

Improving Nutritional Status of Women from Low Income Households' in Bangladesh: A Rural-Urban Comparison

by

Afifa Shahrin

M.S.S. (Economics), University of Dhaka, 2006

B.S.S. (Economics), University of Dhaka, 2005

RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF PUBLIC POLICY

in the

School of Public Policy

Faculty of Arts and Social Sciences

© Afifa Shahrin 2012

SIMON FRASER UNIVERSITY

Spring 2012

All rights reserved.

However, in accordance with the *Copyright Act of Canada*, this work may be reproduced, without authorization, under the conditions for "Fair Dealing." Therefore, limited reproduction of this work for the purposes of private study, research, criticism, review and news reporting is likely to be in accordance with the law, particularly if cited appropriately.

Approval

Name: Afifa Shahrin
Degree: M.P.P
Title of Capstone: Improving Nutritional Status of Women from Low Income Households' in Bangladesh: A Rural-Urban Comparison

Examining Committee:

Chair: Nancy Olewiler
Director, School of Public Policy, SFU

John Richards
Senior Supervisor
Professor, School of Public Policy, SFU

Royce Koop
Assistant Professor, School of Public Policy, SFU

Jon Kesselman
External Examiner
Professor, School of Public Policy, SFU

Date Defended/Approved: April 13, 2012

Partial Copyright Licence



The author, whose copyright is declared on the title page of this work, has granted to Simon Fraser University the right to lend this thesis, project or extended essay to users of the Simon Fraser University Library, and to make partial or single copies only for such users or in response to a request from the library of any other university, or other educational institution, on its own behalf or for one of its users.

The author has further granted permission to Simon Fraser University to keep or make a digital copy for use in its circulating collection (currently available to the public at the "Institutional Repository" link of the SFU Library website (www.lib.sfu.ca) at <http://summit/sfu.ca> and, without changing the content, to translate the thesis/project or extended essays, if technically possible, to any medium or format for the purpose of preservation of the digital work.

The author has further agreed that permission for multiple copying of this work for scholarly purposes may be granted by either the author or the Dean of Graduate Studies.

It is understood that copying or publication of this work for financial gain shall not be allowed without the author's written permission.

Permission for public performance, or limited permission for private scholarly use, of any multimedia materials forming part of this work, may have been granted by the author. This information may be found on the separately catalogued multimedia material and in the signed Partial Copyright Licence.

While licensing SFU to permit the above uses, the author retains copyright in the thesis, project or extended essays, including the right to change the work for subsequent purposes, including editing and publishing the work in whole or in part, and licensing other parties, as the author may desire.

The original Partial Copyright Licence attesting to these terms, and signed by this author, may be found in the original bound copy of this work, retained in the Simon Fraser University Archive.

Simon Fraser University Library
Burnaby, British Columbia, Canada

Ethics Statement



The author, whose name appears on the title page of this work, has obtained, for the research described in this work, either:

- a. human research ethics approval from the Simon Fraser University Office of Research Ethics,

or

- b. advance approval of the animal care protocol from the University Animal Care Committee of Simon Fraser University;

or has conducted the research

- c. as a co-investigator, collaborator or research assistant in a research project approved in advance,

or

- d. as a member of a course approved in advance for minimal risk human research, by the Office of Research Ethics.

A copy of the approval letter has been filed at the Theses Office of the University Library at the time of submission of this thesis or project.

The original application for approval and letter of approval are filed with the relevant offices. Inquiries may be directed to those authorities.

Simon Fraser University Library
Burnaby, British Columbia, Canada

update Spring 2010

Abstract

This study analyzes the nutritional status of women from low income households in Bangladesh. The key policy issue is inadequacy of protein and micronutrients in the regular diet of low income women. Women's poor nutritional condition results in long-term health problems and pregnancy-related disorders that pass from one generation to the next. On the basis of a primary survey on about 800 married women in rural, urban and suburban areas in Bangladesh, this study identified a number of underlying factors related to women's poor nutritional status. These include illiteracy and low education, poor economic conditions, addiction to tobacco, drinking unclean water, not having nutritional supplements, ineffective services by community health workers, and ongoing food price hikes. This study proposes several short-term, low-cost policy alternatives to address the cited dietary deficiencies of low income women in Bangladesh.

Keywords: malnutrition; health; Bangladesh; women; food score; BMI

Dedication

To my mother and Shimon

Acknowledgements

I would like to thank all the people who supported and inspired me during my educational life. I am deeply indebted to John Richards, my supervisor for all the valuable guidance, inspiration and affection not only during this capstone work but throughout the past two years. I never could reach here if I did not meet Professor Richards. Thanks to J. Rhys Kesselman, for his valuable comments and feedbacks as my external examiner. Thanks to Nancy Olewiler for all her guidance during my journey to the MPP program.

Thanks to all people in Dhaka who helped me to undertake such an ambitious survey. Thanks to Karen Lund, coordinator of the nursing college at the International University of Business, Agriculture and Technology (IUBAT) in Dhaka, Alimullah Miyan, Vice-Chancellor of IUBAT, and Narayan Chandra Das from BRAC, Bangladesh for their support. Thanks to all surveyors who worked effectively to collect the data. Thanks to all officials of BRAC and IUBAT who helped me to organize the focus group discussions in Dhaka and Jamalpur. Thanks to Jesse Joice from my thesis group and also to all my classmates. Thanks Arno Kamolika for helping me during the data entry work. Special thanks to Georgia Gulden from the Asian University of Women, Bangladesh and Christine Sommers from OASIS Hospital, Bangladesh for sharing their collected data for my capstone work. Many thanks also to CARE Society, Canada for the award during my co-op term. A special thanks to the Department of Economics, SFU for offering me TA jobs during my MPP program.

Last but not least I would like to thank Shuhash Shimon, my husband for all the little discussions during the survey, during the capstone work and most importantly to always be my side in this journey.

Table of Contents

| | |
|--|-----------|
| Approval..... | ii |
| Abstract..... | iii |
| Dedication..... | iv |
| Acknowledgements..... | v |
| Table of Contents..... | vi |
| List of Tables..... | ix |
| List of Figures..... | x |
| List of Acronyms..... | xii |
| Executive Summary..... | xiii |
| | |
| 1. Introduction..... | 1 |
| | |
| 2. Background..... | 3 |
| | |
| 3. Methodology..... | 19 |
| 3.1. Description of the Sample..... | 19 |
| 3.2. Sampling technique..... | 21 |
| 3.3. Questionnaire Design..... | 22 |
| 3.3.1. Diet recall..... | 22 |
| 3.3.2. Sources of minerals and vitamins..... | 23 |
| 3.3.3. Hygiene and Cleanliness..... | 23 |
| 3.3.4. Smoking and Betel nut chewing..... | 23 |
| 3.3.5. Awareness and Education..... | 23 |
| 3.3.6. Assets and Income..... | 23 |
| 3.3.7. Demographic information..... | 24 |
| 3.3.8. Self-assessed questions..... | 24 |
| 3.3.9. Price Information..... | 24 |
| 3.4. The survey and its limitations..... | 24 |
| 3.5. Focus group discussions..... | 25 |
| | |
| 3.A. Chapter 3: Tables and Figures..... | 27 |
| | |
| 4. Descriptive Statistics..... | 33 |
| 4.1. Dependent Variables..... | 34 |
| 4.2. Independent Variables..... | 36 |
| 4.2.1. Education of woman..... | 36 |
| 4.2.2. Education of husband..... | 37 |
| 4.2.3. Household's highest level of education..... | 37 |
| 4.2.4. Occupation of women..... | 38 |
| 4.2.5. Occupation of husbands..... | 38 |
| 4.2.6. Age of woman..... | 39 |
| 4.2.7. Structure of family..... | 39 |
| 4.2.8. Addictions to tobacco..... | 40 |
| 4.2.9. Addictions to betel-nut..... | 41 |

| | |
|--|------------|
| 4.2.10. Households' income index | 41 |
| 4.2.11. Advice on nutritional diet | 41 |
| 4.2.12. Intra-household food distribution | 42 |
| 4.2.13. Hygiene and cleanliness of the household | 43 |
| 4.2.14. Women's consumption of nutritional supplements..... | 43 |
| 4.2.15. Effects of Inflation | 44 |
| 4.A. Chapter 4: Tables and Figures..... | 45 |
| 5. Analysis..... | 60 |
| 5.1. The Education-Nutrition Link..... | 60 |
| 5.1.1. Women's education..... | 60 |
| 5.1.2. Husband's education and highest household education level..... | 61 |
| 5.2. Gender-Nutrition | 62 |
| 5.3. Hygiene-Nutrition..... | 63 |
| 5.4. Income-Nutrition | 63 |
| 5.5. Advice-Nutrition | 64 |
| 5.6. Nutritional supplements-Nutrition | 65 |
| 5.7. Addictions-Nutrition | 65 |
| 5.8. Inflation-Nutrition | 66 |
| 6. Policy Analysis | 67 |
| 6.1. Policy options | 67 |
| 6.1.1. Option 1: Nutritional supplements | 67 |
| 6.1.2. Option 2: Hygienic drinking water..... | 69 |
| 6.1.3. Option 3: Healthy food initiative through social enterprises | 71 |
| 6.1.4. Option 4: Behaviour change through nutritional advice | 73 |
| 6.1.5. Option 5: Controlling consumption of tobacco | 73 |
| 6.1.6. Option 6: Status quo | 76 |
| 6.2. Criteria for Analysis | 77 |
| 6.2.1. Effectiveness..... | 77 |
| 6.2.2. Cost | 78 |
| 6.2.3. Administrative feasibility..... | 78 |
| 6.2.4. Public acceptance..... | 79 |
| 6.3. Assessment of options..... | 79 |
| 6.3.1. Evaluation of Nutritional supplements program | 79 |
| 6.3.2. Evaluation of providing hygienic drinking water | 81 |
| 6.3.3. Evaluation of healthy food initiative through social enterprises..... | 83 |
| 6.3.4. Evaluation of behaviour change through nutritional advice..... | 84 |
| 6.3.5. Evaluation of tobacco control | 85 |
| 7. Conclusion and Recommended policies | 88 |
| References..... | 91 |
| Appendices..... | 102 |
| Appendix A: Survey Questionnaire | 103 |

| | |
|---|-----|
| Appendix B: Food Scoring Method | 113 |
| Appendix C: Income and Asset Index Calculation | 116 |
| Appendix D: Results from cross tabulations | 117 |

List of Tables

| | |
|--|----|
| Table 4.1. Distribution of food scores, by rural, urban and suburban samples (percent) | 35 |
| Table 4.2. Average food scores, by rural, urban and suburban samples and question | 58 |
| Table 4.3. Distribution of Household per capita Income (percent) | 58 |
| Table 4.4. Distribution of the sources of advice on healthy food (percent) | 58 |
| Table 4.5. Distribution of the nutritional supplements consumption (percent) | 59 |
| Table 6.1. Rates of tobacco taxes in Bangladesh, 2009 | 74 |
| Table 6.1. Policy Matrix | 87 |
| Table 7.1. Setting priorities of the policy options, by implementing agency | 89 |

List of Figures

| | |
|---|----|
| Figure 2.1. Map of Bangladesh..... | 4 |
| Figure 2.2. Framework for maternal mortality and morbidity | 10 |
| Figure 3.1. Location of rural sample area | 27 |
| Figure 3.1.1. The map of Jamalpur district | 27 |
| Figure 3.1.2. Location of the Kendua thana in the map Jamalpur Sadar upazila | 28 |
| Figure 3.2. Location of urban sample area..... | 29 |
| Figure 3.2.1. The map of Dhaka city..... | 29 |
| Figure 3.2.2. Location of urban (Uttara, Dhaka) sample area | 30 |
| Figure 3.3. Location of suburban sample area..... | 31 |
| Figure 3.3.1. The map of the Chittagong district..... | 31 |
| Figure 3.2.2. The map of suburban (Raozan) sample area..... | 32 |
| Figure 4.1. Distribution of Body Mass Index, Rural, Urban and Suburban Samples..... | 45 |
| Figure 4.2. Distribution of Food Scores, Rural, Urban and Suburban Samples..... | 46 |
| Figure 4.3. Distribution of food scores, Rural, Urban and Suburban Samples, by individual questions | 47 |
| Figure 4.3. Distribution of food scores, Rural, Urban and Suburban Samples, by individual questions | 48 |
| Figure 4.4. Distribution of Literacy of Women | 48 |
| Figure 4.5. Distribution of Women’s highest class attendance | 49 |
| Figure 4.6. Distribution of husband’s literacy | 49 |
| Figure 4.7. Distribution of husband’s highest class attendance..... | 50 |
| Figure 4.8. Distribution of households’ highest class attendance | 50 |
| Figure 4.9. Distribution of occupation of women | 51 |
| Figure 4.10. Distribution of occupation of husbands | 51 |
| Figure 4.11. Distribution of the age of women..... | 52 |
| Figure 4.12. Distribution of the structure of family..... | 52 |
| Figure 4.13. Distribution of households, by number of members smoking tobacco | 53 |
| Figure 4.14. Share of spouses smoking tobacco | 53 |
| Figure 4.15. Distribution of estimated monthly expenditure on tobacco, by households with smokers..... | 54 |
| Figure 4.16. Distribution of households, by number of members chewing betel-nut | 54 |
| Figure 4.17. Share of spouses chewing betel-nut..... | 55 |

| | |
|---|----|
| Figure 4.18. Distribution of estimated monthly expenditure on betel-nut, by households with betel-nut chewers | 55 |
| Figure 4.19. Distribution of households' food distribution pattern | 56 |
| Figure 4.20. Distribution of drinking water, by source | 56 |
| Figure 4.21. Distribution of the reasons for less food consumption | 57 |

List of Acronyms

| | |
|----------|---|
| ADB | Asian Development Bank |
| BMI | Body Mass Index |
| BBS | Bangladesh Bureau of Statistics |
| BRAC | Bangladesh Rural Advancement Committee |
| ESCAP | Economic and Social Commission for Asia and Pacific |
| FAO | Food and Agriculture Organization |
| ICDDR, B | International Centre for Diarrheal Disease Research, Bangladesh |
| NGO | Non Government Organization |
| SEWA | Self Employed Women's Association, |
| UNICEF | United Nations Children's Emergency Fund |
| UNDP | United Nations Development Programme |
| UNFPA | The United Nations Population Fund |
| WFP | World Food Programme |
| WHO | World Health Organization |

Executive Summary

The lack of protein and micronutrients in the regular diet of low income women in Bangladesh is the key policy problem identified in this study. The objective of this study is to assess the nutritional status of this population group and to provide low-cost and easily implementable policy suggestions to improve their nutritional status.

