AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Food Security in Afghanistan: Household-level Evidence from the 2007-08 Food Price Crisis

Anna D'Souza *
Dean Jolliffe ‡

* Economic Research Service, USDA; Contact: adsouza@ers.usda.gov
‡ World Bank; Contact: djolliffe@worldbank.org

October 2010

Abstract: This paper investigates the impact of rising food prices – during the 2007/08 global food crisis – on food security in Afghanistan. Exploiting the temporal stratification of a unique nationally-representative household survey, we find evidence of large declines in real per capita food consumption and in food security (i.e., per capita calorie intake and household dietary diversity) corresponding to the price shocks. The data reveal smaller price elasticities with respect to calories than with respect to food consumption, suggesting that households trade off quality for quantity as they move towards staple foods and away from nutrient-rich foods such as meat and vegetables. In addition, we observe Giffen good properties, i.e., increased demand in the face of price increases, for staple foods (wheat) in urban areas. Our work improves upon country-level simulation studies by providing estimates of actual household wellbeing before and during the height of the global food crisis in one of the world's poorest, most food-insecure countries.

JEL Codes: D12, I3
Keywords: food security, high food prices, nutrition, poverty, Afghanistan

Acknowledgments: Findings from this analysis provide background information for the World Bank's poverty assessment for Afghanistan, and have informed the Ministry of Economy (MoEc), Government of Afghanistan (GoA). The authors are grateful to GoA Central Statistics Organization for granting access to the data for this research, as background for poverty assessment. This paper is a revised version of a selected paper presented at the 2010 Agricultural and Applied Economics Association annual meetings. The authors wish to thank for comments Amanullah Assil, Cheryl Christensen, John Hoddinott, Mark Nord, John Pender, Shahla Shapouri, seminar participants at ERS, and conference participants at the 2010 AAEA meetings. D'Souza is a Research Economist at ERS, USDA; Jolliffe is a Senior Economist at the World Bank, and also holds affiliations with the Institute for the Study of Labor (IZA) in Bonn and with the National Poverty Center (NPC) at the Ford School of Public Policy, University of Michigan. The views expressed here are those of the authors and may not be attributed to ERS-USDA, the World Bank, IZA, or NPC.

1 Introduction

During the 2007/08 global food crisis the world average price of staples more than doubled; perhaps one of the most serious consequences of the crisis was its disproportionate effect on the world's most vulnerable populations. For those who spend the majority of their budgets on food, the crisis led to a severe erosion of purchasing power, pushing households into poverty and crippling the already poor. Poor households cope with negative shocks in many ways, for example, by relying on family assistance, selling off assets, borrowing money, or – in the most desperate cases – reducing intake of food and nutrients. Such coping mechanisms can have both short and long run consequences for a family's wellbeing and livelihood.

This paper investigates the impact of the global spike in food prices on household welfare in Afghanistan – one of the world's most food-insecure countries.[1] The analysis in this paper provides one of the very few empirical assessments of the effects of the global food crisis based on data collected prior to and during the crisis and using direct measures of household consumption; further, it is the first analysis on this topic from a conflict country, Afghanistan. It is rare to have high-quality household data from conflict countries, where many of the world's most vulnerable live, and even rarer to have such data collected during a largely unanticipated shock. In countries like Afghanistan, shocks like the food crisis can compound the deleterious effects of years of conflict, drought, and economic hardships.

The estimates provided in this paper are based on direct measures of food security and food-based coping strategies, e.g., moving to cheaper foods, based on observed household behavior prior to and after the spike in food prices. Most studies on the global food crisis use pre-crisis national household survey data to simulate the short-run effects of price increases on poverty. See for example, Robles and Torero (forthcoming) who examine simulated results from four Latin American countries,[2] Woden *et al.* (2008) who summarize simulations for twelve African countries,[3] Ul Haq *et al.* (2008) who simulate welfare changes

[1] According to the Economic Research Service (*Food Security Assessment, 2008-2009*), in 2008 Afghanistan had a nutrition gap – the difference between available food and food needed to support a 2,100 per capita calorie intake – of 1,999 thousand tons. Only North Korea was estimated to have a larger nutrition gap in that year.
[2] The countries are Guatemala, Honduras, Peru and Nicaragua.
[3] The countries are Burkina Faso, Democratic Republic of Congo, Ghana, Gabon, Guinea, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo. Their findings suggest overall increases in poverty as a result of the food crisis, with a large share of the increases in poverty due to a worsened situation for the already poor.

in Pakistan, Simler (2010) who examines Uganda,[4] and Ivanic and Martin (2008) who simulate price increases in nine low-income countries.[5] In these studies, the magnitude of the impact of the crisis varies greatly across households and countries, depending on many characteristics including the degree of price transmission, dependence on food imports, whether staple foods are traded internationally, and overall levels of productivity.[6] But the general finding is similar – national poverty rates increase, with urban areas on average suffering larger increases.

From these studies though, it is difficult to disentangle the extent to which the simulated estimates result from actual changes in household behavior and wellbeing, or from the simulation assumptions. For example, Woden *et al.* (2008) assume that increases in food prices directly produce an equivalent reduction in total consumption. That is, the household is assumed to have no behavioral response to the price increase. In this case, the magnitude of the poverty reduction is determined by the shape of the distribution of consumption and the assumed reduction in total consumption.

The need to simulate welfare effects is driven by a lack of comparable pre- and post-crisis data. Jensen and Miller (2008) improve upon the simulation studies by using a panel of 1,300 urban poor households in two Chinese provinces to measure the nutritional effects of the crisis. The data in their analysis though are from April and December, 2006, and largely do not reflect the stark increase in the price of staples during the crisis.[7] They find a limited nutritional impact of the crisis, as measured by calorie intake, which they suggest is due to government policies that stabilized grain prices and household substitution towards cheaper foods.

The analysis in this paper is similar to Jensen and Miller (2008) in that the estimates are based on measured (not simulated) differences in consumption behavior. While we do

---

While urban poverty rates increase more than rural poverty rates in most countries, they find evidence of the reverse in three countries: Ghana, Senegal, and Liberia.

[4] Simler simulates changes in both the prevalence and depth of poverty, and finds increases in both. He argues that this result is due to the large increases in the price of all staple goods and the fact that most poor households, even in rural areas, are net buyers of food.

[5] In their study, poverty increased in seven of the nine countries studied -- Bolivia, Cambodia, Madagascar, Malawi, Nicaragua, Pakistan, Peru, Vietnam, Zambia.

[6] The simulations also produce variation based on whether households are net buyers or sellers of food, whether they own land, and whether the household head is a woman (FAO, 2008).

[7] While their data track the start of the crisis, the province-average increase in the price of rice was just 4 percent between April and December of 2006. In contrast, between June, 2006 and June, 2008, the China CPI indicates that the price of grains more than doubled.

not have panel data, our data fully include pre-crisis and crisis price levels, unlike Jensen and Miller (2008). We estimate the relationship between household-level food security and increasing food prices using a unique cross-sectional, temporally stratified, nationally-representative survey. The data are from the National Risk and Vulnerability Assessment (NRVA) 2007/08, a sample of over 20,000 households from all 34 provinces of Afghanistan, conducted over a 13-month period. It is the first nationally-representative household survey in Afghanistan[8] designed to account for seasonal variations in consumption and other measures of wellbeing.[9] The most important feature of the design for this analysis is that the NRVA provides a comprehensive and representative portrayal of consumption patterns prior to and after the onset of the 2007/08 food price shock, providing substantial variation in prices and comparable sub-samples for our analysis.

A particular strength of the NRVA survey is its detailed information on the frequency and quantity of food consumption of 91 different food items, which allows us to observe how households change the composition of their diets in response to price changes and also allows us to create multiple measures of household food security. Food security broadly consists of four main dimensions: availability, access, utilization, and stability.[10] In this analysis, we concentrate on aspects of access and utilization. The former refers to a household's ability to obtain food, which depends on income, prices, and market access; the latter refers to an individual's ability to process nutrients and energy from food, which depends on many factors, including dietary diversity and nutrient absorption, intra-household allocation of food, and hygienic preparation. In our analysis we examine two aspects of utilization, namely measures of dietary diversity and consumption of a key macro-nutrient – protein.

Several salient findings emerge from the household-level food security analysis. Prior to and during the large increase in food prices from August 2007 to September 2008, the descriptive statistics reveal a decline in the real food consumption of approximately 33

[8] While census data does not exist for Afghanistan, the pre-cursor to the census, a national household listing was undertaken from 2003 to 2005 by the Central Statistics Organization. This listing forms the basis for the current official population estimates and also serves as the sampling frame for the NRVA 2007/08.
[9] The NRVA 2007/08 is the third round of the survey; fieldwork took place from August 2007 to September 2008. The first two rounds (2003, 2005) were each conducted during a single season, leading to seasonally-biased estimates, e.g., poverty estimates during or immediately after harvest will be lower than during lean periods. The NRVA 2007/08 was implicitly stratified over time during the year-long fieldwork so that estimates of wellbeing could account for seasonal variations.
[10] FAO(2006)

percent. The regression analysis indicates much smaller price elasticities with respect to calories than with respect to food consumption, suggesting that households traded off quality for quantity of calories consumed. As additional evidence of this trade-off, the regression estimates show that the price increases are associated with changes in the composition of food consumption, namely decreases in dietary diversity and a movement towards staple foods. This result is similar to that of McKenzie (2006) who finds a shift in food consumption towards staples after the devaluation of the Mexican Peso in 1994.[11]

The analysis in this paper also documents the statistical relationships between commonly used nutrition indicators and various measures of food security, and thereby contributes broadly to work on the efficacy of household-level indicators like dietary diversity.[12] This is in line with the growing recognition of the importance of household- and individual-level consumption data in developing sub-national interventions to reduce chronic food insecurity (Barrett, 2010).[13] In addition to contributing more broadly to the food security literature, we also believe that this analysis fills a critical gap in the knowledge base. The dearth of data and analysis available on Afghanistan poses acute challenges to political leaders, lawmakers, and humanitarian organizations interested in creating programs and policies to alleviate poverty.

More findings on the household response to the price effects are described in section 4, along with discussion of robustness tests. The next section in this paper briefly describes the Afghan economy and its ties to international markets during the period of the food crisis. Section 3 provides details on the survey, the methodology and the sample, Section 4 discusses the results and section 5 concludes.

