumped into street or empty plot (%)	9.9	25.9	18.3	16.4	31.2	24.1
Dumped into canal or drainage (%)	1.3	18.3	10.1	0.8	16.4	8.9
Burned (%)	1.9	18.9	10.8	1.4	15.5	8.7
Fed to animals (%)	0.3	5.9	3.2	0.2	4.6	2.5

Source: El-Zanaty and Way (2006, 2009).

consumption. Waste disposal is suboptimal in Egypt overall, and proper waste disposal is considerably less common in rural areas than in urban areas (Table 3.8). The quality of the system did not markedly improve or—depending on the indicator used—may even have declined between 2005 and 2008 (for which comparable data in the 2000s are available). According to the DHS data, waste/trash was collected from 53.6 percent of urban households in 2005 and from 46.5 percent of urban households in 2008 (MOH, El-Zanaty and Associates, and Macro International 2008; MOHP, NPC, and ORC Macro 2000; MOHP et al. 2003; MOHP et al. 2005). In rural areas, the coverage slightly increased from a low 26.4 percent to 28.2 percent over the same time period. The proportion of urban households whose trash/waste was collected from street containers slightly increased from 32.8 percent to 34.4 percent, and the proportion of rural households who dumped their waste/trash into water canals and drainage slightly decreased from 18.3 percent to 16.4 percent.

Still, a larger proportion of households in both urban and rural areas dumped their waste/trash into the street or any empty plot. Waste/trash piles, as well as the heaps around street containers, sometimes serve to feed domestic animals. Between 2005 and 2008, this proportion increased more rapidly in urban areas than in rural areas, from 9.9 percent to 16.4 percent in urban areas compared to from 25.9 percent to 31.2 percent in rural areas. The comparability of these DHS-based rates with our rates calculated from the 2011 HIECS data (CAPMAS and WFP 2011) is somewhat limited because of different formulations of the survey questions. Nonetheless, the HIECS data suggest that 67.5 percent of all households, 58.9 percent of urban households, and 74.9 percent of rural households openly dump their waste/trash into street containers into the street and empty spots, or use another unsafe disposal method.

Overall, there is no strong indication that Egypt's growing growth-nutrition disconnect and double burden of malnutrition during the 2000s was driven by deteriorating infrastructure and public services.

Primary Healthcare and Nutrition Interventions

A well-functioning primary healthcare system can significantly reduce malnutrition through prevention and treatment of nutritional deficiencies, overweight/obesity, and related diseases. With the exception of nutrition education in public educational institutions and food fortification programs, public investments in most nutrition-related interventions are under the responsibility of the health sector. In Egypt, total health expenditure (including public and private expenditures) as a share of GDP declined from 6.1 percent in 2002 to 4.9 percent in 2011—a similar share to that in 1997 (World Bank 2014). However, total health expenditure in value terms steadily increased through the 2000s, from I$337 per capita in 2000 to I$520 per capita in 2011 (at constant 2011 prices).[20] The largest share of total health expenditure has been private expenditure—a possible indication of a healthcare system that does not meet most people's health needs. Between 2000 and 2011, household out-of-pocket expenditure accounted for somewhere between 55 percent and 61 percent of total health expenditure (World Bank 2014). The share of out-of-pocket expenditure in total health expenditure in Egypt is considerably above the global average (32.1 percent in 2011), the developing-country average (36.5 percent), and the Arab country average (44.0 percent).

Information on the allocation of Egypt's healthcare budget to nutrition-relevant primary healthcare services and their cost-effectiveness is lacking. Evidence from cross-country studies points to generally very low cost-effectiveness in primary healthcare across the developing world. Filmer and Pritchett (1999) demonstrate this low cost-effectiveness by comparing the cost of medical interventions to avert child mortality with actual public spending per child death averted. The estimated costs of common medical interventions to avert the largest causes of child mortality in developing

20 The exceptions to this general increase in health expenditure were slight decreases in 2003 and 2004 and a drop in 2010—likely as a consequence of the EGP devaluation in early 2003 and the 2009 global financial crisis, respectively.

countries fall into the range of I$10 to I$4,000 per child (Filmer and Pritchett 1999). However, using the national prevalence rates of child and infant mortality as indicators for capturing the effect of primary healthcare service delivery, Filmer and Pritchett (1999) estimate that the actual public spending per child death averted is I$50,000–100,000 for a developing country at average income levels. According to the authors, this cost ineffectiveness is mainly caused by ineffective health budget allocation and healthcare service delivery. In a follow-up study, Filmer, Hammer, and Pritchett (2000) show that, in most developing countries, government funds are largely concentrated in some inexpensive (curative) healthcare services, where they tend to crowd out functional private services, and that most developing countries lack adequate provision of other, potentially more effective basic healthcare services. The other main shortcoming of the healthcare system in many developing countries is the lack of institutional capacity in service delivery and especially the inability to monitor and control the behavior of public employees (Filmer, Hammer, and Pritchett 2000).