In order to identify the problem, primary data on 24-hours diet of 1,015 women residing in rural, urban and suburban areas of Bangladesh was collected. Rural and urban women are from low income households. It was found that a majority of women from all three categories of households consume optimum calories (measured by body-mass index). However, a large proportion does not have adequate servings from the full range of food groups (measured by a method called 'food record scoring' by the WHO). Women scored particularly poorly in their consumption of vegetables, fruits, milk and milk products. In the long run such inadequacy of protein and micronutrients results poor health of women, pregnancy-related diseases, low-birth-weight children and sometimes the death of both mother and children at childbirth.

Using cross-tabulation analysis, this study identified a number of variables that are associated with the nutritional status of women. The factors include women's literacy and highest class attended, their husbands' and other household members' education; household members' addiction to smoking and betel-nut chewing; access to hygienic source of drinking water; households' income and assets; advice on nutritional food from radio, television, poster, health facilities, doctors, and nurses and food price hikes. The ineffectiveness of nutritional advice from community health workers justified the recently identified lack of presence of adequate education and enthusiasm among health workers of Bangladesh. One interesting finding in this study is the lack of awareness about fortified food and micronutrients among the sample women.

On the basis of the crosstab analysis, this study identified six policy options such as nutritional supplements, tobacco control, providing hygienic drinking water, healthy food initiative through social enterprises, behaviour change through nutritional advice and status quo. Those policies could be implemented in various ways in the context of

Bangladesh. Each policy option was analysed on the basis of 4 criteria: effectiveness, cost (USD), administrative feasibility and public acceptance. Finally the study ranked the policy options identifying specific modes of implementation. The policy analysis and suggestions focused on low cost and most effective options. As a result I did not discuss education of women or income generation as policy options, though they were found to be important factors associated with women's nutritional status.

This study distinguished policy suggestions on the basis of implementation by government and NGOs. Two policy options were identified to be implemented by NGOs in Bangladesh. Increasing salaries and training of community health workers ranked first among the policy options for NGOs. Household gardening in rural and suburban areas ranked as second.

Providing nutritional supplements through selling fortified rice at a subsidized price to the ultra poor (who live below USD 1.00 per day) for a short time period has ranked first among all of the policy options to be implemented by the government. It is expected that eventually price will decrease with large scale production and people will be habituated to eating fortified rice. Constructing shallow tube-wells in urban slums ranked second. Distributing *Siraj mix*, a kind of water purification tablet ranked as third. Television advertisement on nutrition and health was found to be the fourth important policy alternative. Banning of all type of tobacco and tobacco products advertisement and restriction on their selling ranked as fifth due to indirect association with women's health and nutrition.

1. Introduction

Protein and micronutrient deficiencies are the most common nutritional problems in almost all developing countries. The acuteness of these problems among women and children are of concern to both researchers and policy makers. Among the targets of the millennium development goals is an emphasis on reducing hunger, maternal and infant mortality, as well as improving the health of mothers and children. An overall long term development approach is useful to address these problems. At the same time, simple and less costly reforms can often yield significant improvement of people's health and nutrition.

This paper identifies the nature of the nutritional problems among low-income women in the context of Bangladesh, a populous less-developed country in South Asia. The reason for choosing women from low-income households is that they are among the most disadvantaged in the population. These women are often deprived of the basic necessities such as basic nutrition, health care or education.

The objective of this study is to provide policy suggestions to improve low-income women's nutritional status. In this regard this paper identifies the inadequacy of protein and micronutrients in their regular diet as the policy problem. The study analyzes a sample of women selected through a primary survey in both rural and urban Bangladesh.

Policy options are analyzed with specific criteria such as effectiveness, monetary cost, administrative feasibility and public acceptance. Though my study considers the importance of a long-term total approach to address women's nutritional deficiencies, I focus on short-term and low-cost policies, which are easy to implement in the context of a less-developed country like Bangladesh.

This study is organized as follows. Chapter 2 gives a background on the basis of existing literature about Bangladesh, rural and urban lives, nature of food consumption

of the population, women's overall health and nutritional status, and the associated factors determining women's health and nutrition. Chapter 3 discusses the methodology of this study, including a description of the sample, sampling technique and the questionnaire used. Chapter 4 describes the basic characteristics of dependent and independent variables. Chapter 5 analyzes the relationship between women's nutritional status and explanatory problems. Chapter 6 identifies a number of short-run, low-cost policy options motivated by the identified relationship between women's nutritional status and other variables in chapter 5. The policy options are analyzed with specific criteria. Finally chapter 6 provides policy recommendations.

2. Background

2.1 About Bangladesh

Bangladesh is a republic in South Asia, bordered on the south by the Bay of Bengal, on the west and north by India, and on the east by Myanmar and India. It is a country with a small area of 144 thousand square kilometres¹ and a large population of 150 million. Bangladesh is the 12th most densely populated country in the world with 1,040 people per square kilometre².

Bangladesh became an independent state in 1971 after a nine-month war of liberation with West Pakistan. From the end of the British Raj in 1947 until 1971 it was the unhappy eastern partner in a federation dominated by West Pakistan. In spite of political turmoil and corruption, the country has in the last two decades been maintaining a moderate rate of economic growth and social development.³ According to the World Bank the annual per capita real income of Bangladesh for year 2009 is USD 475. The growth rate of the annual per capita real income for the decade 2000-2009 is 3.6 percent⁴. This growth has been mainly due to its export-oriented readymade garment industry, remittances sent by the overseas workers, and growth of the manufacturing and service sector. Social services provided by large non-government organizations (NGOs) – such as microcredit supplied by Grameen and non-formal primary schools by BRAC – have been major supplements to government programs. It is often argued however that the wide-spread corruption and poor governance since the birth of the

¹ Bangladesh Bureau of Statistics 2011

² Bangladesh Bureau of Statistics 2011, United Nations 2008

³ Bangladesh Bureau of Statistics 2011

⁴ The World Bank 2011

country has been hampering its process of development. Bangladesh ranked as the 13th from the bottom in the latest corruption perception index⁵ prepared by Transparency International (December 2011).

Figure 2.1. Map of Bangladesh



Note. The red-circled areas are the sample areas for this study

⁵ A lower ranking in the corruption perception index implies a higher level of corruption (Transparency International 2011)

As of 2009, 61 percent of the population in Bangladesh had completed primary school, a percent well below India and Sri Lanka, but on a par with Pakistan.⁶ Nonetheless, government policy to make female education free up to class 12 has contributed to a doubling of the female literacy rate from 25 percent in 1991 to 51 percent in 2011.⁷ Life expectancy at birth is 66.6 years. Despite some progress in major socio- economic indicators, about 50 percent in the country are living below \$1.25 per day.⁸ The maternal mortality per 100,000 live births is 340.⁹ In terms of human development Bangladesh ranked 146 among 187 countries, with a low human development index value according to UNICEF (HDR 2011).

2.2 Rural and Urban areas of Bangladesh

In spite of rapid urbanization in the country during recent decades – Dhaka is the world’s 9th largest city with a population approaching 20 million – about 72 percent of the population in Bangladesh lives in rural areas.¹⁰

Urban areas have greater inequality in terms of income and standard of living compared to rural areas (Bose and Dey 2007). Though urban residents have more access to education, health care and other services, often the urban poor cannot access these services. Nonetheless, during 1990-2000 the urban population in Bangladesh grew at an annual rate of 5.6 percent, the highest in South Asia (BBS 2003). Lacking adequate education and skills, urban migrants do not get employment in the formal sector and end up working in the informal sector as rickshaw pullers, van and auto drivers, construction workers and day labourers. A few, with better education and skills,

⁶ The World Development Indicators 2011

⁷ The World Development Indicators 2011

⁸ The World Development Indicators 2011

⁹ The World Development Indicators 2011

¹⁰ Population Division, United Nations 2011

find jobs as low-skilled office employees and garment workers (Hossain 2006). In rural areas the major income earners are agricultural workers on own or on others' lands or as day labourers. They may own small businesses such as handicrafts and poultry farms.

2.3 Food consumption patterns in Bangladesh

Rice is the basic staple food in Bangladesh. Generally, people in Bangladesh consume rice twice per day along with curries made with fishes, meats, eggs, vegetables, lentils cooked with a number of spices. The quantity and quality of food greatly vary with the economic well-being of households. Among the poor, food consumption is highly responsive to changes in income (Ahmed 1993). Taste, education, geography, religion and the number of household members also influence food consumption patterns (Bhat et al. 2002). Generally upper-income-class people residing in urban areas have breakfast in the morning with *roti* (unleavened bread), puffed rice and tea.

Tea is a popular drink in both urban and rural areas. Milk consumed with tea is often the only source of calcium and vitamin D among the poor. Milk, fruits, meat and fish are on occasion consumed by the poor but, as we will show, often not in sufficient quantities. In recent years the typical food bundle among the poor has shifted to fashionable but nutritionally poor food items such as chips, biscuits, *samosas*, chocolates, and cold drinks (such as Coke), and away from traditional more nutritious items such as fish, meat, fruits, vegetables and eggs or milk products (Halder et al. 2003).

2.4 Women's health and nutritional status in Bangladesh

Malnutrition among women is a serious problem in Bangladesh – as in many other developing countries. Protein-energy malnutrition (PEM), iron deficiency anaemia (IDA), iodine deficiency disorders (IDDs) and vitamin A deficiency are common (UNICEF 2010; Latham 1997). Malnutrition is a major cause of the high maternal mortality rate in

Bangladesh, a rate second only to Pakistan among South Asian countries (UNICEF 2011). The World Food Program (2004) has estimated the prevalence of anaemia among pregnant women in Bangladesh in 2004 was 47 percent. Malnutrition passes from one generation to the next generation as malnourished mothers give birth to malnourished children (UNICEF 2011). According to the Bangladesh Demographic and Health Survey (2004), among adult women (15-49 years) one-third were found underweight (BMI < 18.5).

There exist regional differences in the health and nutritional status of women. Generally people living in the slums of Dhaka region consume more calories than those living in slums of other regions. In a study of 1900 slum households located in Dhaka, Chittagong, Khulna and Rajshahi (Benson 2007), 24 percent of Dhaka slum households consumed less than 80 percent of the recommended calorie intake. The comparable statistic for Khulna was 31 percent, for Chittagong 36 percent, Rajshahi 40 percent (Benson 2007). Among a sample of 120 women living in an urban slum near Dhaka city, about 12 percent did not have adequate calorie intake in their diet to achieve a body mass index (BMI) above the traditional threshold of 18.5 (Richards et al. 2010). Bloem et al. (2004) found more than 20 percent of slum women in Dhaka suffering chronic energy deficiency (BMI < 18.5); in Chittagong and Khulna about 35 percent of slum women suffered chronic deficiency.

Studies on low-income women's health and nutritional status in the context of Bangladesh mostly concentrate on urban and suburban slums. Few studies give a comparative simultaneous picture of rural and urban women's health status. Among adolescent girls (ages 13-18 years) in rural Bangladesh 26 percent were found to be 'thin' and 32 percent 'stunted' (Alam et al. 2010). A comparative rural/urban study (Rout et al. 2009) on 15-49 years old married women living in Orissa, a less developed state in India, the BMI distribution of rural women was worse than for urban women. Another study (Corsi et al. 2011) found very limited, though increasing evidence of obesity among women living in Dhaka region and other urban centres of the country. In the context of Bangladesh where many people struggle to get adequate calories, obesity has been considered a much less serious problem than insufficient calorie intake.

The question arises whether low-income women who have an adequate calorie intake are getting a balanced diet. If not, is there any way to improve the quality of their diet at a reasonable cost – to either government or relevant NGOs? This is the central policy problem addressed in this study. Food security in Bangladesh has often been assessed on the basis of the adequacy of rice consumption (Bose and Dey 2007). Among the sample of ultra-poor women considered in her study, Haseen (2005) found that 90 percent of their calories came from rice. Another study on more than 7000 households of all income classes residing in both urban and rural areas found that rice and wheat accounted for more than three-fourths of per-capita protein and calorie intake (Bose and Dey 2007). In the small sample study on nutritional status of slum dweller women in Dhaka, 85 percent were found to consume adequate servings¹¹ from the rice and cereal group, while only 14 percent consumed adequate servings from the fruit and vegetable category; another 18 percent consumed minimally adequate fruit and vegetable servings. Only 4 percent consumed adequate milk or milk product servings; another 8 percent consumed minimally adequate servings in this category. However, among this sample 87 percent had adequate servings from protein-source foods including meat, fish, egg and lentil (Richards et al. 2010). Benson (2007) reached similar conclusions: among urban slum households located in Dhaka, Chittagong, Khulna and Rajshahi, meat, poultry, milk products and sugar were irregularly consumed.