2 Afghanistan

Over the past decade, the Afghan economy has experienced strong growth, with real GDP growth averaging approximately 10.8% per year between 2003 and 2009. But after

[11] See Ruel *et al.* (2009) for a more detailed review of the literature on the effects of economic crises on household wellbeing.
[12] See Ruel (2003) for a review of studies examining the efficacy of dietary diversity measures.
[13] For example, select research examines reductions in maternal and child nutritional status following the Indonesian crisis and the CFA devaluation (Martin-Prevel *et al.*, 2000; Block *et al.*, 2004). See Ruel *et al.* (2009) for a more detailed review of the literature on the effects of economic crises on household and individual wellbeing.

decades of war and political instability, landlocked Afghanistan remains one of the world's least developed nations and one of the poorest countries in its region. The IMF (2009) estimates that gross domestic product (GDP) per capita was $350 in 2007 and $457 in 2008 (current US$).[14] Based on the broader set of development indicators used in the UNDP human development index (e.g., health, education, living standards), Afghanistan ranks 181st out of 182 countries.[15] And UNICEF (2009, p. 11) reports that Afghanistan has the highest prevalence of stunting in the world among children under five years old.[16]

The Afghan economy is largely based on agriculture; major crops include wheat, rice, maize, barley, vegetables, fruits, and nuts. Approximately 70% of cultivated crop area is devoted to wheat and about 15% is devoted to rice, barley and maize.[17] Wheat is both a major production crop and the main staple of the Afghan diet, with wheat flour contributing 57 percent to the total caloric content of the average bundle of food items of the relatively poor (i.e., the 20th to 50th percentile of the total consumption distribution, which is the basis for the official Government of Afghanistan poverty line). Due to large fluctuations in weather and insecurity, however, wheat production is highly volatile and the country is dependent on its trading partners to meet any shortfalls.[18] Pakistan is the major supplier of wheat (mostly in the form of flour) due to close historical ties and a shared 1,600 kilometer border; estimates of Pakistan's share of the Afghan wheat and flour import market range from 59% (Chabot and Dorosh, 2007) to 79% (Maletta, 2004).

Seasonality plays an important role in food security in Afghanistan. Temperatures vary dramatically across seasons, with hot summers and frigid winters; and the climate in the highlands varies with elevation. In many cases, severe winter conditions affect transportation, and in high mountainous areas roads are often blocked throughout the winter due to heavy snow accumulation. In these communities in particular, households are forced to rely only on food supply stored before the winter.

---

[14] In a country like Afghanistan though, where the drug economy is large, the official National Income Accounting data are likely to significantly understate GDP. UNODC (2008) estimates that in 2007 the farm gate value of opium cultivation was US$1 billion, but this dropped to US$730 million in 2008. The potential export value in 2007 of opium, morphine and heroin (at border prices in neighboring countries) was $4 billion (or, in per capita terms, about $160).
[15] UNDP (2009)
[16] Based on data from the 2004 National Nutrition Survey.
[17] Chabot and Dorosh (2007)
[18] Afghan wheat production has been estimated to be over five times as variable as Pakistan's wheat production. (Persaud, 2010)

According to the World Food Programme, Afghanistan is among the world's most vulnerable countries in terms of absorbing food and fuel price shocks; such countries have consistently high levels of food insecurity, are heavily dependent on food and fuel imports, and have large populations of poor people who spend significant shares of their income on food (Sanogo, 2009). Also, mountainous terrain and poor infrastructure, coupled with weak governance, insecurity and corruption, have limited the government's ability to manage its food distribution and supply networks.

International prices of food commodities increased substantially in 2007 and rapidly in early 2008, peaking around May-July 2008. During this period, Afghanistan experienced several shocks that led to a disruption of its food supply network, causing prices to soar throughout the country. Due to drought and early snow melt, the 2008 wheat harvest of 1.5 million metric tons was the worst since the 2000 harvest (Persaud, 2010). (The harvest period typically falls in the summer months: May-August.) The price impact of the large shortfall in wheat production was magnified by export bans in Pakistan and rising international food prices. In February 2008 the Afghan government eliminated import tariffs on wheat and wheat flour (tariffs had been set at 2.5%), but due to export bans in Pakistan, Iran and Kazakhstan, there was little effect on prices. Between fall 2007 and summer 2008, the prices of domestic wheat and wheat flour increased by over 100%. Figure 1 displays the retail price (Afghani per kilogram) of wheat in four major markets from January 2006 to December 2009.

Total inflation was largely driven by the surge in food prices. Figure 2 presents the consumer price indices (CPI) for food and non-food items in urban areas from 2006 to 2008 constructed by the Government of Afghanistan.[19] During the NRVA survey time frame (August 2007-September 2008), the urban food CPI increased by nearly 60%, while the non-food CPI increased by only 10%. Our calculations using the NRVA district price survey data similarly indicate a 60% weighted average increase in food prices in urban areas during this period (with the overall increase at 40%).

[19] The consumer prices indices were constructed by the Afghan Central Statistics Organization, based on data from six urban areas of Afghanistan.

3 Data and Methodology

3.1 Data

Our primary data come from the 2007/08 National Risk and Vulnerability Assessment (NRVA), conducted by the Afghanistan Central Statistics Organization and the Ministry of Rural Rehabilitation and Development. The frame used for drawing the sample was the 2003-05 national household listing – a listing of every house in the country; the sample was selected following a stratified, multi-stage design.[20] The survey was administered between August 2007 and September 2008 and covered 20,576 households (about 150,000 individuals) in 2,572 communities.[21]

A salient feature of the survey is its implicit stratification over time, which ensures that the samples for each quarter reflect the overall composition of the country.[22] This aspect is essential to address the seasonality associated with household wellbeing. The year-long fieldwork also allowed coverage of insecure/conflict areas. It is extremely difficult to obtain high quality household data in conflict countries. The NRVA was able to achieve this task through a process of informally securing permission from local leaders in insecure areas, as well as a flexible design for field work. In particular, when a primary sampling unit was considered too insecure to interview at the scheduled time, it would not be immediately replaced, but would be re-considered at a later date within the quarter.[23]

The NRVA consists of three components: household and community questionnaires and a district market price survey. The household questionnaire includes 20 sections – 6 administered by female interviewers to female household members and 14 administered by male interviewers to the male household head.[24] A key component of the survey is the food

---

[20] The population frame was stratified into a total of 46 domains or strata. The 11 provinces with the most populous provincial centers were each stratified into urban and rural areas, producing 22 strata. Each of the remaining 23 provinces were then also treated as separate strata (and are identified as rural areas), and finally the nomadic Kuchi population is treated as a separate stratum. There were 2,441 primary sampling units (PSUs) from urban and rural settled populations and 131 PSUs from Kuchi populations. In the second and final stage households were selected. In our analysis, standard errors are corrected for the stratified, multi-stage design.

[21] The household response rate was 99.8%, and the primary sampling unit replacement rate was 3%.

[22] Implicit stratification means that the frame was sorted both spatially and temporally to ensure that (with a systemic interval selection) the selected sample would be seasonally representative. See Kish (1965, p. 235-6) for a discussion of implicit stratification.

[23] The motivation for this flexibility is that insecure areas were not necessarily insecure throughout the year. Many areas move in and out of periods of security.

[24] Households were asked about consumption, demography, housing infrastructure and access, maternal and child health, education, income sources, agriculture and livestock, migration and remittances, assets and credit.

consumption section, which asks female respondents about consumption of 91 food items belonging to nine food groups consumed over the previous week. The broad coverage of foods, including seasonal varieties, allows for better calculation of calorie and nutrient intake than surveys with fewer items.

Another key component of the NRVA is the district market price survey; data were collected on the prevailing prices of all food items included in the consumption section, domestic and imported grains, and fuel. Given Afghanistan's mountainous terrain and poor infrastructure, transportation costs most likely vary greatly across the country, and in particular in remote and insecure areas; therefore in order to identify correctly the impact of the price increases at the household level, it is necessary to obtain data on actual prices that households face in their local markets.

As previously noted, the NRVA household survey combined with the matching market-level price survey reveals a 40% increase in a weighted food price index from August 2007 to September 2008 (the duration of the survey fieldwork). Basic descriptive statistics indicate that this increase coincided with sharp declines in household wellbeing. Average monthly real food expenditure dropped from 1,200 Afghani in fall 2007 to 798 Afghani in summer 2008, while the percentage of households consuming less than 2,100 calories per person per day rose from 24% to 34%.

3.2 Empirical specification

To assess the impact of rising price of staple foods on the welfare of Afghan households, we estimate the relationship between several measures of household wellbeing and the price of domestic wheat flour. To isolate the price effect from other potentially confounding correlates, our basic specification is as follows:

$$\boldsymbol{log(x_h) = \beta_0 + \beta_1 log(price\ wheat\ flour_{apq})}$$
$$\boldsymbol{+\theta Prices_{apq} + \alpha HH_h + \delta DIST_{dq}} + \Pi_p + \boldsymbol{\varepsilon_h} \qquad \text{[eq1]}$$

where x is a measure of household wellbeing for household h. Prices denotes a vector of commodity prices, averaged by area a (urban or rural), province p, and quarter q. HH denotes household-level variables; $DIST$ denotes district-level variables and Π denotes

province-level fixed effects. These control variables are described in detail below. ε denotes an idiosyncratic error term; we use the sandwich variance estimator (sometimes referred to as the Huber- or Huber-White robust estimator), which allows for correlation of the residuals within clusters (i.e. PSUs) and is therefore robust to violations of the assumptions of identically and independently distributed residuals.[25]

3.2.1 Dependent variables

We examine the following measures of wellbeing: real monthly per capita food consumption; per capita daily calorie intake; per capita daily protein intake; household dietary diversity; and expenditure shares by broad food groupings. Finally, we examine the demand for wheat products (per capita intake of wheat) as a result of the price increases. Our priors are that the large increases in wheat prices will be associated with reductions in wellbeing in terms of total food consumption, total calorie intake, and diversity. In terms of wheat and protein consumption, it is not clear whether the substitution effect or income effect will dominate. When the price of one good increases, the relative price of the other goods declines, and the substitution effect implies that the consumption of relatively cheaper other goods will increase. The countervailing income effect is driven by the fact that as the price of one good increases, real income declines, which results in decreased consumption of normal goods. (For example, as wheat prices in Afghanistan increased, the price of lamb relative to wheat declined; this would suggest more consumption of meat . However, the increase in wheat prices also led to a decline in real income, suggesting less consumption of meat. Therefore the overall effect is an empirical question.) We also expect a change in the composition of food expenditures, with a general movement towards cheaper, lower quality foods.