Although estimates of the cost-effectiveness of Egypt's primary healthcare service are unavailable, findings from health sector evaluation studies point to conditions that are consistent with those analyzed by Filmer and coauthors. For example, the Readat Refiat (community health worker; literally, "village pioneer" in Arabic) program is the frontline program of the public sector's primary healthcare system in rural areas. A main purpose of the community health worker program is to counsel expecting mothers on maternal and child health issues and refer them to health units, if needed. The program—with a total workforce of 14,280 permanent staff (in 2012)—is ill functioning, especially in terms of staff development and program performance evaluation, pays insufficient attention to maternal and child nutrition, and completely ignores issues related to overweight/obesity and associated diseases (Abdelmegeid et al. 2015).

Obviously, the first step in addressing NCDs is to make the affected individuals aware of their conditions. The Egypt Health Issues Survey (HIS) 2015 reveals that many Egyptians are unaware that they have high blood pressure. Among HIS respondents, 47 percent of women and 73 percent of men who were classified as hypertensive had never been told before by a healthcare provider that they had high blood pressure (MOHP, El-Zanaty and Associates, and ICF International 2015).

One of the most important determinants of individuals' nutritional status is feeding practices during their infancy. Suboptimal breastfeeding, especially nonexclusive breastfeeding in the first six months of life, is a leading risk factor of morbidity, possibly causing child growth retardation. It is estimated to be responsible for 10 percent of the disease burden in children younger than five years of age globally (Black et al. 2008). Although most Egyptian children are breastfed at some point, the initiation of breastfeeding and the methods of supplementary feeding are inadequate. Throughout the 2000s, the proportion of children in Egypt who had ever been breastfed was stable at around 95 percent, with no significant differences between urban and rural areas, according to DHS data (Table 3.9). However, only 78.0 percent of all newborns were put to the breast within the first day after birth and only 49.7 percent within one hour after birth in 2008. The proportion of breastfeeding initiation within the first hour after birth was significantly lower in urban areas than in rural areas (which may be partly explained by the higher proportion of urban births in hospitals and common after-birth care practices). The early initiation of breastfeeding declined considerably between 2000 and 2008 and at similar rates in urban and rural areas (Table 3.9). Prelacteal feeding has been common in Egypt. Almost half of the newborns received prelacteal feeds, and most of them were given sugar or glucose water, tea, or other inappropriate infusions (El-Zanaty and Way 2009).

Exclusive breastfeeding of infants has been far from universal in Egypt, and it slightly decreased during the 2000s (Table 3.9). According to DHS data, the proportion of children under six months of age who were exclusively breastfed declined from 56.2 percent in 2000 to 53.2 percent in 2008 (MOH, El-Zanaty and Associates, and Macro International 2008; MOHP, NPC, and ORC Macro 2000; MOHP et al. 2003; MOHP et al. 2005). The proportion of children ages 0–3 months who were given only breast milk remained constant between 2000 and 2008 while—on a positive note—the proportion of children who were given inappropriate liquids such as cow's milk, tea, and sugar water decreased substantially. Although just over one-half of all children under six months of age were exclusively breastfed in Egypt, the prevalence of exclusive breastfeeding was relatively high compared to global and regional averages. Our calculations based on the latest health survey data in 113 developing countries from 2005–2012 (World Bank 2014) suggest that the average exclusive breastfeeding rate is 37.3 percent, and Egypt actually belongs to the top 25 percent in this sample. The average rate across the 12 Arab countries with available data is only 24.2 percent.