The inadequate consumption of protein and micronutrients results in various long term and short term health problems among women, such as stunting, underweight, osteoporosis, and low bone-mass.¹² In turn these problems impair the physical ability to work and undertake healthy pregnancies (Leslie 1991; Sheshadri 2001; Pathak et al. 2004; UNICEF 2011). Lack of dietary diversity has been identified as a reason for micronutrient insufficiency by researchers (Ahmed et al. 2009). Such deficiencies are most often identified during pregnancy when there is increased need of micronutrients

¹¹ The adequate serving was considered on the basis of WHO recommended daily (24-hour) dietary guidelines.

¹² In general iodine deficiency is not a problem. More than 80 percent of households in Bangladesh consume iodized salt (WFP 2004).

due to changes in women's physiology (Pathak et al. 2004). As a result most nutritional interventions are traditionally targeted to maternal and child health (MCH), limited to pregnant and lactating women (Pathak et al. 2004; Leslie 1991). Leslie concludes that an excessive focus of nutritional and health intervention during pregnancy limits the effectiveness of such programs.

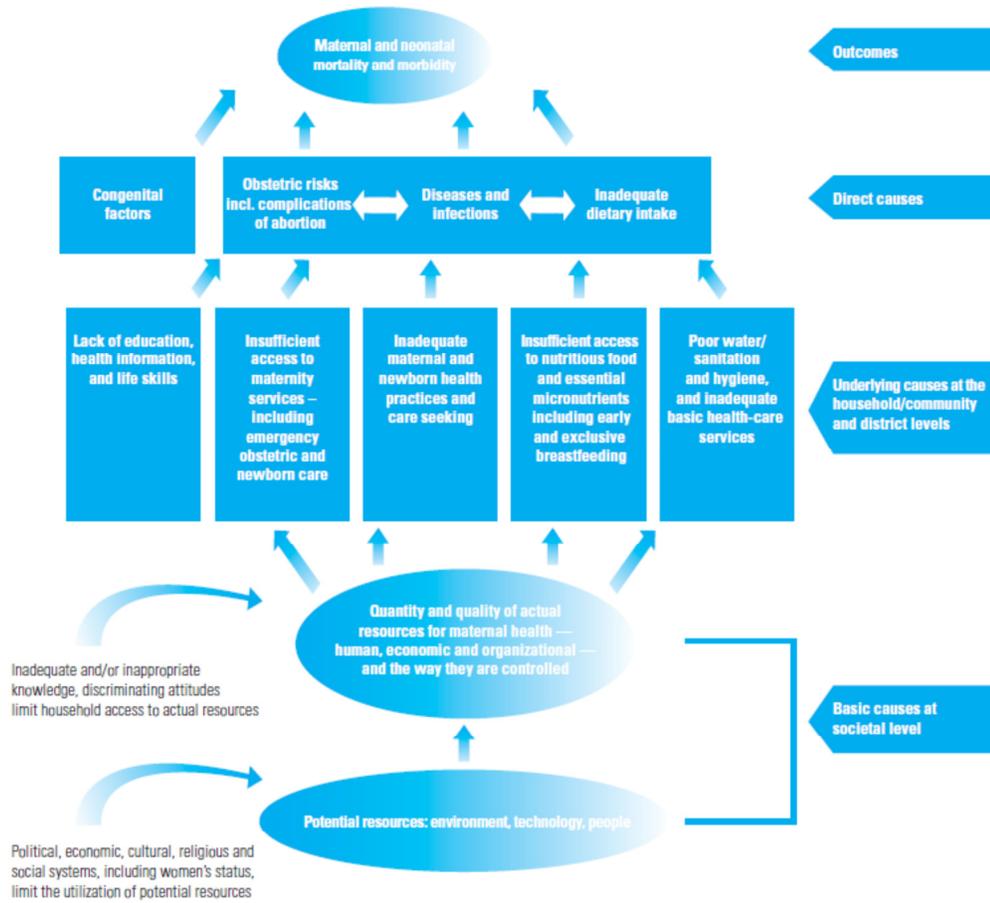
2.5 Factors associated with women's poor nutrition

Access to sufficient quantity and variety of safe food is a precondition to a healthy life (FAO 2011). Many factors at the household, community, national and international levels make addressing the malnutrition issues challenging (UNICEF 2011). Figure 2.2 summarizes the attempt by UNICEF to organize the interactions among associated factors. Below, I consider separately seven potentially relevant sets of factors conducive to poor nutrition among women: 2.5.1) poverty; 2.5.2) low education levels among women; 2.5.3) absence of basic nutritional information; 2.5.4) cultural barriers facing women; 2.5.5) persistent food price inflation; 2.5.6) inadequate standards of cleanliness and hygiene; and 2.5.7) usage of tobacco and betel nut among household members.

2.5.1 Poverty

Poverty is a significant determinant of calorie intake and malnutrition. It is also an indicator of health (Osmani 1993). Poverty is often the root cause of food insecurity, inadequate access to health care services, poor sanitation and unsafe water, illiteracy and low education, and lack of proper caring practices among pregnant women (UNICEF 2009; Haseen 2005). It has often been observed, however, that poverty alleviation programs run by government and NGOs, including microfinance programs, have very limited reach among the extreme poor population group (Rahman and Razzaque 2000; Haseen 2005).

Figure 2.2. Framework for maternal mortality and morbidity



Source: UNICEF.

Source: UNICEF 2009; (<http://www.unicef.org/sowc09/report/report.php>)

There are several ways to measure poverty. The most frequently cited is the fraction having a per-capita income, measured in US dollar purchasing power parity, below USD1.25 per day. The most recent UNDP estimate of the Bangladesh population consuming at less than USD1.25 per day is 49.6 percent (UNDP 2011). (Henceforth, those consuming less than USD 1.25 per day are identified as ‘extreme poor’). Among the extreme poor 10 percent are identified as ‘ultra poor’; population who live below USD 1 per day (BRAC 2012). The rural poverty rate is higher than in urban areas in the country (Narayan et al. 2007).

Poor households often face challenges in providing an adequate diet for all family members. In order to obtain adequate calories, the extreme poor often sacrifice foods necessary to obtain nutrients such as protein, calcium, iron and other micronutrients. (Osmani 1993). Haseen (2005) found that more than 50 percent of women from ultra poor households have been facing chronic energy deficiency, while 48 percent have anaemia. Maintaining a balanced diet with adequate variety of food is simply beyond their reach.

The vicious intergenerational cycle of 'poverty-malnutrition-poverty' has been identified in the literature (Horwitz 1995¹³, Jha et al. 2009). The proponents of 'material well-being theory' (McKeown 1976) argue that improved health outcomes, including improvement in nutrition, primarily come from material prosperity. The major improvement in life expectancy and nutritional intake in Europe and North America coincided with late 19th and early 20th century improvements of economic development (McKowen 1976; Fogel 1992). Among 15-49 years old ever-married women in different rural and urban areas in Bangladesh, the likelihood of being underweight (BMI<18.5) is higher among women from low-income households or those living in less wealthy neighbourhood (Corsi et al. 2011). For urban slum households located in Dhaka, Chittagong, Rajshahi and Khulna, the hourly wage of household head and the asset ownership were found as important factors for a food secure household (Benson 2007).

When poor households become less poor, they spend less on low-cost cereals and more of their additional income on more expensive foods, such as finer cereals, meat and dairy products, which are essential for a balanced diet (Osmani 1993). In countries experiencing rapid economic development, such as in India, a 'nutritional transition' is happening. The 'extreme poor' share of the population living with less than \$1.25/day has been declining. Malnutrition among the poor (including 'near poor' and extreme poor') has been declining due to increases in their average per capita real

¹³ Interview of Abraham Horwitz (1995) with SCN News.

(Source: <http://www.unsystem.org/scn/archives/scnnews13/ch2.htm#b1-Interview%20with%20Dr%20A%20Horwitz,%20SCN%20Chair,%2019861995>)

income. Among the non-poor population in the developing country the percentage of overweight has been increasing with their increased income. However in some cases underweight remains a persistent problem because of the reduction of energy expenditure with improved socio-economic status (Griffiths and Bently 2001; Ramchandran 2007; Corsi et al. 2010). In Bangladesh this 'nutritional transition' is limited to the Dhaka region¹⁴ and other major urban centres of the country. It is less evident compared to many other developing countries (Corsi et al. 2010).

2.5.2 Education of women

Material prosperity is a necessary but not sufficient condition to achieve better health and nutrition. Independently of the effect of education on labour productivity, schools build human capital skills, abilities and resources, and they contribute to the health and wellbeing of people (Ross and Mirowsky 1999). Among countries experiencing similar levels of economic development, cultural and behavioural patterns within the society are mainly determined by education. Gender relationships and female education, along with the system of governance, are factors contributing to cross-country differences in women's and children's health status (Osmani 1993).

In Bangladesh, free primary education for all, free education for girls up to class twelve, and stipends for families with female students¹⁵ have lowered the gender gap in education over the last two decades. Primary school completion rate of girls in the country (63.2 percent) is now higher than for boys (57 percent) (World Bank 2011). However, among the adult population (> 15 years) the female literacy rate (51 percent) is still lower than the male rate (60.7 percent) (World Bank 2011). Interrelated barriers – such as poverty, an unfavourable socio-cultural environment due to the lack of safety on the way to school, less supportive mentality of family and society, early marriage and

¹⁴ Dhaka is the capital of Bangladesh.

¹⁵ Jennifer Hove (2007) describes in detail the stipend for female students program.

pregnancy – mean that girls often drop out before completion of secondary school (grade 10). The secondary school completion rate is lower for female (30 percent) than male (39 percent) students (World Bank 2011).

Women are primarily responsible for preparing and distributing food in developing countries, and their level of education is a key determinant for their own, their children's and family's health and nutrition (FAO 2011). Education gives women the opportunity to know their rights, to involve themselves in paid work, to take a more effective part in household decision making. Such autonomy and self esteem help them to take care of their own health and nutrition as well as the health and nutrition of other members in the family (Haseen 2005). Internationally, there is a large literature on the role of education and women's health. Within Bangladesh, several studies have documented the effects of education. Among adolescent girls in rural Bangladesh, the risk of being stunted was found to be higher among girls with lower class attainment than girls with higher class attainment (Alam et al. 2010). Literacy among women living in a Dhaka slum lowered the likelihood of consuming unhealthy stimulants such as betel nut (Richards et al. 2010). In a study of 15,000 rural women of age 45 and higher it was found that the mortality rates of women and their husbands were significantly lower if women had formal education and somewhat lower if they have *koranic*¹⁶ education (Hurt et al. 2004).

2.5.3 Information

Even with a low income, families can often improve their nutritional status by substituting healthy for unhealthy foods. Improper selection of foods is a cause identified by FAO behind the malnutrition of vulnerable families (FAO 2011). Unfortunately, the FAO concludes, vulnerable households have limited access to nutrition information and resources to improve household's food security.

¹⁶ A kind of Islamic religious education.

The basic dietary knowledge among all people in Bangladesh, including rich and poor, is weak (Richards et al. 2010). Among rural girls in Bangladesh, ages 13-18, more than half do not know the name of foods which are sources of protein and 36 percent do not know the necessity of nutritional supplements for their physical growth (Alam et al. 2011). Providing relevant information may have some impact. Among slum households in Dhaka city, families that received personal nutrition advice from a health worker were more likely to boil their drinking water and realized a slightly higher food score than those families that did not receive such advice (Richards et al. 2011).

2.5.4 Cultural barriers

Due to the patriarchal nature of Bangladeshi society and a deep-rooted preference for sons, females in South Asian countries often face discrimination in terms of investment in education, access to resources (especially food and health care), and freedom to own assets – and in household decision making (FAO 2011; Ravindran 1986; Leslie 1991). Son-preference is rooted in the idea of higher earning potential of sons than daughters and expectation of support from sons for parents during their old age and at times of crisis (Muhuri and Preston 1991). In the South Asian region the nutritional status of female children (age 0-4 years) is worse than male children of the same age. The South Asian gender gap in nutrition is worse than in other regions of the world and the gap widens as children grow up (UNICEF 2011).

Women are often obliged to marry at a premature age. This means girls are obliged to drop out from school and are told that their only responsibility is child bearing and fulfilling family expectations as a daughter-in-law (Leslie 1991). Even if they have a decent education, they often cannot benefit from it. Though women's education has positive effects on children's and family's health and nutrition, somehow the effect on her own health is limited (Leslie 1991). Similarly husbands' education does not have any significant effects on women's health and longevity (Hurt et al. 2004). Women often do not have permission to work outside home in a paid job. Only 41.2 percent of adult women in Bangladesh participate in the labour force (The World Bank 2011).

Because of the discriminatory cultural and social environment, women often have low self-confidence, self-esteem and accept a 'self-sacrificing' role in the family – including acceptance of her food needs as the least important among family members (Ravindran 1986; Leslie 1991). As a result, from childhood through adolescence and even during pregnancy and lactating periods, women consume inadequate nutrients (Leslie 1991). Women may not benefit from nutrition and health interventions offered, even if those are free of cost. Because of some underlying 'hidden barriers' women may not be able to take time off from household work, or they may not get permission from their husband or elderly member in the family to go to a health centre if it is far from home (Razzaque et al. 1998; UNICEF 2010). Given these cultural barriers, projects intended to empower women and promote gender equity may significantly improve the nutritional status of all household members (FAO 2010).