Total food consumption is an informative measure of wellbeing in itself, but is also important because it is a core component of the poverty indicators. To calculate the value of total monthly consumption on food (in Afghani), we map district price data to quantity data from the household consumption module. (Households are asked for the quantity of foods consumed over the past seven days; these quantities are multiplied by 4.2 to get monthly values.) Food consumption data include food bought, produced or obtained

[25] See Kauermann and Carroll (2001) for details on the properties of this estimator.

through other methods, e.g., food aid, gifts. Prices were matched by month, item, and district. Since not all food items were available in all district markets at all times of the year, we imputed the missing elements to obtain a complete price matrix. The imputation process filled in missing values using the first-feasible methodology according to the following order: 1) median of the 20 nearest neighboring districts; 2) province median of that month; 3) national median of that month; 4) median price of 20 neighboring districts of the quarter; 5) province median of that quarter; and 6) national median of that quarter.

In order to account for differences in price and quality between domestic and imported wheat and rice, we calculate price averages for domestic and imported varieties separately. (The survey includes questions on the percentages of imported wheat and rice the household consumes; these percentages are used to calculate total expenditure for these items.) Finally, the value of expenditure on food away from home is included in the calculation of total food consumption, but not included in the calculation of calorie intake since quantity data on such food was not collected.[26]

We adjust consumption estimates using both NRVA price data and the official consumer prices index data to compare consumption across regions and over time. For food prices, we use an NRVA-based, Laspeyres price index estimated by quarter for each region.[27] For non-food items, we use a non-food price index developed by the Central Statistics Organization that accounts for temporal, but not spatial, differences in prices. Real consumption is relative to the chosen base: urban areas in the Central region in quarter one; the capital, Kabul, is located in the Central region.

To sharpen the focus on food security, we also examine: (i) per capita daily calorie intake; (ii) the food consumption score – a measure of household dietary diversity; and (iii) per capita daily protein intake.[28] The first measure is related to United Nations Millennium Development Goal 1.9 – to reduce by half the proportion of population below a minimum

[26] Expenditure on food away from home accounts for approximately 2% of household food expenditure.
[27] The food price index is based on a reference bundle of goods consumed by relatively poor households; the reference bundle was constructed to reflect regional diversity in consumption patterns. See Diewert (1993) for a discussion of the Laspeyres price index, as well as other indices.
[28] Since consumption data were collected at the household level, it is not possible to address the issue of individual nutritional status, which depends on the intra-household allocation of resources. There is some evidence that in times of difficulty, households allocate more food to children. (Block *et al.*, 2004) In the robustness tests, we include the number of children in the household as an additional control; the results do not change.

level of dietary energy consumption. The second two measures reflect different dimensions of household food security that relate to nutrient intake. Several studies from developing countries demonstrate a statistically significant relationship between household dietary diversity and child and adult nutritional status, and, more broadly, the access to and utilization of food (Hoddinott *et al.*, 2002; Ruel, 2003; Arimond and Ruel, 2004, Rose *et al.*, 2002).

Daily per capita calorie intake and protein intake are calculated by dividing weekly total household calories and protein intake by seven days and by the effective household size. The effective number of household members incorporates guests eating meals within the home.[29] Food quantities were converted to kilocalories and nutrients using the FAO Food Composition Tables for the Near East.[30]

The food consumption score (FCS) is an indicator developed by the World Food Programme originally used in southern Africa, and now used in food security analyses throughout the world.[31] During the global food price crisis, the FCS was used in field assessments to gauge short-term changes in food security; a benefit of using the FCS is that it is comparable across countries.[32] It is constructed by taking the weighted sum of the frequencies with which households consume foods within eight food groups over the previous week.[33] The food groups include staples, pulses, vegetables, fruit, meat/fish, milk/dairy, sugar, and oil/fat.

3.2.2 Variable of interest and control variables

Our coefficient of interest is β_1, which measures the price elasticity of the dependent variable with respect to changes in the price of domestic wheat flour. (In other words, β_1

[29] Some studies use household size to calculate per capita amounts. In Afghanistan the custom of sharing meals with guests makes it important to account for guests eating meals from the household cooking pot. The effective household size also incorporates information on household members eating outside the home.
[30] Spices, and 'other' foods do not contribute to total calories. USDA sources were used for a few items that were not available in the FAO tables.
[31] See Weismann *et al.* (2009) for an evaluation of the effectiveness of the food consumption score in measuring household food security. See WFP (2008) for a general discussion of FCS analysis, as well as recent evidence from several developing countries.
[32] Sanogo (2009)
[33] Weights for food groups range from 0.5 to 4 based on nutrient density. Condiments receive zero nutritional weight. Frequencies are truncated at 7 for each food group.

measures the percentage change in the food security measure from a one percent change in price.) We use the average price of domestic wheat flour since wheat is the primary staple of the Afghan diet and households often purchase wheat in the form of flour. In the robustness tests, we use the prices of imported wheat flour, and domestic and imported wheat; the results are substantively the same.

Consumer theory indicates that choices are made based on the relative prices of goods. In order to capture this in our empirical specification, and to better isolate the effect of wheat flour prices as distinct from co-movement from other price changes, we include several other prices in our specification. In particular, we include the prices of milk, lamb, rice (domestic) and vegetable oil, as well as the price of kerosene, which is commonly used in cooking. These four food products plus wheat flour make up eighty percent of average food expenditure of the relatively poor (i.e., the reference population for defining the composition of food needs for the poverty line). Average prices are calculated for rural and urban areas within each province for each quarter.

Since each household is observed only once over the year, the household-level controls do not vary over time. They include the following: dummies for consumption quintiles (bottom quintile excluded) intended as proxies for income;[34] age of household head; dummy for households where heads are literate; dummy for households where heads are married. (In the robustness tests, we find that the inclusion of other household demographic characteristics does not qualitatively alter the general findings.)

District-level variables include dummies for topography – plateau and mountainous areas (plains areas excluded) – and a dummy for rural areas. Lastly, we include province fixed effects, Π, to control for observable and unobservable time-invariant province-level factors that could confound the results. These fixed effects control, for example, for differences in local governance efficacy, province-specific variation in relationships with the

[34] The NRVA does not collect detailed income data, but rather focuses on detailed consumption data primarily because it is generally assumed that consumption is more accurately measured than income in poorer countries. Total household consumption (Afghani per month) consists of expenditures on food, non-food, durables and rent, following guidelines in Deaton and Zaidi (2002).

central government,[35] or differences in conflict and insecurity that are present throughout the survey year.

3.3 Estimating the differential effects of food price increases

During the global food price crisis, much of the public discourse focused on differences in the ability of various subpopulations to cope with rising prices. In particular, governments and international organizations emphasized the vulnerability of urban households, who cannot produce their own food, during price shocks.[36] Singh, Squire, and Strauss (1986) and Strauss (1984) present models of household behavior that emphasize the distinction between whether a household is a net seller or net buyer of food. Deaton (1989, 2000) presents an estimation procedure based on this distinction. The basic idea is simply that net sellers produce enough food to consume as well as to sell on the market and therefore benefit from the price increase; while net buyers depend on the market to meet their food needs and suffer from the price increase.

As a proxy for net buyer or seller, we include dummies for whether the household resides in an urban or rural area. The basis for this proxy is two-fold; first, net sellers of food are largely situated in rural areas, and second, most rural households have access to agricultural land which may afford even net buyers in rural areas more coping options. Urban households rarely have access to agricultural land or own-food production and are more dependent on cash income. They are also more likely to consume internationally-traded staple foods than rural households, who often have better access to roots and tubers (Ruel *et al.*, 2009).

A major caveat to using urban and rural as a proxy is that certainly not all rural households are net sellers and not all rural households have access to land (for example, landless rural households may be as negatively impacted by the price increase as urban households). To explore whether the urban/rural proxy fails to capture important differences, we consider two other proxies for household types that are likely to be

[35] As one candidate example, the World Bank (2008) identifies wide variation across provinces in the distribution of public expenditures from central funds as a key public finance concern. Comparisons of per capita, public expenditures by province produces unusually large (and unexplained) variation with a six-fold difference between provinces receiving the highest and lowest levels of per capita public expenditures.
[36] FAO (2008)

differentially affected by price increases. We construct a dummy variable identifying those households that report wheat as their major crop in the previous harvest season. We also consider a proxy for access to agricultural land by constructing a dummy for those households that report owning or operating agricultural land.

To identify differences in the effects of price shocks based on our proxies, we add an interaction term to the basic specification:

$$\begin{aligned} \boldsymbol{log(x_h) = \beta_0 + \beta_1 log(price\ wheat\ flour_{apq})} \\ \boldsymbol{+\beta_2[log(price\ wheat\ flour_{pq})\ X\ rural_d]} \\ \boldsymbol{+\theta Prices_{apq} + \alpha HH_h + \delta DIST_{dq}} + \Pi_p + \boldsymbol{\varepsilon_h} \end{aligned} \qquad \text{[eq2]}$$

The effect of wheat flour prices on household wellbeing for urban households is β_1 and for rural households it is $\beta_1 + \beta_2$. In alternative specifications, we replace the rural dummy in equation 2 with either the dummy for wheat producing households or the dummy for agricultural households.

A limitation of this analysis is that we do not attempt to disentangle changes in prices due to the 2007/08 global food crisis and those due to seasonal variations based on weather and harvest quality. As mentioned above increases in the price of wheat flour were likely due to a confluence of factors, including domestic shortages, typical variations over the harvest cycle[37], and international elements. Therefore the results below identify the effect of overall prices changes on household wellbeing.

3.4 Sample Description

The effective sample size for our most of our regressions is between 20,491 and 20,500 households in 394 districts in 34 Afghan provinces.[38] Approximately 80% of

[37] If food prices follow a cyclical pattern, dropping in the months after harvest (September-October) and slowly increasing throughout the year as stocks deplete, then we would expect price increases due to the global food crisis to be compounded by the cyclical domestic pattern. The CPI data in Figure 2 though certainly suggests that the extent of seasonal price variation is very small relative to the price shocks.