Evidence on the effectiveness of large-scale nutritional interventions in Egypt is scarce, too. Several seminal publications in the nutrition literature, including articles in the 2008 and 2013 *Lancet* series on maternal and child undernutrition (Bhutta et al. 2008, 2013; Bryce et al. 2008) and others (e.g.,

TABLE 3.9 **Prevalence of common infant-feeding practices in Egypt**

	2000	2005	2008
Breastfeeding (%)			
Ever breastfed			
Total	95.5	95.1	96.1
Urban	94.9	94.2	95.9
Rural	95.9	95.6	96.2
Initiation of breastfeeding within one day after birth			
Total	87.5	73.3	78.0
Urban	86.1	75.8	79.5
Rural	88.3	71.9	77.1
Initiation of breastfeeding within one hour after birth			
Total	56.5	37.7	49.7
Urban	52.0	33.2	45.6
Rural	59.3	40.2	52.2
Supplementation (%)			
Exclusive breastfeeding among children under 6 months of age			
Total	56.2	—	53.2
Type of supplementation among children ages 0–3 months			
Only breast milk			
Total	68.5	—	68.2
Milk and other liquids (including tea, sugar water)			
Total	26.8	—	15.4

Source: ICF International (2014), based on Demographic and Health Surveys data.

Note: — = data not available.

All prevalence rates refer to children born in the three years preceding the surveys.

Horton et al. 2010), identify a set of specific interventions that have been proven to be highly cost-effective in reducing maternal and child malnutrition worldwide. These nutrition-specific interventions can be grouped into the following: interventions aimed at behavioral change, including promotion of breastfeeding and adequate complementary feeding; micronutrient and deworming interventions, including iron fortification of staple foods, vitamin A supplementation, and deworming campaigns; and complementary and therapeutic feeding interventions delivered through the healthcare system (Horton et al. 2010). In fact, some of these interventions were implemented, at least as trials, in Egypt.

The Government of Egypt in collaboration with WFP and the Global Alliance for Improved Nutrition implemented fortification programs for subsidized Baladi bread flour and cooking oil. Fortification of the flour provided to bakeries for Baladi bread was piloted at large scale over a period of five years, and its fortification with folate was tested (Elhakim et al. 2012; Hefni and Witthöft 2011). Fortification of the subsidized cooking oil with vitamin A was tested, too. However, the results of the effectiveness evaluation of the Baladi flour fortification programs are still unpublished, and serious quality problems were found for the oil fortification program, limiting the success of the program (Laillou et al. 2012).

Moreover, the coverage of the national vitamin A supplementation program for young children is much lower in Egypt than in most other developing countries (ICF International 2014). According to the DHS reports, approximately only 3 in 10 children ages 9–23 months received a vitamin A capsule in the six-month period before the survey interview in both 2005 and 2008 (El-Zanaty and Way 2006, 2009). In addition to reducing vitamin-A-deficiency-caused visual problems and blindness, vitamin A supplements can reduce the severity of measles and diarrheal infections and the rates of child mortality and morbidity caused by these diseases (Beaton et al. 1994; Black et al. 2008; Mayo-Wilson et al. 2011; Villamor and Fawzi 2000). Yet there is no conclusive evidence that vitamin A supplementation reduces the prevalence of child stunting (Rivera et al. 2003).

Similar to our findings on nutrition-sensitive infrastructure and public services, our review of key nutrition-relevant primary healthcare services and nutrition interventions does not show an obvious indication of their deterioration during the 2000s, which could explain the increasing double burden of malnutrition and the widening growth-nutrition disconnect over this decade. Moreover, a very recent longitudinal cohort study on infant malnutrition in 10 Egyptian villages (5 in Lower Egypt and 5 in Upper Egypt) suggests that the causes of child malnutrition seem to be predominantly related to food intake rather than adverse health conditions (Kavle et al. 2016). The authors find that infants' length-for-age z-score decreased and weight-for-length z-score increased from 6 to 12 months of age, forming the double burden of malnutrition.[21] They also find that diarrhea, fever, and exposure to a

21 Six months of age is the recommended infant age for introducing complementary feeding with solid foods. Earlier introduction is a common cultural practice in Egypt (Kavle et al. 2016). Length-for-age z-scores and weight-for-length z-scores (terms used during infancy) correspond to height-for-age z-scores and weight-for-height z-scores during childhood (when children's body height is measured in a standing position instead of a recumbent position).

community-level nutrition education and rehabilitation program were not associated with any growth outcome during infancy. The authors therefore conclude that improving diet quality and reducing reliance on energy-dense foods is needed to address both stunting and overweight in countries like Egypt that are facing the nutrition transition. Nevertheless, poor health conditions, lack of their awareness, and insufficient prevention and treatment of malnutrition are certainly factors that may have contributed to the persistence of Egypt's nutritional challenges.