2.5.5 Persistent inflation in food prices

Starting in 2006, Bangladesh has been highly affected by global food price increases. In May 2011 annual food price inflation rate was around 13 percent (BBS unpublished May 2011). Food price inflation has been higher in rural (14 percent) than in urban areas (11 percent)¹⁷. Sacrificing quality and diversity of diet, cutting health and non-food expenditures are common coping mechanisms among poorer segments of the population (FAO 2010; Sulaiman et al. 2010).

If inflation persists for a long period, people, irrespective of wealth, smooth consumption by substituting rice for protein (Sulaiman et al. 2009). The poorest people cannot manage to maintain consumption of rice at former levels (Sulaiman et al. 2009). During periods of inflation, nutritional intake of girls and women may be adjusted downward more than for boys and men (Beherman and Deolaliker 1990). The Indian state of Gujarat has experienced similar post-2006 inflation as Bangladesh. Food

¹⁷ Bangladesh Bureau of Statistics 2011 (unpublished)

expenditure in Gujarat as a share in households' total expenditure has decreased even during the period of declining inflation; households had to cut the number of meals per day as well as the consumption of meat, fish and milk (SEWA 2009). Surprisingly, cutting educational expenses has not been a coping mechanism in the case of Bangladesh (Sulaiman et al. 2010). There is evidence of a rise in nominal wages in recent years, but it has not been sufficient to compensate for the rise in food prices (Sulaiman et al. 2010).

2.5.6 Hygiene and Cleanliness

Frequent attacks of infectious diseases can offset the improvement of health status arising from a nutritious diet (Osmani 1993). In Bangladesh poor people often do not have access to safe drinking water and sanitation. Among rural people 78 percent have access to improved water such as a household connection, a public standpipe, a borehole, a protected well or spring, or rainwater collection (WDI 2011). Among urban people this percent is slightly higher (85 percent); obviously the living condition of urban slums are worse than the average urban population.

Unhygienic water and sanitation result in high incidence of various water-borne communicable diseases. The morbidity rate due to diarrhoea in Bangladesh per 1000 population is 9.4 per year (BBS 2000). Unclean household environment, poor personal sanitation, and improper disposal of human feces are common in poor neighbourhoods resulting in various parasitic infections (Haseen 2005). Osmani (1993) identified a two-way relationship between diet and diseases; diseases reduce the usefulness of diet, and poor diet increases the likelihood of diseases, which he called the 'infection-nutrition nexus'.

2.5.7 Tobacco and Betel-nut

Though smoking and betel nut chewing have no direct link with nutritional status of women, such habits have significant adverse effects on the overall health status of poor families. Moreover, in poor families, spending on these items by those addicted to them may crowd out money available for food and other goods. Cigarettes, *bidis* (a

cheap small cigarette without filter) and *hookah* (an instrument for smoking tobacco in which the smoke is cooled and filtered by passing through water) are the commonly used means to consume tobacco in Bangladesh (Richards et al. 2010). In spite of its small economy, 15 tobacco companies are competing in the tobacco market in Bangladesh (Efroymsen et al. 2001). Smoking is significantly more prevalent among adult males than adult female. According to a study, 44.7 percent of adult men and 1.5 percent of adult women consume tobacco in Bangladesh (WHO 2011). Among youth (13-15 years) 3 percent of boys and 1 percent of girls smoke (Campaign for tobacco free kids 2010). In the study of 120 Dhaka slum households, 69 percent of families have at least one member who smokes (Richards et al. 2010). Household smoking is likely to influence health and nutritional outcome of adult women both due to the effect of passive smoke, and due to the expenditure on tobacco consumption.

Tobacco consumption is the cause of eight major diseases, such as ischemic heart disease, lung cancer, stroke, oral cancer, cancer of the larynx, chronic obstructive pulmonary disease, pulmonary tuberculosis, and Buerger's disease (GLOBOCAN 2008; WHO 2005). These diseases are responsible for 16 percent of all deaths in Bangladesh; tobacco consumption is the sole cause of 9 percent of such deaths (WHO 2005). The average standardized rate of mortality due to lung cancer in Bangladesh (18.2 per 100,000 population) is the highest among all South Asian countries (GLOBOCAN 2008). The annual cost of tobacco-related illness in Bangladesh is estimated at USD 40 million (WHO 2005). Cigarette taxes on tobacco and related products in Bangladesh are very low, which is a reason for the high prevalence of smoking in the country (Richards et al. 2010).

Betel quid (betel leaf, areca nut, lime and sometimes tobacco) is another common addictive purchase in Bangladesh and South Asia. In rural areas, offering a decorated betel quid to guests and relatives is a symbol of hospitality, which people consume for recreation, breath freshening and for digestive purpose. In their Dhaka slum survey Richards et al. (2010) reported 65 percent of households have at least one member who chews betel nut.

Chewing areca nut may cause submucous fibrosis and used along with tobacco can cause leukoplakia which ends as oral cancer (Auluck et al. 2009). Among South

Asian immigrants in British Columbia, Canada, the users of betel quid have higher oral cancer rates than the general BC population (Auluck et al. 2009).

3. Methodology

The primary methodology was a survey to assess the nutritional status of low-income women in two sites, one urban the other rural. To explore more complex issues, I conducted two focus group discussions, again one urban the other rural.

3.1. Description of the Sample

This study was designed to compare the nutritional status of rural and urban low-income women in Bangladesh. Only married women were considered for the study.

For the rural survey low-income women were selected from four villages (Satkura, Mohadanga, Narkeli and Fatehpur) in the Kendua union in Jamalpur Sadar, an upazila in the district of Jamalpur, located in northern Bangladesh.¹⁸ In choosing these villages, I tried to identify a relatively less urbanized rural area. Geographically proximate villages were selected to reduce the cost of travel and accommodation of the surveyors. Figures 3.1, 3.2 and 3.3 show the location of the three sample areas¹⁹.

A large slum located in the Abdullahpur / Kamarpara area in Dhaka city was selected as the urban sample area. Abdullahpur / Kamarpara is located in Uttara Sector 10, a northern part of Dhaka city, close to the Turag river. The established residents are

¹⁸ Bangladesh has been divided into 6 administrative divisions. Under these 6 divisions are 64 districts. Jamalpur is one of them. Each district is divided into sub-districts called Upazila. Jamalpur Sadar is a upazila in Jamalpur district. Each upazila is divided into a number of unions. Unions are the lowest administrative unit in rural Bangladesh (Banglapedia 2012).

¹⁹ All the figures for this chapter are at the end.

middle to upper middle class. In the recent past a large shanty community, mostly migrants from rural areas, has grown in Uttara Sector 10 on government-owned land.

These slum houses are mostly built by the local political leaders who often have no legal lease on the land but nonetheless collect rent from the slum dwellers. These shanty communities are representative of urban poor in many literature reviews (World Bank 2007; Asian Development Bank 2002). The reason for selecting the slums in Uttara was their proximity to the workplace of researchers and surveyors who collected data. Moreover the slum area in Uttara is one of the biggest slum areas in Dhaka city.

Most of the houses in the rural area and urban slums are *non-pakka* (are without solid permanent foundations, walls and roofs). The major difference in the pattern of houses in rural and urban areas is the surrounding space. In Jamalpur each house is separated from another house and has a wide open area around it. Each house has a separate kitchen and washroom. Slum houses in Uttara are spread along the two sides of a highway called the 'Tongi - Ashulia road. These houses are traditionally *non-pakka*; they share common walls made of corrugated tin or sheets of interwoven bamboo leaves. In most cases each family lives in one room, and shares kitchen, washroom and other household facilities with other families.

In addition, we obtained survey data from a third group: relatively prosperous women in Raozan upazila in the Chittagong district. They can be considered as the benchmark group, indicating the nutritional status of non-poor women. This third group was surveyed by faculty at the Asian University of Women. Raozan is an old sub-district with total area of 27.15 square kilometres and more than 50,000 population,²⁰ famous as the birth place of a number of renowned educators, cultural activists, and politicians and for historical spots. Many initiatives have been taken in Raozan to spread education and promote the socio-economic development of the local population.

²⁰ Bangladesh Bureau of Statistics, 2010
(<http://www.bbs.gov.bd/WebTestApplication/userfiles/Image/SY2010/Chapter-02.pdf>)

The survey in Raozan was conducted on married women with the same questionnaire used in the two other survey areas. However, the sampling technique for this survey was different from the surveys in Jamalpur and Uttara, which I will illustrate in the next section.

3.2. Sampling technique

In order to select a representative sample from low income households, the surveyors restricted their sample to women who live in *non-pakka* houses made from inexpensive construction materials such as mud, tin, bamboo fences, leaves, etc.

A systematic sampling²¹ technique was used In Jamalpur and Uttara. Initially we designated a sample size of 600 households divided equally between rural and urban. In each sample location, surveyors approached every third *non-pakka* house. If the woman did not want to participate in the survey, then the next *non-pakka* house was approached. If a woman from that house participated in the survey, then the process continued.

A household included all people living together in the same dwelling and sharing their assets and income. Both characteristics needed to be fulfilled to define a household. If two households live in the same dwelling, then surveyors randomly selected one household for the interview.

²¹ *Systematic sampling* is often used instead of random sampling. After the required sample size has been calculated, every Nth record is selected from a list of population members. (Source: <http://www.statpac.com/surveys/sampling.htm>)

In Raozan a 'judgement sampling'²² technique was used. The only criterion applied was that the respondent have a child aged less than 5 years. The mother of the child was interviewed. As a result, the average age of the women interviewed in Raozan was younger than that of the women interviewed in Jamalpur and Uttara. In this survey, women from all households, whether or not low income, were targeted. In my analysis because of this purposive difference in sample selection I will designate rural and urban households as 'poor' households and suburban households as 'non-poor' households.

3.3 Questionnaire Design

The survey consists of 37 questions in total. I translated the questionnaire into simple Bangla to make it understandable to the interviewer and interviewee. The translation used sensitive wording for questions which may be uncomfortable for the women or their household. The complete questionnaire for the survey is attached in appendix A. The broad topics for the survey were the following:

3.3.1. Diet recall

The 24-hours diet recall was the key component to assess the nutritional status of the women. Though the measurement of quantity of consumed food is subjective and depends on the respondent's memory, this is a well accepted research method to assess a person's regular diet (WHO Training course 2001).

In the survey each woman was asked to recall what she ate at breakfast, lunch, supper and other times during the day. To reduce the uncertainty and subjectivity about quantity, each woman was provided two measuring cups of 250 ml and 125 ml. Rice and

²² *Judgment sampling* is a common nonprobability method. The researcher selects the sample based on judgment. This is usually an extension of convenience sampling. For example, a researcher may decide to draw the entire sample from one "representative" city, even though the population includes all cities. When using this method, the researcher must be confident that the chosen sample is truly representative of the entire population. (Source: <http://www.statpac.com/surveys/sampling.htm>)

lentils, the major staple foods, were measured in the 250 ml cup. All other foods were measured in terms of a 125 ml cup or as pieces.

3.3.2. Sources of minerals and vitamins

Surveyors asked whether the women consume iodized salt, calcium tablets, fortified yogurt, vitamin “sprinkles”, zinc and iron – either regularly or irregularly.

3.3.3. Hygiene and Cleanliness

Surveyors asked about the sources of drinking and other water for household uses, and about household toilet facilities.

3.3.4. Smoking and Betel nut chewing

Twelve questions gathered information about the number of household members who smoke or chew betel nut, and about any change in the use of tobacco or betel nut, and the reasons behind those changes.

3.3.5. Awareness and Education

The survey asked whether the interviewed women received any education or advice on nutrition, and how to maintain nutrition during times of food price inflation. Did they receive advice on hygiene and cleanliness, smoking and betel nut chewing, and if they received advice from which source(s)?

3.3.6. Assets and Income

Since women have less knowledge than their husbands about household monetary income and often they are not willing to tell an outsider about households' monetary income, questions were asked about each member's occupation and how many hours on average each member works per day. Also questions were asked about land ownership, electricity connection of the household, and the list of assets the household owns.

3.3.7. Demographic information

Information was collected on the respondent's age, weight, height, highest class attainment and occupation. Similar information (except height and weight) was also collected for all other members in the household. Each pair of surveyors was provided a scale and a tape to measure the weight and height of the women.

3.3.8. Self-assessed questions

In order to assess the effect of inflation on the respondent's food consumption and nutrition, she was asked to assess in general the household's current food adequacy and food adequacy one year before. Similarly, some qualitative questions asked about food distribution among household members (who gets more food in the household or is food divided equally among all), problems due to price increases, and reasons for consuming less food if so reported.

3.3.9. Price Information

In the neighbourhood of each survey area, surveyors inquired of a few shopkeepers about the price of regular foods purchased by the nearby households. National data about the price of those foods are available. However in Bangladesh large regional variation exists in the retail price of daily foods. So we collected the local price from the neighbourhood shops and market place.

3.4 The survey and its limitations

In rural areas the survey data were collected by 10 professional surveyors between June 02 and June 09, 2011. In total 276 women were interviewed in rural area. The survey in the urban slums was done by 10 undergraduate students at the International University of Business, Agriculture and Technology (IUBAT), Dhaka from mid-June to early July 2011. A total of 301 women were interviewed.

A pair of surveyors, a male and a female, went to each household to interview respondents. As most of the women could not read, questions were asked orally by the female surveyor. The male surveyor took notes and assisted the female surveyors. The

reason behind female surveyors posing questions was the cultural sensitivity of interaction between male and female. For the same reason weight and height of the women were also measured by the female surveyor. However due to security concerns of young women in Bangladesh moving alone, each pair of surveyors included a man. Surveyors were given an honorarium for their works.