[38] Less than 100 households (0.5%) are dropped from the analysis due to missing data. For the model where we estimate consumption of wheat products, we select on positive consumption which produces a subsample of 19,325 households.

households reside in rural areas; of these households, 6.3% are Kuchi, nomadic pastoralists. On average, households have 8.6 members living in about 3.6 rooms (or tents for Kuchi populations). The typical household consists of 2.1 men, 2 females, and 4.7 children (under 16). Heads of households are about 45 years old; the vast majority are married. Most household heads are illiterate, though there are large differences between urban and rural areas.

Monthly nominal per capita total consumption for Afghan households is 1925 Afghani (slightly more than 1.5 times the poverty line); about 60% of total consumption is spent on food. Table 1 presents weighted estimates for key variables for the nation and by area; the estimates are population characteristics for the country as a whole, as well as by province, and for urban and rural areas.[39] As in many developing countries, poverty in Afghanistan is more prevalent in rural areas.[40] Rural areas often lack basic infrastructure, like roads, electricity and communications; and households often have limited access to basic services, like healthcare and education. Given the dependence on agriculture, rural households are often more susceptible to the impact of natural shocks, like drought. In this context, it is not surprising that total monthly per capita consumption in rural areas is 44% lower than that in urban areas, and that rural households spend a larger share (63%) of total consumption on food than urban households (44%). Rural and urban households also differ in their levels of food security. Although their per capita calorie intake is similar, rural households have lower levels of dietary diversity. These statistics suggest that while calorie intake may be similar across areas, micronutrient intake is not.

Following guidelines from the World Food Programme (WFP, 2008), we create three food consumption profile groups using the recommended cutoffs (of 28 and 42 for populations whose daily diets include sugar and oil) for the food consumption score (FCS). Approximately 20% of all Afghan households have poor or borderline diets, with a disproportionate number in rural areas.

Further differences between rural and urban households can be observed in the calorie and expenditure shares devoted to various food groups. (Table 2) The patterns are consistent with those seen in other low-income countries. Grain, including wheat, breads and other

[39] All point estimates are weighted to reflect population characteristics; all standard errors are corrected for sample stratification and clustering.
[40] World Bank (2008)

cereals, represent 48% of food expenditure and 70% of calorie intake for the national sample. On average, urban households devote significantly fewer resources to grains and dairy and significantly more resources to the other food groups than rural households; household calorie shares follow a similar pattern.We also present the consumption and food security statistics for the other subpopulations examined. (Table 3) Given that agricultural households and wheat producing households are largely situated in rural areas, they have consumption and dietary patterns similar to rural households.

Finally we present select national statistics by quarter (Table 4). Over the survey year, there was a small, statistically insignificant decrease in nominal monthly per capita total and food consumption. But the effects of the price shock can be seen in the inflation-adjusted amounts. We observe a small decrease in real per capita total consumption, but a large decrease in real per capita food consumption. Real monthly per capita food consumption drops by a third, from about 1,200 Afghani to a little less than 800 Afghani. (Quarter 1, Central region urban prices are used as the base for the real amounts.) Calorie and protein intake also suffer declines, as does the average level of dietary diversity. These data provide a broad snapshot of the changing landscape during the global food price crisis; the econometric results below further investigate these patterns by controlling simultaneously for a variety of factors in order to isolate the effects of the price changes on household wellbeing.

4 The Impact of Higher Food Prices on Afghan Households

4.1 Full sample results

Increases in the price of wheat flour are associated with declines in several dimensions of wellbeing for Afghan households. (Table 5 displays the coefficient of interest, log of wheat flour prices; for the full set of coefficients, see Appendix Table 1.[41]) Specifically, a one percent increase in the price of domestic wheat flour is associated with a 0.20 percent decline in real monthly per capita food consumption. Given that wheat prices

[41] The parameter estimates for the control variables mostly follow a logical pattern; for example, we observe that households with higher levels of overall consumption (quintile dummies) have higher levels of food consumption, calorie and protein intake, and dietary diversity. The price of kerosene is an exception in that the sign of the coefficient is contrary to our expectations.

were observed to more than double during the crisis, the magnitude of this effect is large. To illustrate the size of this change, we consider the hypothetical exercise of subtracting from total consumption an amount equal to 20 percent of the value of food consumption (as would be implied from a doubling of wheat prices). With this decline in total consumption, the poverty rate for Afghanistan would increase from 36 percent to 48 percent (Islamic Republic of Afghanistan, 2010).

The estimates based on calories and diversity though, show that households are able to buffer the impact of the large shock in prices to a certain extent. The calorie elasticity is less than half the size of the food consumption elasticity, with a decline in per capita daily calorie intake of 0.07 percent as a result of a one percent increase in wheat flour prices. This relatively smaller effect on calories can be explained by the decline in dietary diversity. A one percent increase in the price of wheat flour is associated with a 0.10 percent decline in the food consumption score. The change in dietary diversity is also reflected in the relatively large decline in daily per capita protein intake; for a one percent increase in price, we observe a 0.25 percent decline in grams of protein consumed per person per day.[42]

The findings suggest that households are trading off quality for quantity. As a result of the price increases and the subsequent decline in purchasing power, households change the composition of their diets in order to maintain calories. In particular, they shift towards lower quality (less nutrient-rich), cheaper foods, thus allowing them to acquire more food to maintain their calories – to the extent possible – in the face of large declines in purchasing power. Diagana *et al.*, (1999) find similar effects – decreases dietary diversity and changes in food consumption patterns – after the devaluation of the CFA franc in 1994.

Table 6 displays the coefficient of interest for regressions that examine changes in food expenditure shares devoted to select food groups as a percentage of total food expenditure. We observe declines in expenditure shares of all food groups except grains, consistent with a story of substitution across food groups and a movement toward staple food consumption. The largest decline is seen in fruit, which can be considered a luxury item.

[42] The reductions in calories and protein may be due in part to skipped meals or reduced portion size; however without data on individual food intake, we cannot identify such changes.

4.2 Differential effects of the price increases

While the repercussions of rising food costs are observed across Afghanistan, the impact differs across rural and urban households. (Table 7; Appendix Table 2 includes the full set of results for all control variables.) The differences are stark; the percentage decline in real monthly per capita food consumption in urban areas (-0.355) is over double the decline in rural areas (-0.186).[43] This evidence is consistent with literature on the global food crisis that demonstrates the disproportionate impact on urban areas, in terms of poverty and total consumption. It is also consistent with the interpretation that we are capturing net sellers with our urban proxy, and net sellers are harmed more by price increases.

The national level evidence indicated that households are not experiencing as large of a decline in caloric intake as they are in the value of food consumption. They appear to be trading off quality for quantity. This tradeoff seems to exist in urban and rural areas, but takes different forms. For urban households, we observe no statistically significant decline in calorie intake for urban households, despite the large reduction in the value of food consumption. For rural households, we observe a decline of -0.0744 percent for for a one percent increase in wheat flour prices (slightly larger than the national estimate). To understand these differences, we turn to changes in the level of dietary diversity and expenditure shares. The results show that urban households experience a large decline in dietary diversity, approximately three times that of rural areas; that is, urban households make relatively large changes in the composition of their diets in order to buffer the shock to calorie intake. The results on expenditure shares reveal that the national level result of an increase in expenditure share on grains is largely driven by urban households. (Table 8)

We next turn to the differential impact of increasing food prices on households that produce wheat (denoted as 'wheat households') and those that have access to agricultural land (denoted 'agricultural households'). (Tables 9 and 10) We observe patterns similar to the rural-urban results, though with smaller magnitudes for the food consumption and food consumption score regressions and with no statistically significant differential impact in protein intake for either group relative to their counterparts. In the regression analysis, the rural-urban distinction is the most striking and best captures the differential impact of the

[43]Recall that the coefficient on the base effect of the price of wheat flour corresponds to the effect for urban households; to get the effect for rural households, we add the coefficient on the interaction term (0.169) to the coefficient on the base term (-0.355).

price shock. As we reclassify households based on other characteristics (wheat-producing, access to agricultural land), the proxy variable then includes more and more rural households in the base category, dampening the significant differences between the two groups. In the Afghanistan context, we view urban households as the best proxy for net buyers.

4.3 The demand for wheat products

We examine changes in the demand for wheat products by calculating per capita daily intake of wheat.[44] (Table 11) Again we find large differences between urban and rural areas. In rural areas, increases in the price of wheat flour reduce demand for wheat products, in line with the basic economic law of demand, i.e., price increases reduce quantity demanded. But in urban areas, we observe just the opposite: an upward-sloping demand curve. We argue that these patterns represent the paradox of Giffen goods in the economics literature.[45] Broadly, the consumer response to a price increase can be classified into two parts: the previously described income and substitution effects. The income effect of a price increase is reflected in a decrease in the consumer's purchasing power, which reduces demand for all *normal* goods and increases demand for *inferior* goods. The substitution effect reflects consumers substituting away from the relatively more expensive good. In the case of Giffen goods, the good is inferior and the income effect dominates the substitution effect. These findings are consistent with Jensen and Miller (2008), who find evidence of Giffen behavior related to rice consumption among impoverished urban households in the Hunan province of China. In Afghanistan, in the case of urban households, our findings suggest that the reduction in real income dominates the relative price increase of wheat; therefore these household increase their consumption of (demand for) wheat products.

4.4 Tests of robustness

We pursue several tests to evaluate the robustness of our coefficient of interest – the coefficient on log of the price of domestic wheat flour. We discuss tests of the national

[44] Wheat products include wheat, wheat flour, naan (Afghan bread) and other items derived from wheat.
[45] The paradox of Giffen goods dates back to Marshall (1895).

results and those of the urban-rural results; tables are available from the authors upon request.

First, we replace our variable of interest with the price of imported wheat flour to see whether households respond differently to changes in the price of imported versus domestic flour; the main results are qualitatively the same. We also replace the price of domestic wheat flour with the prices of domestic wheat and imported wheat, with similar results. Although the magnitudes of some coefficients differ across these models, the basic picture remains the same.