The survey in the suburban area took place during July-August 2011. Eight female undergraduate students of Asian University of Women (AUW) individually collected the survey data. Several faculty members and officials of the university assisted them during the survey. The survey was a part of the community work of their studies.

The survey was conducted from Sunday to Thursday in one week. Bangladesh, being a Muslim country, Friday is considered as a religious day and is a holiday. Most households prepare special improved meals on that day. So Friday and Saturday were avoided for the survey.

One limitation of the survey was not asking direct questions about monetary income of the household. Another is reported interference by the mother-in-law in the case of Raozan interviews. The women interviewed were young and live in extended nuclear families with mothers-in-law in the household. Similarly, women were uncomfortable about mentioning household toilet facilities. Women in urban slums were less uncomfortable regarding these questions than women in rural and suburban areas. The answers of these questions may be biased to some extent.

3.5 Focus group discussions

I conducted two focus group discussions (FGDs) with women, one in Satkura, a village in Jamalpur, and another in Uttara. The discussions took place in BRAC non-formal schools located in those areas. (BRAC provides free primary education to children from low-income households.) Approximately a dozen women participated in each FGD. The duration of each FGD was approximately one hour. BRAC provided organizational supports for the interviews.

In the FGDs I asked questions about the effects of food price inflation and coping strategies at the time of food price spikes. I also discussed women's nutritional education, their husbands' smoking behaviour, arranging healthy food for the family, role of schools for nutritional education, short-term income generating initiatives appropriate for less educated and conservative women. Questions were semi-structured and were open ended. Women's views were useful for the policy analysis part of my study.

3.6. Analytical methods

I coded the collected data and entered the data in an Excel template in an appropriate format for quantitative analysis. I categorized the collected data and constructed relevant dependent and independent variables identified earlier. I then constructed a number of charts and graphs to explore the nature of each variable.

The variable of interest is the nutritional status of women. Each observation of the calculated values of the variable has been categorized into one of four groups. Relationship of the variable with a number of other variables has been explored through cross-tabulation analysis. For each variable, crosstab analysis provides the distribution of households among these four nutritional status groups. Of most interest is the percentage falling into what I later define as the "inadequate" status. These distributions give an approximate measure of the nutritional status of women characterized by different conditions. Microsoft excel was used for making charts and SPSS software was used for cross tabulation analysis. I undertook full transcriptions of the focus group discussions for policy analysis.

3.A. Chapter 3: Tables and Figures

Figure 3.1. Location of rural sample area

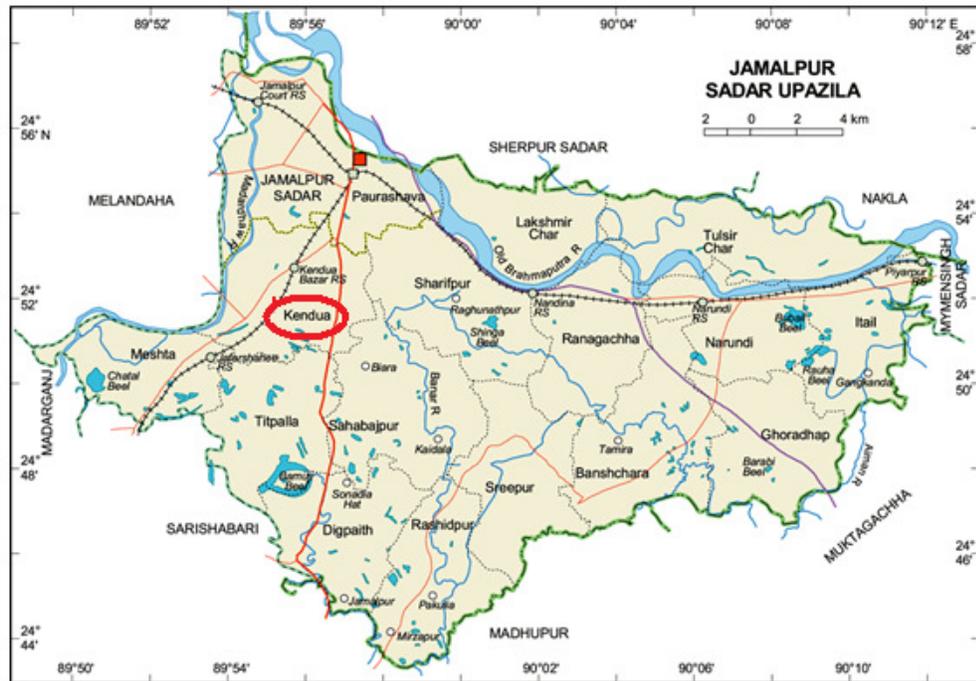
Figure 3.1.1. The map of Jamalpur district



Note. The red-circled area is Jamalpur Sadar upazilla

Source: Banglapedia 2012

Figure 3.1.2. Location of the Kendua thana in the map Jamalpur Sadar upazila



Source: Banglapedia 2012

Figure 3.2. Location of urban sample area

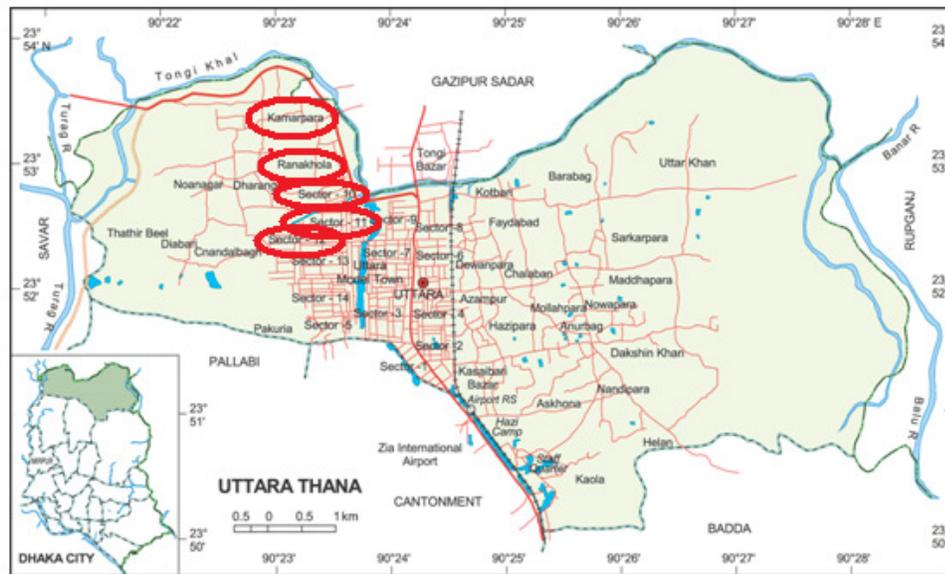
Figure 3.2.1. The map of Dhaka city



Note: The red-circled area is the Uttara area

Source: Banglapedia 2012

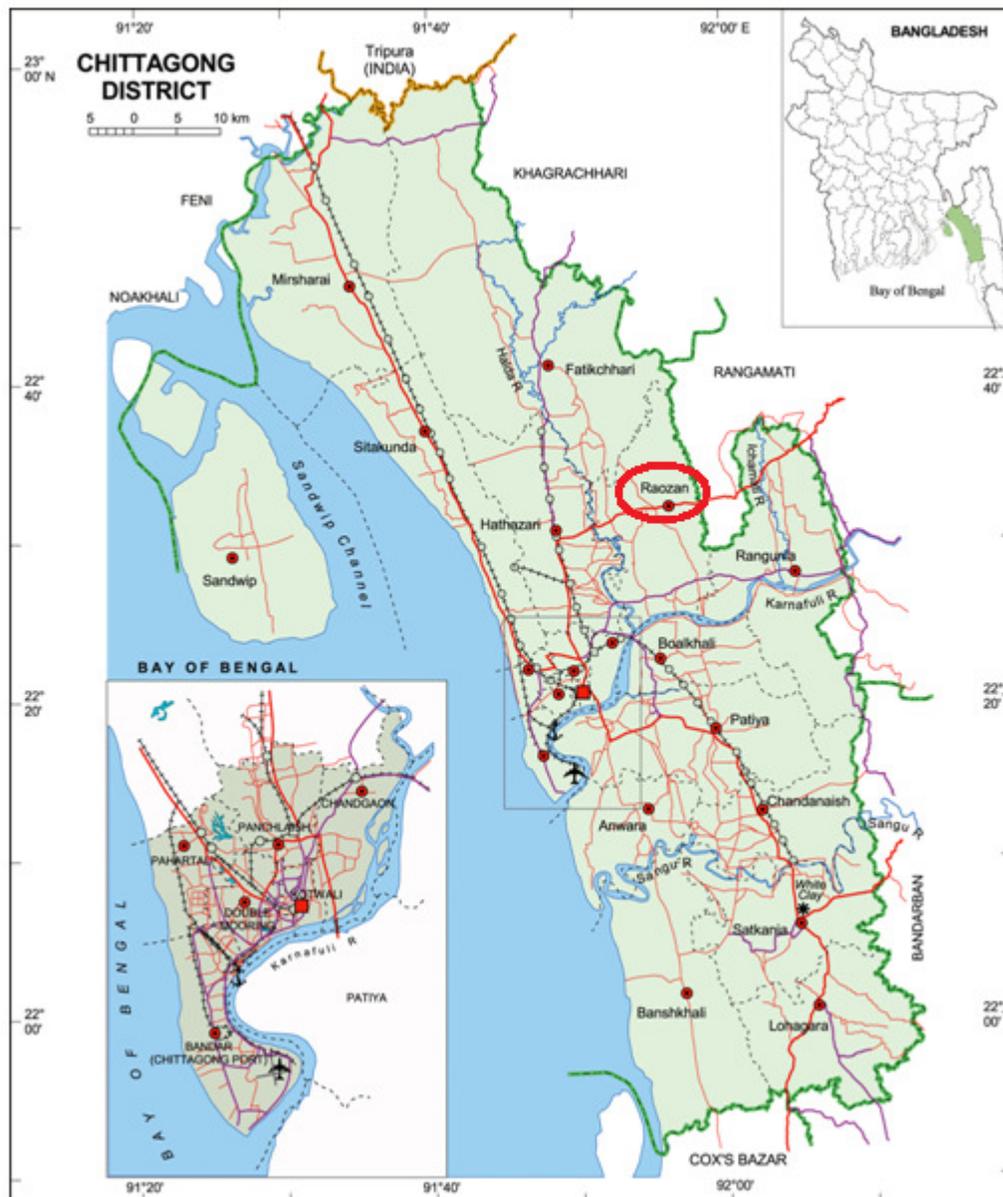
Figure 3.2.2. Location of urban (Uttara, Dhaka) sample area



Source: Banglapedia 2012

Figure 3.3. Location of suburban sample area

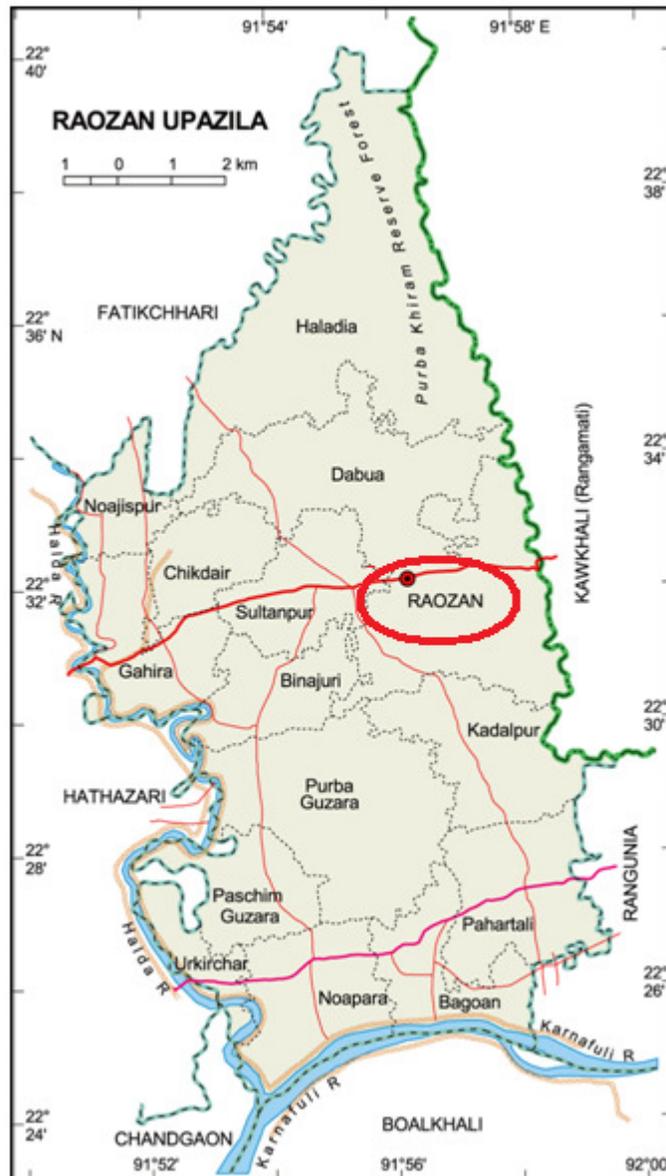
Figure 3.3.1. The map of the Chittagong district



Note. The red-circled area is the Raozan upazilla

Source: Banglapedia 2012

Figure 3.2.2. The map of suburban (Raozan) sample area



Source: Banglapedia 2012

4. Descriptive Statistics

There are a number of methods to assess the health and nutritional status of a person. The current study uses data on dietary intake and an anthropometric measure, the body mass index (BMI). Among other ways, physical examination, biochemical measurement and laboratory assessment can be used for nutritional assessment (WHO 2001). However, those methods require a sophisticated organizational setting which was not feasible in this study. Self-assessed health status, in which the respondents define their health status (on a scale from poor to excellent), is a common measure of health status of a population. This measure is highly subjective and thus is not used.

Data collected for this study includes anthropometric measures, such as weight and height of women and their food intake for 24 hours. BMI is a widely used measure defined as the ratio of weight (in kilogram) and the square of height (in meters) (WHO 2001). BMI is commonly used to classify the under-weight, over-weight and obesity among the adult population and thus to identify vulnerable groups and also to assess the trend of nutritional transition at a population level (WHO 2006). Food record scoring is based on reported dietary intake during a short period. To calculate the food score of individual, names of the foods with their quantities are listed. Data can be collected for 24 hours, 48 hours, 72 hours, even sometime for a week (WHO 2001).

Of the two measures of nutritional status available in the dataset, the current study uses food score for the analysis. BMI will not be used as a dependent variable in the cross-tab analysis. While both body mass index (BMI) and food record scores are simple measures that fail to capture detailed nutritional problems, the food score reveals the core problems of nutrition better than the BMI. In addition to revealing whether the respondent obtains adequate calories via basic cereals, the food score reveals whether the respondent is consuming adequate protein, an adequate variety of fruits and vegetables, too much fat, and so forth (WHO 2001). The BMI indicates whether the respondent is receiving adequate calories. The policy problem for this paper deals with

women's consumption of protein and micronutrients, for which dietary recall is an adequate measurement tool. So for this study no information on diseases or medical history was collected. The nutritional intake will be used to assess the adequacy of the quantity and quality of diet on a scale of nutrient requirements. All crosstab analysis in subsequent chapters is based on the food score data.

To get a snap-shot picture of women's overall health status, I have calculated women's BMI. I have used the WHO (2001) criteria to divide BMI scores into different nutritional status categories. The 'optimum' BMI range is 18.5 to 25. A BMI score below 18.5 indicates 'underweight', between 25 and 30 'overweight', and above 30 'obesity'. Both malnutrition and over-nutrition increase the risk of various communicable and non-communicable diseases and syndromes compared to those in the optimum range (Richards et al. 2010). Figure 4.1 shows the distribution of BMI of women in three sample areas. Among all three samples, the share falling into the optimum category was identical (64 percent). The overall pattern of BMI distribution is quite similar among all three samples. Underweight is slightly higher among low-income rural than urban women (23 percent vs. 20 percent). Underweight is least prevalent among the suburban women of Raozan (16 percent). Similarly, overweight and obesity are slightly higher among urban than rural women (16 percent vs. 13 percent). Among suburban women 21 percent are either overweight or obese.

4.1. Dependent Variables

As mentioned earlier, food score is the measure of women's nutritional status. Surveyors listed all foods and enquired about quantities consumed by the women for the last 24 hours. The technique of food scoring used was developed by the World Health Organization (WHO 2002).

The food score of a woman was calculated on the basis of 10 questions on her dietary intake for the previous 24 hours. The questions address the quantity of all foods in the basic categories: cereal group (such as rice, potato and wheat); vegetables and fruits group; milk and alternatives group (yogurt, cheese); meat and alternatives group (meat, fish, pulses); fat, oil and sugar group. The questions also score diets with respect

to the variety of each item of food within groups (see appendix B for detail). For each satisfactory answer a woman receives one point. So an individual's food score varies between 0 and 10.

WHO (2001) characterizes women with food scores 3 and below as in a 'risky' condition, diet scores between 4 and 7 as 'fair'. I have subdivided the 'fair' category into 'fair-low' (above 3, below 5), 'fair- medium' (above 5, below 6) and 'fair-high' (above 6, below 7.5) as introduced by Richards et al. (2010). The WHO guidelines (2001) suggest need for improvement for women with a 'fair-low' or 'risky' food score. These two categories are combined and labelled 'inadequate' in subsequent analysis. Women with a food score of 7.5 and higher generally have a healthy diet, 7.5 to 8.5 scored as 'good', and higher than 8.5 as 'excellent'.

Based on BMI distribution, non-poor women (i.e., those in Raozan) consume higher average calories than the low-income women. However, based on food scoring, the diet quality of low-income women is on average somewhat better than that of their suburban counterparts. Also, among low-income women, rural women have on average better diets than do urban women.

Table 4.1. Distribution of food scores, by rural, urban and suburban samples (percent)

| Food score | Rural (%) (Jamalpur) | Urban (%) (Uttara) | Suburban(%) (Raozan) |
|-----------------------|-------------------------|-----------------------|-------------------------|
| Inadequate (0-5) | 41 | 45 | 50 |
| Fair-medium (5-6) | 20 | 27 | 29 |
| Fair-high (6-7.5) | 22 | 20 | 16 |
| Good (7.5-8.5) | 17 | 8 | 5 |
| Excellent (above 8.5) | 0 | 0 | 0 |

In order to explore these differences in more detail, I examined the scores for the individual questions (figure 4.3 and table 4.2). More than 90 percent of all women consumed satisfactory servings (score 1.0) from the cereals and potato group of food (Q1). The majority in all three samples failed to eat at least five servings from the fruit and vegetables category (Q2). The inadequacy was most acute among the suburban women, followed by the urban. While below 5, the rural women achieved a higher average number of servings than in the two other samples. Women in all three samples

consumed inadequate dairy servings (Q3). Average scores for the protein consumption questions were similar across the three samples, but low-income women were much more likely to have consumed no protein over the previous day than the suburban women (Q4). Almost all poor women consumed fat, oil and sugar within acceptable limits (Q5, Q10). However, nearly 17 percent of suburban women reported servings above optimal. To obtain adequate intake of micronutrients, a diverse diet is required. Nearly a third of the low-income women scored zero on the question probing dietary diversity (Q6). Given their rural location, it is perhaps not surprising that the rural women scored best in terms of eating at least two vegetables, due to their access to home-grown and locally produced vegetables at low cost and sometimes free of cost (Q7). The suburban women scored lowest in this category. Rural women also scored highest and suburban women lowest in terms of eating at least one fresh fruit (Q8) and choosing healthy snacks (Q9). But the majority of all three groups did not eat any fresh fruit and chose relatively unhealthy snacks mostly purchased from nearby street food shops.

4.2. Independent Variables

As discussed in the background section, protein and micronutrient deficiencies of women are caused by several underlying factors. On the basis of the literature review, I have identified independent variables that influence – or correlate with – women’s nutritional status. The survey instrument was designed to provide evidence on the strength of the link between each of those variables and the dependent variables. The independent variables comprise individual and household characteristics. I am not differentiating between household-level data and individual-level data, since only one woman was interviewed per household in the survey.

4.2.1. *Education of woman*

Both ‘literacy’ and ‘highest class attendance’ of women are used to measure the level of education of women. Both are categorical variables. ‘It is expected literate women’s nutritional status is better than illiterate women. Higher class attendance is also expected to improve the food score of women.

The distribution of literacy dramatically differs between poor and non-poor women (figure 4.4). Among poor women approximately two out of three cannot read at all. The average highest level of education among poor women is class 2.

Eighty-six percent of non-poor women can read, which is much higher than the national adult (>15 years) female literacy rate. Among the non-poor women, the average highest level of education is class 8. As explained in the methodology section, because of the presence of a number of social development programs, the literacy rate in Raozan is higher than in other parts of Bangladesh. Approximately 50 percent of the total non-poor women attended class 10 and higher.

4.2.2. Education of husband

Women's husbands are primarily responsible for earning money income and buying food in the household. Because of the patriarchal society, husbands have more authority in household decision-making than women. A better educated husband is expected to earn more and buy more nutritious food than an illiterate husband and will probably be more concerned about his wife's health and nutrition.

More than half of poor women's husbands are illiterate (figure 4.6). More than 80 percent of non-poor women's husbands are literate. The average literacy rate of husbands is higher than their wives in poor households. However among non-poor households, women's average literacy rate is higher than their husbands. In spite of the free secondary education program for girls, the adult female literacy rate in Bangladesh remains lower than the male rate.

4.2.3. Household's highest level of education

The higher the household highest class attainment the higher is expected to be a woman's nutritional outcome. This variable is calculated taking the highest class attainment among all members in the household except the woman interviewed.

Figure 4.8 shows that among the rural poor households, 55 percent have at least one member (excluding interviewed women) who attended class 6 and higher. Among urban poor households this statistic is 37 percent. These distributions differ considerably

from those of husbands and wives, indicative of higher education levels among children relative to their parents. Among suburban households 76 percent fell under that category.

4.2.4. Occupation of women

The majority of married women in Bangladesh are housewives and do not work in paid jobs outside their home. The occupations of women who do work outside the home include agricultural farming, business, handicrafts, poultry farming, house worker, official job, construction worker, garment worker, etc. Women's work in paid jobs positively contributes to their nutritional status in either or both of two ways: first, households where both husbands and wives work may have more aggregate income and a better standard of living including the quality of diet; second, women who work outside have more autonomy and freedom and thus can have access to more nutritious food. However in the context of the conservative society of Bangladesh, families often do not allow women to work outside unless they face extreme monetary difficulties.

Figure 4.9 shows that among the three groups of women the highest percentage working outside the home is in the urban slum. In urban areas there is more opportunity to work and the high cost of living encourages women to abandon the traditional conservative mentality and accept work outside the home.

Although the suburban women have a better educational attainment, only 2 percent work outside. The reasons may be financial wellbeing, less availability of work opportunities compared to cities and parenting young children. The suburban areas in Bangladesh are generally more socially conservative than urban areas and sometimes even more than rural areas.

4.2.5. Occupation of husbands

In the rural area the majority of the husbands (55 percent) are agricultural labourers, while approximately one-fourth work as day labourers, carpenters, etc. (figure 4.10). In the urban area the majority (53 percent) of the husbands work in the residual category (day labourer, hawker, rickshaw-puller and construction worker). About one-fifth

of the urban husbands work in the low-paid formal sector, which includes car driver, office assistant, field workers in NGOs, security guard, etc.

While nearly half (46 percent) of suburban husbands work in the residual category, more work in business and in the formal sector than in the urban area. The percent of unemployed husbands is highest (14 percent) in the urban area.

4.2.6. Age of woman

The average age of rural women is 38 years, for urban women 34 years, while for suburban women it is 26 years (see figure 4.11). As described in section 3.2, the only criterion for selecting suburban women was to have a child below 5 years. Except upper socio-economic class women, married women in Bangladesh have their first child around this age.

4.2.7. Structure of family

I have categorized families as nuclear, stem, and joint. 'Nuclear' family is a two-generation family consisting of husband and/or wife and their single children. 'Stem' family is a three-generation family living together. It consists of husband and/or wife, their parents, married and/or unmarried siblings and the unmarried children of them or their siblings. 'Joint' family is a type of family where three or more generations with members like the stem family plus husbands/wives uncles/ aunts and their families live together. Women living in stem and joint families are often dominated by a number of male and older female members. So, a higher percentage of women living in stem and joint families are expected to have lower nutritional status compared to women living in nuclear families.

The majority of the rural and urban households (78 percent and 82 percent) maintain a nuclear family structure. Equal percentages of both types of families exist among suburban households (figure 4.12). Younger couples are more likely to stay with their families than are older couples.

4.2.8. Addictions to tobacco

Among low income men in Bangladesh, addiction to tobacco is very common. Such households often don't have adequate money to buy a nutritionally balanced diet. Spending on tobacco may have a negative effect on women's nutritional status. I have constructed a number of categorical variables such as 'number of household members who smoke', 'monthly expenditure on tobacco' and the 'gender distribution of tobacco consumption in the households'.

Figure 4.13 shows that more than 65 percent of the rural households and 70 percent of the urban households have at least one member who smokes. Among non-poor households smoking is less prevalent. In all three areas very few households have female smokers (figure 4.14). In most of the households in rural and urban areas if someone smokes, it is usually the husbands; in suburban households, there is less smoking and members in the household other than the husband are more likely to smoke.

The variable 'monthly expenditure on tobacco' (figure 4.15) was constructed by multiplying household total cigarette consumption (adding cigarette consumption of all family members) by the price of the cheapest cigarette in Bangladesh (Tk. 0.24).²³ (Based on the price of *bidis*, the expenditure is a low estimate.) The average monthly expenditure on tobacco in the rural households with at least 1 smoker is Tk. 114.4 (USD 1.4); in urban area it is Tk. 139 (USD 1.74), and in suburban it is Tk. 79 (USD 1.0). In urban slums about 6 percent of households spend more than Tk. 300 (USD 4.5) per month. In rural and urban area the average expenditure on cigarettes of households with at least one smoker is around 1 percent of their total monthly income, but only 0.27 percent in suburban area.

²³ USD 1 = Tk. 80 approximately. (Source: <http://www.oanda.com/currency/converter/>)

4.2.9. Addictions to betel-nut

Like tobacco, addiction to betel-nut is expected to have negative effects on women's nutritional status. About 65 percent of poor households have at least one member who chews betel-nut (figure 4.16). The majority of those chewing are women (figure 4.17). As with tobacco, use of betel-nut is less prevalent in non-poor households (figure 4.16).