We next include extra controls for household demographics, i.e., the number of males, females and children in household (when the dependent variable is a per capita amount, only the number of children is included). There is no change in the main results. The number of children in a household is often statistically significant; as the number of children increases, real monthly per capita food consumption increases slightly and per capita daily calorie intake decreases.

In a country like Afghanistan, we might be concerned that food aid is an important component of a household's budget and that households receiving food assistance may respond differently to price shocks. We test this hypothesis by excluding the 7% of households that report receiving some form of food assistance over the past year. The results do not change.

We also include indicators of non-food coping mechanisms that a household may employ during the year to examine whether controlling for such differences across households will change the results in a significant manner. We include dummies for households that sold off livestock in the previous year or households that borrowed money to purchase food; the results are robust to such changes.

Finally, we estimate separate regressions for each subpopulation that we examine (rural, urban, agricultural, and wheat households); this allows full flexibility for all the coefficients included in the basic model. That is, instead of including an interaction between the rural dummy and the price of wheat flour in a regression using the full sample, we run separate regressions for rural households and for each group, including only the price of wheat flour and the controls. In all of the cases, the coefficients of interest are substantively

the same; in some cases, allowing more flexibility for the control variables affects the magnitude and significance of their coefficients.

5 Summary and conclusions

With a long history of political instability and conflict, as well as weak infrastructure and mountainous terrain, Afghanistan is particularly vulnerable to economic and natural shocks. The 2007-2008 global food crisis was no exception. Afghanistan experienced rapid increases in the prices of staple foods and other commodities due to both international and domestic factors. Our work makes several contributions in helping to understand how the people of Afghanistan were affected by, and how they coped with, these price shocks. While there has been an abundance of research on the causes of the food crisis, less has been done on household responses to the crisis. The household-level research that exists often uses pre-crisis survey data and simulation methods. We use the nationally-representative NRVA household survey data to assess the impact of rising food prices on household welfare. The data give us the opportunity to capture actual household behavior during the peak of the global crisis, providing rare insight into short-term coping mechanisms in a poor, conflict country.

Over the course of the fieldwork (August 2007 – September 2008), the food price index increased by 40%, with some of the largest price increases (100%) seen in wheat – the Afghan staple. Our analysis examines the food-based coping mechanisms (i.e., reductions in calorie and nutrient intake and dietary diversity) that households employ in the face of such price shocks. During this time, food insecurity (households with per capita daily calorie intake less than 2,100 calories) increased by 10 percentage points to a striking 34% in the fourth quarter; that is, in the summer of 2008 over one-third of Afghan households were unable to meet the minimum daily energy requirements.

We find that increases in the price of wheat flour lead to large reductions in real monthly per capita food consumption, but smaller declines in per capita daily calorie intake. Households are able to buffer the shock to energy intake by changing the composition of their diets. In particular, households move away from nutrient-rich foods like meat, fruits and vegetables towards staples like wheat, seen through changes in the composition of

household expenditures on various food groups in response to the price increases. The large declines in food security experienced by Afghan households potentially can have serious implications. In particular, low levels of dietary diversity have been statistically linked to poor diet quality and inadequate nutrient intake.[46] And micronutrient deficiencies have been linked to multiple negative outcomes for children, as well as adults; these include impaired cognitive development, physical and mental disabilities, child and maternal deaths, and lower productivity (UNICEF, 2004). Additionally, young children, lactating and pregnant women and the chronically ill are particularly susceptible to decreases in nutrient intakes due to their high nutrient requirements.[47]

The quality-quantity trade-off observed at the national level is also observed at the sub-national level, when we look at differences across rural and urban areas. Rural households experience small declines in calorie intake, whereas urban households are able to buffer the shock to calories by reducing the diversity of their diets. We also explore the possibility that access to agricultural land and producing wheat (since net sellers of wheat can benefit from higher prices) can help to buffer the shock of higher prices. We find that these two groups of households are in fact better able to buffer the shock of increasing food prices with respect to their food consumption and dietary diversity; though, with respect to calorie intake, they are unable to buffer as well as their counterparts.

Finally, we find evidence that among certain subpopulations, the demand for wheat products is upward sloping (i.e., Giffen good); specifically, among urban households, large decreases in purchasing power brought about by the spike in staple food prices caused per capita consumption of wheat products to increase as the income effect of the price change dominated the substitution effect.

These new survey data provide a unique opportunity to calculate indicators of socio-economic development and to analyze changes in these outcomes over time.[48] Such analysis

---

[46] See Arimond and Ruel (2004) for evidence from 11 Demographic and Health Surveys worldwide.
[47] World Food Program and UNICEF (2008); See also Grantham-McGregor *et al.* (2001) for a review of studies on iron deficiency and childhood cognitive development.
[48] The Islamic Republic of Afghanistan (2010) has published initial findings in the *National Risk and Vulnerability Assessment 2007/08: a profile of Afghanistan.* The report is being used to better inform policy makers on many dimensions of wellbeing, including progress towards the Millennium Development Goals (MDG). The reduction of hunger – part of MDG1 – is a priority for the Government of Afghanistan and is a target under the Economic and Social Development Pillar of the Afghanistan National Development Strategy. (IMF, 2008)

is particularly crucial in conflict areas, which may be most susceptible to shocks, but which usually have little quantitative data. Our findings inform current policy discussions within Afghanistan and, more generally, within the international development community. They provide valuable information to policymakers and humanitarian agencies as they consider strategies to respond to future crisis.

While the global food crisis has largely subsided, food prices in some countries remain higher than pre-crisis levels. As evidenced by the recent global financial crisis, as markets become more integrated, it becomes more and more difficult for countries to isolate themselves from international shocks. Moreover, recent wildfires and export bans (Russia), as well as flooding (Pakistan) underscore the recent volatile nature of international food prices. Our findings on the short-term household responses to high food prices suggest that were another crisis to occur, many households would resort to cutting back on micronutrient-rich foods, as well as overall calories. Such episodes can exacerbate chronically low levels of nutrient intake in countries with large shares of the population living in poverty with generally poor diets. Further, even if there is only a short stint in poor micronutrient and protein intake, there may be long term repercussions for young children who are in developmental stages. Potential policy interventions could include micronutrient supplementation programs that kick in based on food inflation indicators.

References

Arimond, Mary and Marie T. Ruel. "Dietary Diversity is Associated with Child Nutritional Status: Evidence from 11 Demographic and Health Surveys," *Journal of Nutrition*. Vol. 134. October 2004. 2579-2585.

Barrett, Christopher. "Measuring Food Insecurity," *Science*. Vol. 327. No. 5967. February 12, 2010. 825-828.

Benson, Todd, Samuel Mugarura, and Kelly Wanda. "Impacts in Uganda of rising global food prices; the role of diversified staples and limited price transmission," *Agricultural Economics*. Supplement. Vol. 39. 2008. 513-524.

Black, Robert E., Lindsay H Allen, Zulfiqar A. Bhutta, Laura E. Caulfield, Mercedes de Onis, Majid Ezzati, Colin Mathers, and Juan Rivera. "Maternal and child undernutrition: global and regional exposures and health consequences," *The Lancet*. Vol. 371 January 19, 2008.

Block, Steven A., Lynnda Kiess, Patrick Webb, Soewarta Kosen, Regina Moench-Pfanner, Martin W. Bloem, and C. Peter Timmer. "Macro shocks and micro outcomes: child nutrition during Indonesia's crisis," *Economics and Human Biology*. Vol 2. 2004. 21-44.

Calculation and use of the food consumption score in food security analysis. Rome: World Food Program. February 2008.

Center for Policy and Human Development, UNDP. *Afghanistan Human Development Report 2007, Bridging Modernity and Tradition: Rule of Law and the Search for Justice*. Islamabad: Army Press. 2007.

Chabot, Philippe and Paul A. Dorosh. "Wheat markets, food aid and food security in Afghanistan," *Food Policy*. Vol. 32. 2007. 334-353.

Deaton, Angus. "Rice Prices and Income Distribution in Thailand: A Non-Parametric Analysis," *Economic Journal*. Vol. 99. No. 395. Supplemental conference issue 1989. 1-37.

Deaton, Angus. *The Analysis of Household Surveys*. Baltimore: The Johns Hopkins University Press. 2000.

Deaton, Angus and Salman Zaidi. "Guidelines for Constructing Consumption Aggregates for Welfare Analysis." LSMS Working Paper Series, no. 135, Washington DC: World Bank.2002. available: http://www-wds.worldbank.org/external/default/WDSContentServer/ WDSP/IB/ 2002/07/31/000094946_02071304010552/Rendered/PDF/multi0page.pdf (Retrieved May 26, 2009)

Diagana, Bocar, Francis Akindes, Kimseyinga Savadogo, Thomas Reardon, and John Staatz. "Effects of the CFA franc devaluation on urban food consumption in West Africa: overview and cross-country comparisons," *Food Policy*. Vol. 24. 1999. 465-478.

Diewert, Erwin. "Index Numbers," in *Essays in Index Number Theory*. W.E. Diewert and A.O. Nakamura (eds.). Vol 1. Elsevier Science Publishers: 1993.

Economic Research Service, U.S. Department of Agriculture. *Food Security Assessment, 2008-2009*. GFA-20. June 2009.

FEWS NET. "Afghanistan Food Security Outlook: July to December 2008," July 2008.

FEWSNET. "Afghanistan Food Security Update," January 2008; July 2008.

Food and Agricultural Organization (FAO), United Nations. "Food Security," FAO Policy Brief. Issue 2. June 2006. Available: ftp://ftp.fao.org/es/ESA/policybriefs/pb_02.pdf (Retrieved on April 15, 2010)

Food and Agricultural Organization (FAO), United Nations. *The State of Food Insecurity in the World 2008: High food prices and food security – threats and opportunities*. Rome: FAO. 2008.

Food and Agricultural Organization (FAO), United Nations. FAOSTAT. Rome: FAO. 2009.

Friedman, Jed and James Levinsohn. "The Distributional Impacts of Indonesia's Financial Crisis on Household Welfare: A 'Rapid Response' Methodology" The World Bank Economic Review. Vol. 16. No. 3. 2002. 397-423.

Grantham-McGregor, Sally and Cornelius Ani. "A Review of Studies on the Effect of Iron Deficiency on Cognitive Development in Children," *Journal of Nutrition*. Supplement. Vole 131. 2001. 649S-668S.

Hoddinott, John and Yisehac Yohannes. June 2002. "Dietary Diversity as a Food Security Indicator". IFPRI FCND Discussion Paper No. 136.

International Monetary Fund. "Islamic Republic of Afghanistan: Poverty Reduction Strategy Paper," IMF Country Report 08/153. May 2008.

International Monetary Fund. World Economic Outlook. 2009.

Islamic Republic of Afghanistan, Ministry of Economy, and the World Bank, Economic Policy and Poverty Sector. *Poverty Status in Afghanistan: A Profile Based on the National Risk and Vulnerability Assessment (NRVA) 2007/08*. Kabul: July 2010. [online:] http://siteresources.worldbank.org/AFGHANISTANEXTN/Resources/305984-1264608805475/6739619-1286210806756/AFPovertyReport.pdf [accessed: Oct. 4, 2010].

Ivanic, Maros and Will Martin. April 2008. "Implications of Higher Global Food Prices for Poverty in Low-Income Countries," World Bank Policy Research Working Paper No. 4594.

Jensen, Robert and Nolan Miller. "The Impact of the World Food Price Crisis on Nutrition in China" *Agricultural Economics*. Vol. 39. 2008. 465-476.

Jensen, Robert and Nolan Miller. "Giffen Behavior and Subsistence Consumption," *American Economic Review*. Vol. 94. Iss. 4. 2008. 1553-1577.

Kauermann, Göran and Carroll, Raymond. "A Note on the Efficiency of Sandwich Covariance Matrix Estimation." *Journal of the American Statistical Association*, December 2001. 96(456): 1387-1396.

Kish, Leslie, *Survey Sampling*, New York: Wiley Classics Library Edition, 1995.

Klotz, Christine, Saskia de Pee, Andrew Thorne-Lyman, Klaus Kraemer, and Martin Bloem. "Nutrition in the Perfect Storm: Why Micronutrient Malnutrition will be a Widespread Health Consequence of High Food Prices," *Sight and Life Magazine*. Iss. 2. 2008.

Maletta, Hector. "Winters of Discontent: Seasonal changes in wages and food prices in Afghanistan, 2002-2003," FAO discussion paper. January 2004. Available at ftp://ftp.fao.org/country/afghanistan/Winters_of_discontent.pdf (Retrieved April 15, 2010)

Marshall, Alfred. *Principles of Economics*. London: Macmillan. 1895.

Martin-Prevel, Y., F. Delpeuch, P. Traissac, J-P. Massamba, G. Adoua-Oyila, K. Coudert, and S. Treche. "Deterioration in the nutritional status of young children and their mothers in Brazzaville, Congo, following the 1994 devaluation of the CFA franc," Bulletin of the World Health Organization. Vol.78. Iss. 1. 2000. 108-118.

Mayang, Sari, Saskia de Pee, Martin W. Bloem, Kai Sun, Andrew L. Thorne-Lyman, Regina Moench-Pfanner, Nasima Akhter, Klaus Kraemer and Richard D. Semba. "Higher Household Expenditure on Animal-Source and Non-grain Foods Lowers the Risk of Stunting among Children 0–59 Months Old in Indonesia: Implications of Rising Food Prices," in the supplement: "The Impact of Climate Change, the Economic Crisis, and the Increase in Food Prices on Malnutrition," The Journal of Nutrition. November 25, 2009.

McKenzie, David J. "The Consumer Response to the Mexican Peso Crisis," *Economic Development and Cultural Change*. Vol. 55. Iss. 1. 137-172. October 2006.

National Risk and Vulnerability Assessment 2007/08: a profile of Afghanistan. Kabul: Johoon Printing Press. October 2009.

OXFAM. *The Cost of War: Afghan Experiences of Conflict, 1978-2009*. November 2009.

Persaud, Suresh. "Price Volatility in Afghanistan's Wheat Market," E-Outlook Report No. WHS-10d-01. U.S. Department of Agriculture, Economic Research Service. May 2010.

Reuters. "Afghan census postponed for two years: U.N." June 8, 2008. http://www.reuters.com/article/idUSISL267420080608 (Retrieved April 14, 2010)

Robles, Miguel and Maximo Torero."Understanding the Impact of High Food Prices in Latin America," forthcoming *Economia*.

Rose, Donald, Stephan Meershoek, Carina Ismael, and Margaret McEwan. "Evaluation of a rapid field tool for assessing household diet quality in Mozambique," *Food and Nutrition Bulletin*. June 2002. 181-189.

Ruel, Marie T. "Operationalizing Dietary Diversity: a review of measurement issues and research priorities" *Journal of Nutrition*, Vol. 133. November 2003. 3911S-3926S.

Ruel, Marie T., James L. Garrett, Corinna Hawkes and Marc J. Cohen. "The Food, Fuel, and Financial Crises Affect the Urban and Rural Poor disproportionately: A Review of the Evidence," in supplement: "The Impact of Climate Change, the Economic Crisis, and the Increase in Food Prices on Malnutrition," *The Journal of Nutrition*. Nov. 25, 2009.

Sabry, Zakaria I. and Robert L. Rizek. *Food Composition Tables for the Near East*. Rome: FAO. 1982. (available: http://www.fao.org/DOCREP/003/X6879E/X6879E00.htm#TOC; retrieved on April 15, 2010)

Sanogo, Issa. "The global food price crisis and household hunger: a review of recent food security assessments," *Humanitarian Exchange*. No. 42. March 2009. 8-11.

Simler, Kenneth. "The Short-Term Impact of Higher Food Prices on Poverty in Uganda" World Bank Policy Research Working Paper 5210. February 2010.

Singh, I., L. Squire, and J. Strauss. "The basic model: Theory, empirical results, and policy conclusions" in *Agricultural household models: Extensions, applications, and policy,* edited by I. Singh, L. Squire, and J. Strauss. Baltimore, Md., USA: Johns Hopkins University Press. 1986.

Strauss, John. "Marketed surpluses of agricultural households in Sierra Leone," *American Journal of Agricultural Economics* 66: 321–331. 1984

Thorne-Lyman, Andrew L., Natalie Valpiani, Kai Sun, Richard D. Semba, Christine L. Klotz, Klaus Kraemer, Nasima Akhter, Saskia de Pee, Regina Moench-Pfanner, Mayang Sari and Martin W. Bloem. "Household Dietary Diversity and Food Expenditures Are Closely Linked in Rural Bangladesh, Increasing the Risk of Malnutrition Due to the Financial Crisis," in the supplement: "The Impact of Climate Change, the Economic Crisis, and the Increase in Food Prices on Malnutrition," *The Journal of Nutrition.* November 18, 2009.

Ul Haq, Zahoor, Hina Nazli, and Karl Meilke. "Implications of high food prices for poverty in Pakistan," *Agricultural Economics*. Supplement. Vol. 39. 2008. 477-484.

United Nations Development Program (UNDP). *Human Development Report 2009*. Available: http://hdr.undp.org/en/reports/global/hdr2009/chapters/ (Retrieved April 20, 2010)

UNICEF. *Tracking Progress on Child and Maternal Nutrition: a survival and development priority*. New York: UNICEF. November 2009.

UNICEF/Micronutrient Initiative. *Investing in the future: a united call to action on vitamin and mineral deficiency, Global Report 2009*. Ontario: Micronutrient Initiative. 2009.

United Nations Office on Drugs and Crime (UNODC). *Afghanistan Opium Survey, 2008*. Kabul and Vienna: UNODC. September 2008. http://www.unodc.org/documents/crop-monitoring/Afghanistan_Opium_Survey_2008.pdf (Retrieved April 24, 2010)

Weismann, Doris, Lucy Basssett, Todd Benson, and John Hoddinott. "Validation of the World Food Programme's Food Consumption Score and Alternative Indicators of Household Food Security," IFPRI Discussion Paper 00870. June 2009.

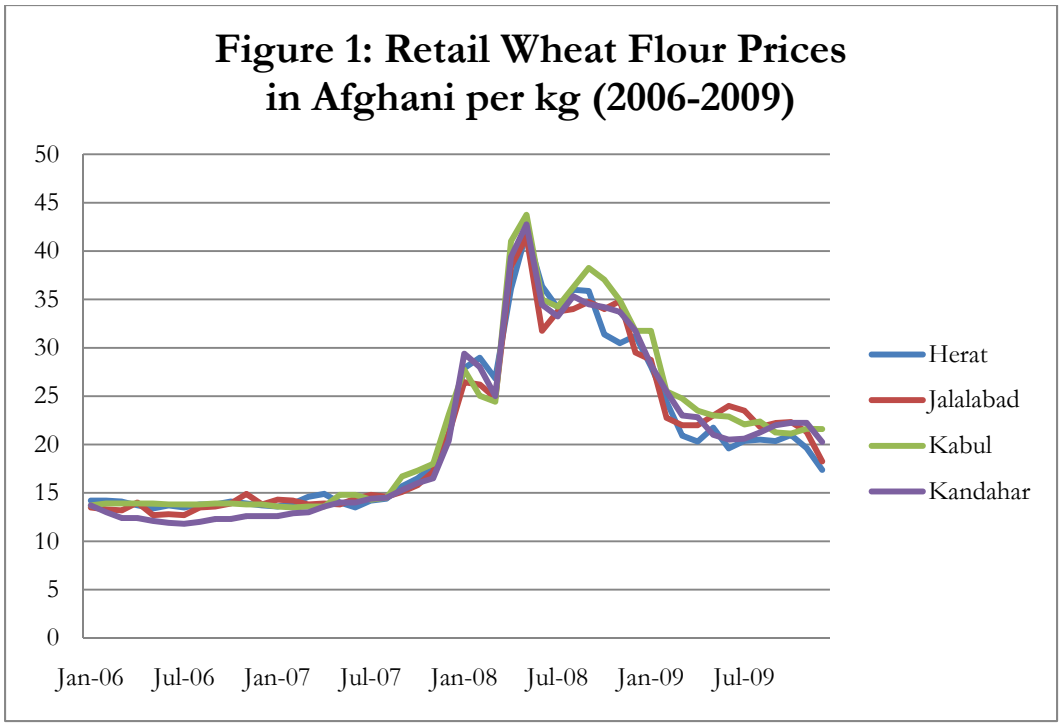
Woden, Quentin, Clarence Tsimpo, Prospere Backiny-Yetna, George Joseph, Franck Adoho, and Harold Coulombe. "Potential Impact of Higher Food Prices on Poverty: Summary of Estimates for a Dozen West and Central African Countries," World Bank Policy Research Working Paper 4745. October 2008.