I have estimated monthly expenditure on betel-nut by multiplying household total number of betel-quid consumed (adding betel-quid consumption of all family members) by the price of one betel-quid in Bangladesh. The average monthly expenditure on betel-nut varies between Tk. 150 and Tk. 200 (USD 2 to 3), which is less than 1 percent of households' monthly average income. Urban households spend on average the most money and suburban households the least.

4.2.10. Households' income index

To construct this variable I considered household members' labour income and income from income-generating assets. From the survey I have information on household members' occupations, average hours worked per day and a list of household assets. In estimating money income per family member, I applied the "square-root formula" – dividing the asset and income index of total family income by the square-root of total number of household members. The details of the calculation are given in appendix C.

The economic condition of suburban households is much better than in the other two (table 4.2). Among the poor households, the rural households are on average poorer than the urban. Better household economic conditions are expected to have positive effects on women's nutritional status. It should be noted that the high living costs in Dhaka city offsets somewhat the higher urban income.

4.2.11. Advice on nutritional diet

Women who have received advice on nutritional diets are expected to have better nutritional status than women who do not. This is a categorical variable, divided

into 7 non-exclusive categories: advice from 1) family/relatives/neighbours, 2) health facility care providers (doctors, nurses), 3) community health worker who visits home, 4) public meeting/ NGOs, 5) radio/television, 6) schools and 7) others, which includes posters, public announcing, etc.

The principal provider of nutritional advice varies in the three areas (table 4.3). Health workers have a major role in providing nutritional advice to women in rural areas (50 percent) and in urban slums (36 percent) but not in the suburban area (only 10 percent). For urban and suburban women the majority (51 percent and 46 percent) received advice from radio/ TV. More than 30 percent of the suburban women received advice from health facilities/ doctors/ nurse, while only 16 percent of rural and urban households got advice from those sources.

Generally health workers in Bangladesh visit poor households. Suburban women, being from better-off households, may not come in contact with health workers but may visit formal health providers, such as doctors and nurses in health clinics. Almost equal shares from the three groups of women (more than one-fourth of each) mentioned that they received advice on healthy food from family members or neighbours.

It can be expected that the in-person advice from people with training in health, such as community health workers, doctors and nurse will have a more positive effect on nutritional outcomes compared to other sources of advice.

4.2.12. Intra-household food distribution

This variable is a measure of intra-household gender equality. It is expected that households that divide expensive and nutritious food such as milk, meat, fish and fruits equally among household members are more gender-neutral compared to households in which husbands get more of those foods.

Figure 4.19 shows that the rural women face more discrimination in household food distribution and suburban women face the least. Overall, very few women mentioned that they get priority in household food.

4.2.13. Hygiene and cleanliness of the household

I have used the categorical variable 'sources of drinking water' as a proxy of household hygiene and cleanliness. Unclean drinking water is the source of various communicable diseases and parasites. Almost all of the rural and suburban households consume hygienic water, mostly from tube wells or boiled tap/river water. However 84 percent of the urban slum women consume unhygienic water (figure 4.20).

Women's consumption of hygienic drinking water is likely to positively correlated with their nutritional status.

4.2.14. Women's consumption of nutritional supplements

Surveyors asked how frequently the respondent women consume nutritional supplements such as iodized salt, fortified yogurt, sprinkles, and calcium tablets. All else equal, women who consume any of the supplements 'regularly' are expected to have better nutritional status than women who don't.

Though all suburban women regularly consume iodized salt, 20 percent of rural and 10 percent of the urban women don't (table 4.4). More than 90 percent of women in all three regions either did not consume or had not heard about fortified yogurt²⁴ and sprinkles. Over 80 percent of urban and rural women either had not heard of or never consumed zinc tablet/ syrup in similar way of zinc.

Calcium, vitamin and iron tablet/syrup are mostly consumed irregularly and/ or during pregnancy and sickness by approximately half of the women in rural and urban area. For suburban women the percentage is slightly higher.

²⁴ Fortified yogurt is a special kind of nutritious yogurt fortified with additional micro-nutrients. The joint venture of Grameen and Danone social business has started marketing such yogurt named as 'shokti-doi' in Bangladesh (Yunus Centre 2012)

4.2.15. *Effects of Inflation*

Bangladesh has been adversely affected by global food price inflation. Women who reported less quantity of current food consumption compared to the previous year were asked the reason behind that. Figure 4.21 shows that rural women were the most affected by the food price inflation; suburban women were the least affected. Women who mentioned 'inflation' as the reason for curtailing their food consumption are likely to have worse nutritional status than women who mentioned other reasons.

4.A. Chapter 4: Tables and Figures

Figure 4.1. *Distribution of Body Mass Index, Rural, Urban and Suburban Samples*

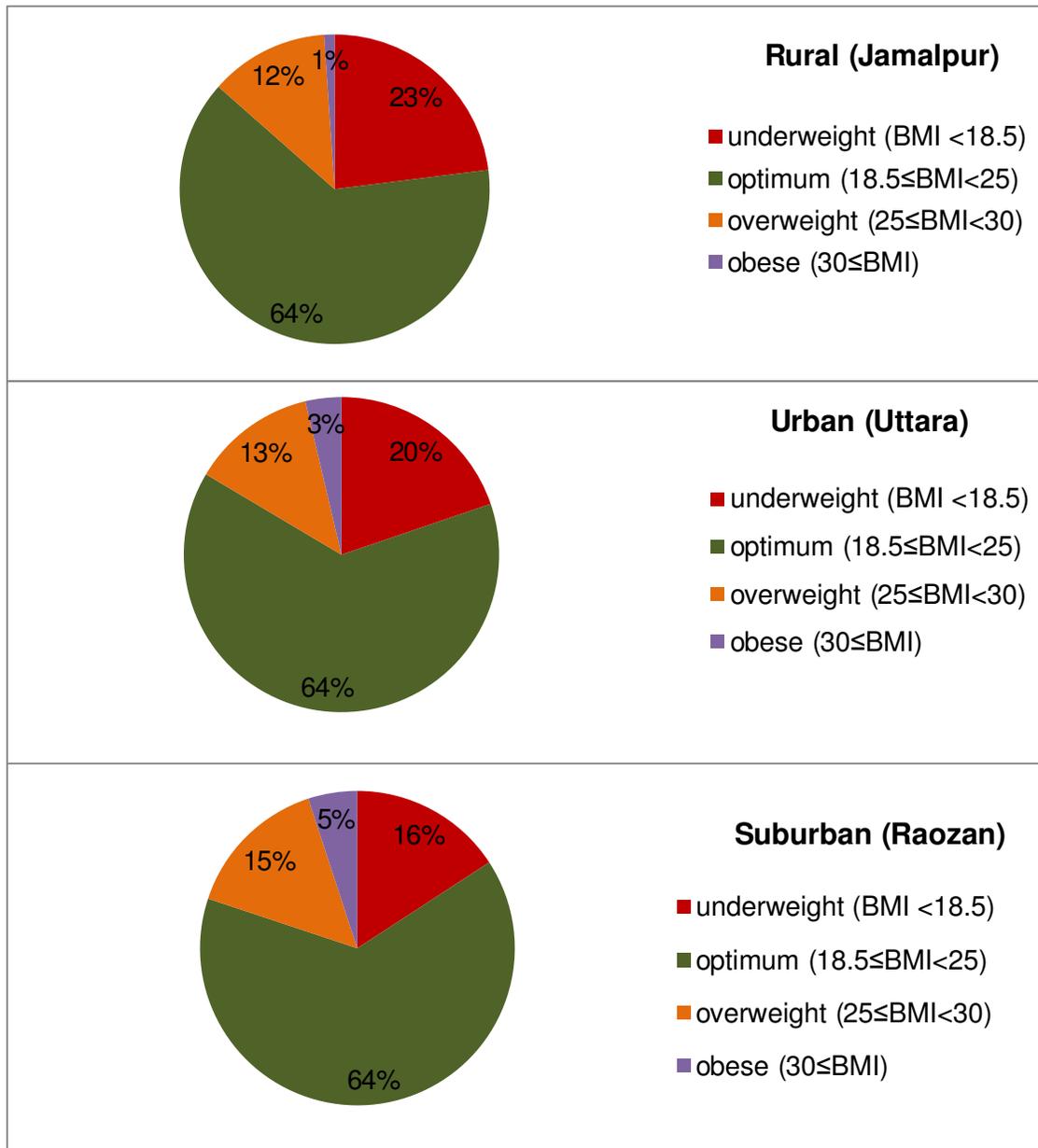


Figure 4.2. Distribution of Food Scores, Rural, Urban and Suburban Samples

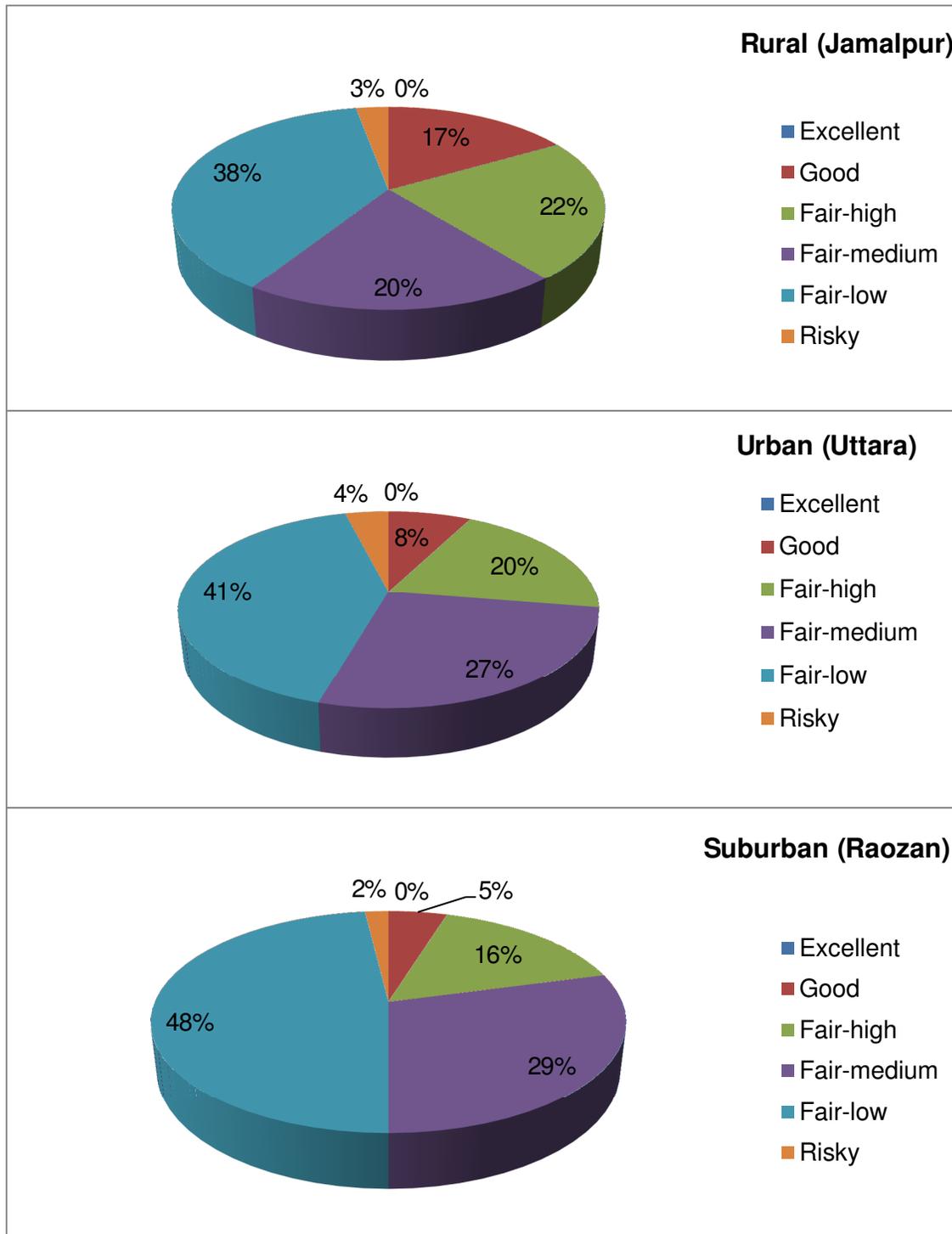


Figure 4.3. Distribution of food scores, Rural, Urban and Suburban Samples, by individual questions