Wood, Benjamin, Carl Nelson and Lia Nogueira. "Food Price Crisis: Welfare Impacts on Mexican Households" - presented at International Agricultural Trade Research Consortium Research Symposium 2009 – not working paper – do not cite this

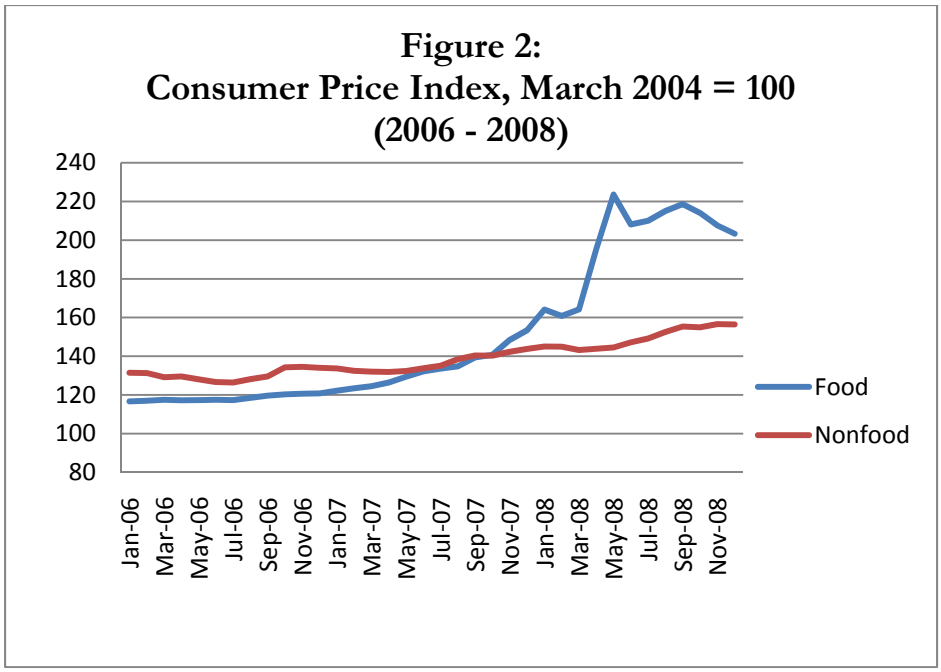
World Bank. *World Development Report 2008: Agriculture for Development*. Washington: The World Bank. 2007.

World Bank. *Intergovernmental Fiscal Relations and Subnational Expenditures in Afghanistan.* Washington, DC. 2008. [Online:] siteresources.worldbank.org/AFGHANISTANEXTN/Resources/305984-1213128265371/5090855-1213585276467/5111745-1217820647673/SNFinancesReport.pdf [July 20, 2010]

World Food Programme and UNICEF. "Increased Food Prices – Interventions required to prevent deterioration of health and nutritional status," Issue Brief. May 2008.



Source: FAO Global Information and Early Warning System (GIEWS)



Source: Central Statistics Organization, Government of Afghanistan

Table 1: Population Statistics by Area

	National	Rural	Urban
Dependent variables			
Nominal per capita total consumption	1925	1675	2930
	(13.46)	(10.60)	(48.49)
Nominal per capita food consumption	1157	1104	1369
	(7.01)	(7.30)	(19.16)
Per capita daily calorie intake	2600	2577	2695
	(11.43)	(13.01)	(23.50)
Per capita daily protein intake	142	134	175
	(4.23)	(4.29)	(12.23)
Food consumption score	60.92	59.56	66.41
	(0.26)	(0.28)	(0.63)
Poor diets (%)	0.05	0.05	0.02
Borderline diets (%)	0.15	0.16	0.13
Acceptable diets (%)	0.80	0.78	0.86
Control variables			
Price of local wheat flour	28.44	28.70	27.43
	(0.17)	(0.19)	(0.37)
Price of vegetable oil (Afghani per kg)	4.38	4.39	4.32
	(0.00)	(0.00)	(0.01)
Price of local rice (Afghani per kg)	3.72	3.72	3.69
	(0.01)	(0.01)	(0.01)
Price of lamb (Afghani per kg)	5.21	5.19	5.27
	(0.00)	(0.00)	(0.00)
Price of milk (Afghani per kg)	3.27	3.25	3.34
	(0.00)	(0.00)	(0.01)
Price of kerosene (Afghani per liter)	48.12	48.45	46.80
	(0.12)	(0.13)	(0.32)
Age of household	44.86	44.43	46.60
	(0.13)	(0.14)	(0.34)
Dummy for married household heads (%)	0.95	0.95	0.94
Dummy for literate household heads (%)	0.32	0.27	0.52
Dummy for plateau areas (%)	0.22	0.26	0.07
Dummy for mountainous areas (%)	0.39	0.48	0.04
Dummy for rural areas (%)	0.80	1.00	0.00
Total observations	20,543	16,463	4,080
Percentage of full sample	100	80.14	19.86

Notes: Estimates are population weighted means. Standard errors, in parentheses, are adjusted for clustering and stratification. *Source:* NRVA 2007/08

Table 2: Calorie and Food Expenditure Composition by Area				
	National	**Rural**	**Urban**	**F statistic**
Calorie shares				
Grains	0.702	0.712	0.663	186*
Meat / fish	0.023	0.023	0.022	0.261
Dairy	0.053	0.058	0.032	445*
Oil / fat	0.117	0.110	0.147	473*
Vegetables	0.037	0.035	0.047	286*
Fruit	0.020	0.017	0.032	106*
Sugar	0.046	0.044	0.053	114*
Expenditure shares				
Grains	0.476	0.484	0.446	38*
Meat / fish	0.119	0.119	0.120	0.113
Dairy	0.098	0.108	0.060	558*
Oil / fat	0.078	0.078	0.080	4*
Vegetables	0.087	0.080	0.116	236*
Fruit	0.060	0.051	0.097	157*
Sugar	0.036	0.036	0.038	8*

Notes: Estimates are population weighted means. The last column presents robust F test statistics of the equality of means for rural and urban households; * denotes a p-value of 1% for the test statistic. *Source:* NRVA 2007/08

Table 3: Population Statistics by Household Type		
	Agricultural HH	**Wheat producing HH**
Nominal per capita total consumption	1752	1639
	(13.36)	(13.63)
Nominal per capita food consumption	1134	1088
	(8.18)	(9.15)
Per capita daily calorie intake	2586	2578
	(14.75)	(17.74)
Per capita daily protein intake	140	131
	(4.74)	(4.79)
Food consumption score	61.57	59.84
	(0.31)	(0.35)
Poor diets (%)	0.04	0.05
Borderline diets (%)	0.14	0.15
Acceptable diets (%)	0.82	0.80
Total observations	11,651	8,204
Percentage of full sample	56.72	39.94

Notes: Estimates are population weighted means. Standard errors, in parentheses, are adjusted for clustering and stratification. Agricultural households denote households that own or operate agricultural land. Wheat producing households denote households that report wheat as their main production crop. *Source:* NRVA 2007/08

Table 4: Population Statistics by Quarter

	Quarter 1 (Fall)	Quarter 2 (Winter)	Quarter 3 (Spring)	Quarter 4 (Summer)
	Full Sample			
Nominal per capita total consumption (Afgani)	2019	1901	1877	1914
Real per capita total consumption (Afgani)	2023	1717	1519	1477
Nominal per capita food consumption (Afgani)	1196	1122	1129	1183
Log real per capita food consumption (Afgani)	1200	960	789	798
Per capita daily calorie intake	2883	2724	2445	2389
Per capita daily protein intake	188	220	92	75
Food consumption score	67.81	61.23	57.85	57.72
Price of local wheat flour (Afghani per kg)	18.09	23.51	34.19	36.50
Price of vegetable oil (Afghani per kg)	4.16	4.33	4.48	4.51
Price of local rice (Afghani per kg)	3.50	3.51	3.82	4.00
Price of lamb (Afghani per kg)	5.20	5.22	5.24	5.18
Price of milk (Afghani per kg)	3.14	3.23	3.28	3.40
Price of kerosene (Afghani per litre)	43.15	45.78	46.83	55.50

Notes: Estimates are population weighted means. Real values reflect adjustments for spatial and temporal price differences, covering 13 months of field work. *Source:* NRVA 2007/08

Table 5: The Impact of Higher Food Prices on Household Wellbeing				
	Log real per capita food consumption	**Log daily per capita calorie intake**	**Log food consumption score**	**Log daily per capita protein intake**
Log Wheat Flour Price	-0.200***	-0.0702***	-0.102***	-0.249***
	[0.0208]	[0.0197]	[0.0241]	[0.0690]
Observations	20500	20491	20496	20491
R-squared	0.657	0.421	0.439	0.306

Notes: Each coefficient is from a separate regression with the dependent variable listed at the top of the column; OLS estimates are population weighted. Robust standard errors -in brackets- are clustered by stratum and adjusted for survey design. Real values reflect adjustments for spatial and temporal price differences, covering 13 months of field work. Controls include dummies for consumption quintiles (bottom quintile excluded); logs of the prices of vegetable oil, local rice, lamb, milk, and kerosene; age of household head, dummy for whether household head is married; dummy for whether household head is literate; dummies for plateau and mountainous areas (plains is excluded category); dummy for rural areas. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.
Source: NRVA 2007/08.

Table 6: Changes in Expenditure Share by Food Group							
	Grain	**Meat/fish**	**Dairy**	**Oil/fat**	**Vegetables**	**Fruit**	**Sugar**
Log Wheat Flour Price	0.191***	-0.0323***	-0.0194***	-0.0309***	-0.0278***	-0.0700***	-0.0121***
	[0.0115]	[0.00852]	[0.00745]	[0.00382]	[0.00441]	[0.00704]	[0.00209]
Observations	20498	20498	20498	20498	20498	20498	20498
R-squared	0.474	0.319	0.261	0.271	0.268	0.285	0.142

See Notes for Table 5. Dependent variable is the household expenditure share devoted to the food group listed at top of column.

Table 7: Differential Impact of Food Prices by Area				
	Log Real Per Capita Monthly Food Consumption	Log Per Capita Daily Calorie Intake	Log Food Consumption Score	Log Per Capita Daily Protein Intake
Log Wheat Flour Price	-0.355***	-0.0179	-0.204***	-0.453***
	[0.0388]	[0.0318]	[0.0349]	[0.109]
Log Wheat Flour Price X Rural Dummy	0.169***	-0.0565**	0.110***	0.221**
	[0.0343]	[0.0280]	[0.0288]	[0.0998]
Observations	20500	20491	20496	20491
R-squared	0.659	0.421	0.44	0.306

See Notes for Table 5. Coefficients of interest are the log of wheat flour price and the interaction between the log of wheat flour price and a dummy for rural areas.

Table 8: Changes in Expenditure Share by Food Group and by Area							
	Grain	Meat/fish	Dairy	Oil/fat	Vegetables	Fruit	Sugar
Log Wheat Flour Price	0.238***	-0.0355***	-0.0338***	-0.0216***	-0.0184**	-0.0998***	-0.0242***
	[0.0182]	[0.0112]	[0.00918]	[0.00544]	[0.00866]	[0.0118]	[0.00314]
Log Wheat Flour Price X Rural Dummy	-0.0509***	0.00347	0.0156**	-0.0100**	-0.0102	0.0322***	0.0131***
	[0.0154]	[0.00885]	[0.00710]	[0.00443]	[0.00821]	[0.0108]	[0.00269]
Observations	20498	20498	20498	20498	20498	20498	20498
R-squared	0.475	0.319	0.261	0.271	0.268	0.287	0.145

See Notes for Table 5. Coefficients of interest are the log of wheat flour price and the interaction between the log of wheat flour price and a dummy for rural areas. Dependent variable is the daily per capita calorie intake from the food group listed at top of column.

Table 9: Differential Impact of Food Prices by Access to Agricultural Land				
	Log Real Per Capita Monthly Food Consumption	Log Per Capita Daily Calorie Intake	Log Food Consumption Score	Log Per Capita Daily Protein Intake
Log Wheat Flour Price	-0.264***	-0.0716***	-0.161***	-0.280***
	[0.0252]	[0.0225]	[0.0263]	[0.0742]
Log Wheat Flour Price X Agricultural HH Dummy	0.0681***	-0.0344**	0.0884***	0.0053
	[0.0204]	[0.0175]	[0.0177]	[0.0511]
Observations	20500	20491	20496	20491
R-squared	0.653	0.408	0.451	0.304

See Notes for Table 5. Coefficients of interest are the log of wheat flour price and the interaction between the log of wheat flour price and a dummy for households that report owning or having access to agricultural land.

Table 10: Differential Impact of Food Prices by Wheat Production				
	Log Real Per Capita Monthly Food Consumption	Log Per Capita Daily Calorie Intake	Log Food Consumption Score	Log Per Capita Daily Protein Intake
Log Wheat Flour Price	-0.251***	-0.0693***	-0.147***	-0.298***
	[0.0234]	[0.0215]	[0.0253]	[0.0738]
Log Wheat Flour Price X Wheat HH Dummy	0.0584***	-0.0489***	0.0806***	0.0437
	[0.0184]	[0.0168]	[0.0170]	[0.0485]
Observations	20500	20491	20496	20491
R-squared	0.652	0.409	0.447	0.303

See Notes for Table 5. Coefficients of interest are the log of wheat flour price and the interaction between the log of wheat flour price and a dummy for households that report wheat as the major crop in the previous growing season.

Table 11: Changes in Wheat Consumption	
	Log Per Capita Daily Wheat Consumption
Log Wheat Flour Price	0.150***
	[0.0546]
Log Wheat Flour Price X Rural Dummy	-0.200***
	[0.0479]
Observations	19325
R-squared	0.218

See Notes for Table 5. Coefficients of interest are the log of wheat flour price and the interaction between the log of wheat flour price and a dummy for rural areas. 1175 households do not report consumption of wheat products.

Appendix Table 1: The Impact of Higher Food Prices on Household Wellbeing				
	Log Real Per Capita Monthly Food Consumption	Log Per Capita Daily Calorie Intake	Log Food Consumption Score	Log Per Capita Daily Protein Intake
Log Wheat Flour Price	-0.200***	-0.0702***	-0.102***	-0.249***
	[0.0208]	[0.0197]	[0.0241]	[0.0690]
Rural	0.167***	0.156***	0.0399***	0.196***
	[0.0119]	[0.0104]	[0.0114]	[0.0318]
Consumption Quintile 2	0.346***	0.222***	0.165***	0.290***
	[0.00770]	[0.00780]	[0.00878]	[0.0163]
Consumption Quintile 3	0.546***	0.331***	0.248***	0.454***
	[0.00831]	[0.00843]	[0.00929]	[0.0203]
Consumption Quintile 4	0.757***	0.440***	0.342***	0.694***
	[0.00977]	[0.00954]	[0.0104]	[0.0247]
Consumption Quintile 5	1.127***	0.596***	0.484***	1.141***
	[0.0123]	[0.0113]	[0.0112]	[0.0314]
Log Vegetable Oil Price	-0.0568*	0.0570*	0.0187	0.324***
	[0.0337]	[0.0343]	[0.0394]	[0.105]
Log Local Rice Price	0.0334	-0.0830***	0.0840***	-0.434***
	[0.0223]	[0.0207]	[0.0228]	[0.0972]
Log Lamb Price	-0.120**	-0.046	-0.027	0.0106
	[0.0543]	[0.0502]	[0.0571]	[0.136]
Log Milk Price	-0.00282	-0.0721***	-0.0191	-0.354***
	[0.0267]	[0.0247]	[0.0250]	[0.0631]
Log Kerosene Price	0.107**	0.109**	-0.0890*	0.554***
	[0.0444]	[0.0433]	[0.0468]	[0.123]
Head Age	0.000497***	0.000320*	0.00185***	0.00207***
	[0.000188]	[0.000187]	[0.000174]	[0.000492]
Head Married	0.0142	-0.0396***	0.0924***	-0.00513
	[0.0104]	[0.00927]	[0.00940]	[0.0255]
Head Literate	0.0101*	0.0365***	-0.0417***	-0.0149
	[0.00585]	[0.00538]	[0.00545]	[0.0166]
Plateau	0.00244	0.000457	0.00548	0.0193
	[0.0126]	[0.0114]	[0.0139]	[0.0285]
Mountainous	0.00341	0.00207	0.00992	0.0485*
	[0.0118]	[0.0115]	[0.0130]	[0.0291]
Observations	20500	20491	20496	20491
R-squared	0.657	0.421	0.439	0.306

Notes: Each column represents a separate regression; OLS estimates are population weighted. Robust standard errors -in brackets- are clustered by stratum and adjusted for survey design. Real values reflect adjustments for spatial and temporal price differences, covering 13 months of field work. Consumption quintile 1 is excluded. Plains is excluded topography category. *, **, and *** denote significance at 10%, 5%, and 1%, respectively. *Source:* NRVA 2007/08.

Appendix Table 2: The Impact of Higher Food Prices on Household Wellbeing				
	Log Real Per Capita Monthly Food Consumption	Log Per Capita Daily Calorie Intake	Log Food Consumption Score	Log Per Capita Daily Protein Intake
Log Wheat Flour Price	-0.355***	-0.0179	-0.204***	-0.453***
	[0.0388]	[0.0318]	[0.0349]	[0.109]
Log Wheat Flour Price X Rural Dummy	0.169***	-0.0565**	0.110***	0.221**
	[0.0343]	[0.0280]	[0.0288]	[0.0998]
Rural	-0.389***	0.343***	-0.323***	-0.533
	[0.115]	[0.0943]	[0.0965]	[0.342]
Consumption Quintile 2	0.349***	0.221***	0.167***	0.293***
	[0.00765]	[0.00780]	[0.00878]	[0.0161]
Consumption Quintile 3	0.550***	0.329***	0.251***	0.460***
	[0.00827]	[0.00844]	[0.00930]	[0.0200]
Consumption Quintile 4	0.763***	0.438***	0.346***	0.703***
	[0.00977]	[0.00959]	[0.0104]	[0.0240]
Consumption Quintile 5	1.132***	0.595***	0.488***	1.148***
	[0.0123]	[0.0112]	[0.0113]	[0.0316]
Log Vegetable Oil Price	-0.0371	0.0504	0.0316	0.350***
	[0.0336]	[0.0344]	[0.0394]	[0.105]
Log Local Rice Price	0.0331	-0.0830***	0.0838***	-0.434***
	[0.0222]	[0.0206]	[0.0227]	[0.0976]
Log Lamb Price	-0.112**	-0.0489	-0.0214	0.0217
	[0.0532]	[0.0504]	[0.0570]	[0.137]
Log Milk Price	0.00938	-0.0762***	-0.0112	-0.338***
	[0.0266]	[0.0248]	[0.0249]	[0.0631]
Log Kerosene Price	0.123***	0.104**	-0.0789*	0.574***
	[0.0442]	[0.0436]	[0.0469]	[0.123]
Head Age	0.000493***	0.000322*	0.00185***	0.00206***
	[0.000188]	[0.000187]	[0.000174]	[0.000489]
Head Married	0.0141	-0.0396***	0.0924***	-0.00513
	[0.0104]	[0.00928]	[0.00943]	[0.0255]
Head Literate	0.0112*	0.0361***	-0.0410***	-0.0134
	[0.00585]	[0.00537]	[0.00545]	[0.0165]
Plateau	0.00316	0.000218	0.00595	0.0202
	[0.0125]	[0.0115]	[0.0139]	[0.0283]
Mountainous	0.00401	0.00188	0.0103	0.0493*
	[0.0118]	[0.0116]	[0.0130]	[0.0290]
Observations	20500	20491	20496	20491
R-squared	0.659	0.421	0.44	0.306

Notes: Each column represents a separate regression; OLS estimates are population weighted. Robust standard errors -in brackets- are clustered by stratum and adjusted for survey design. Real values reflect adjustments for spatial and temporal price differences, covering 13 months of field work. Consumption quintile 1 is excluded. Plains is excluded topography category. *, **, and *** denote significance at 10%, 5%, and 1%, respectively. *Source:* NRVA 2007/08.