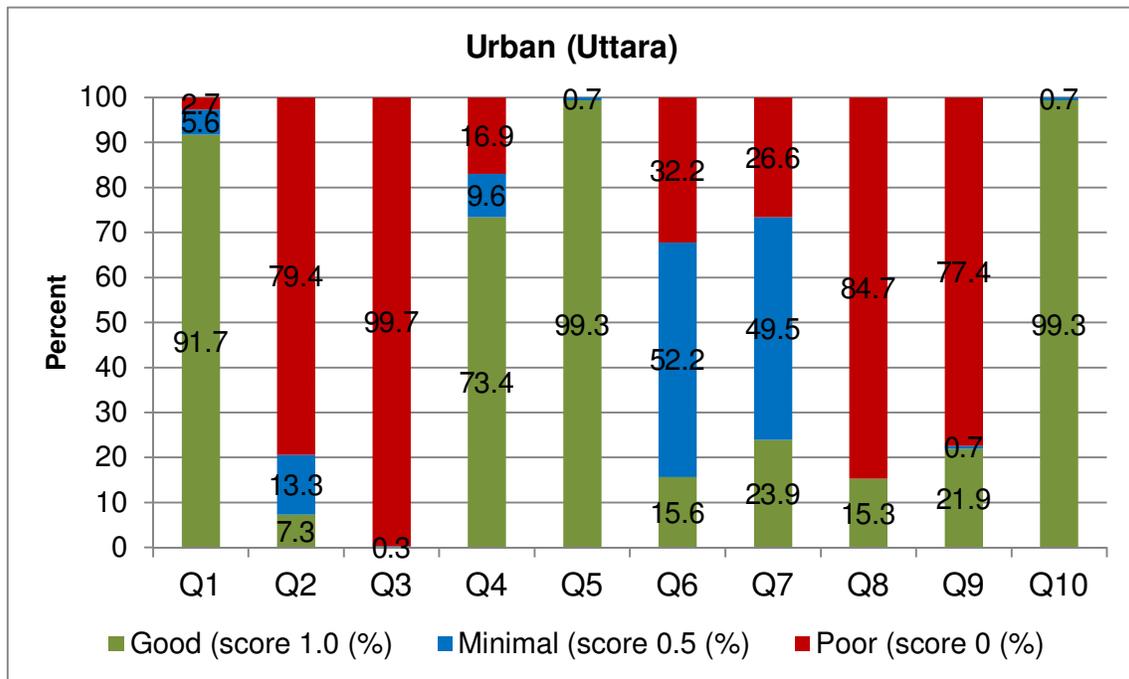
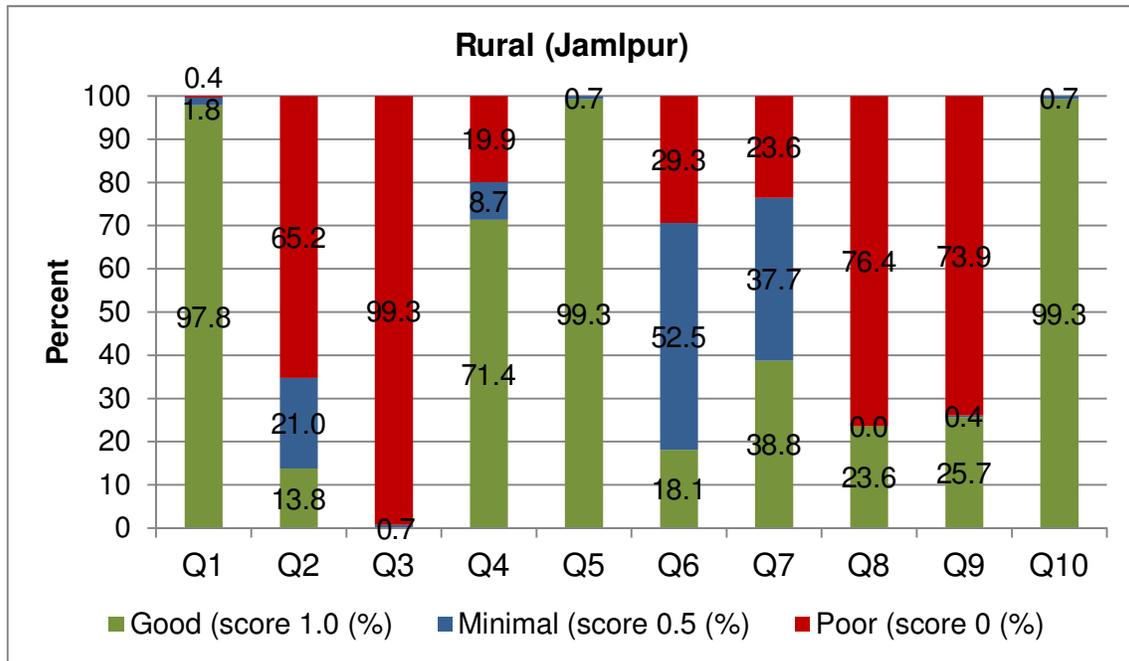


Figure 4.3. Distribution of food scores, Rural, Urban and Suburban Samples, by individual questions

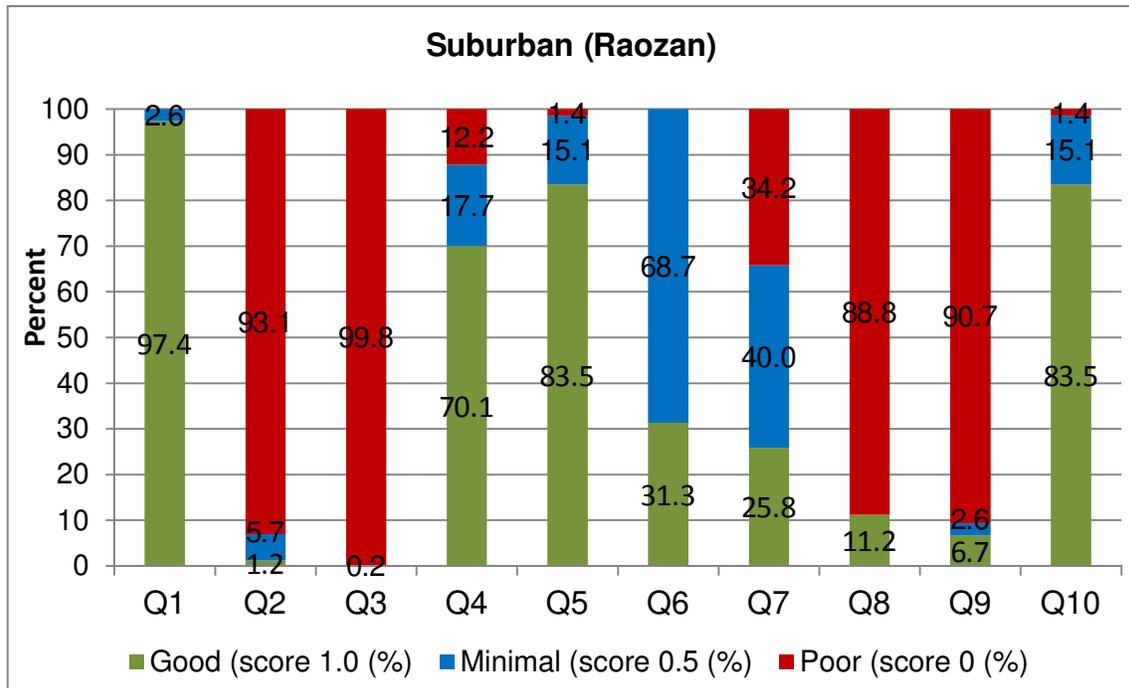


Figure 4.4. Distribution of Literacy of Women

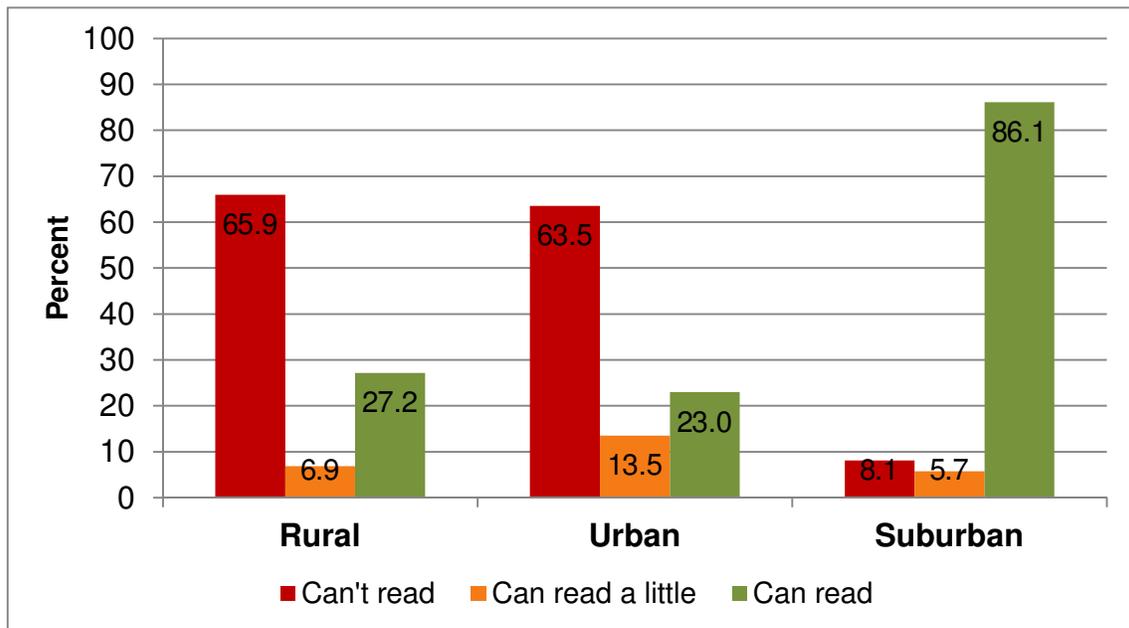


Figure 4.5. Distribution of Women's highest class attendance

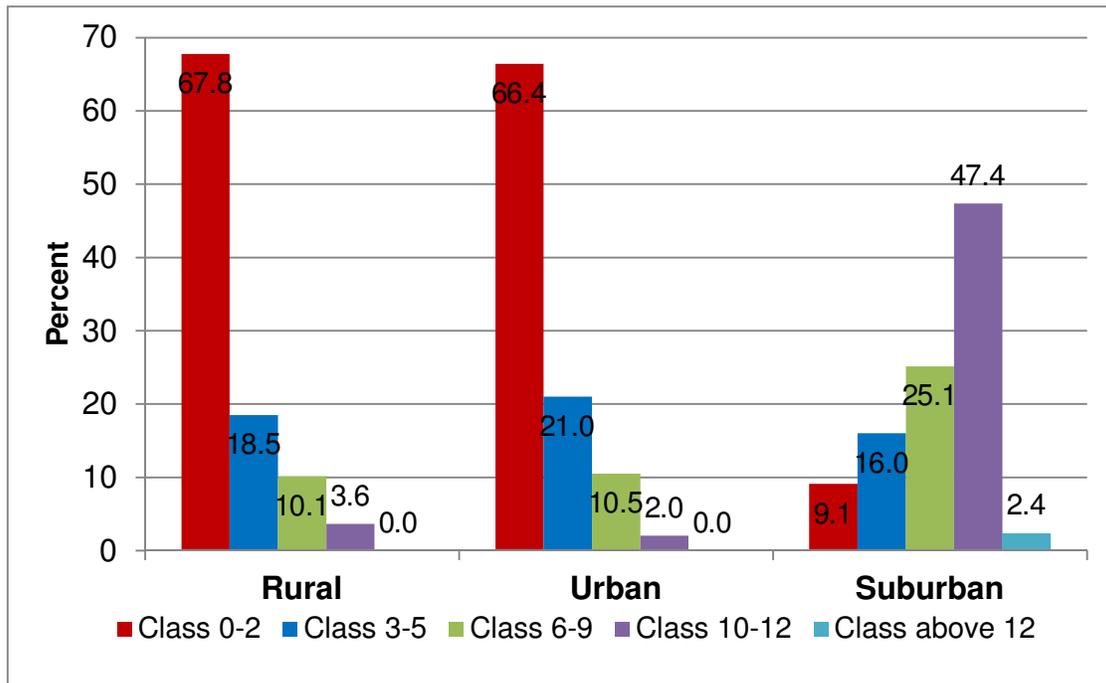


Figure 4.6. Distribution of husband's literacy

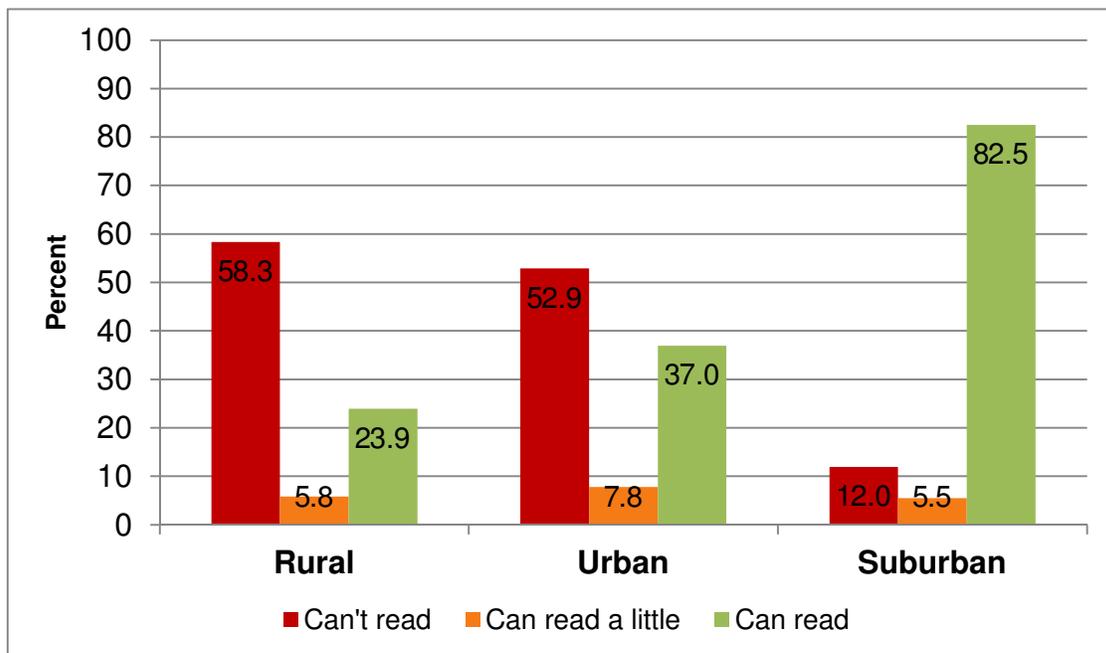


Figure 4.7. Distribution of husband's highest class attendance

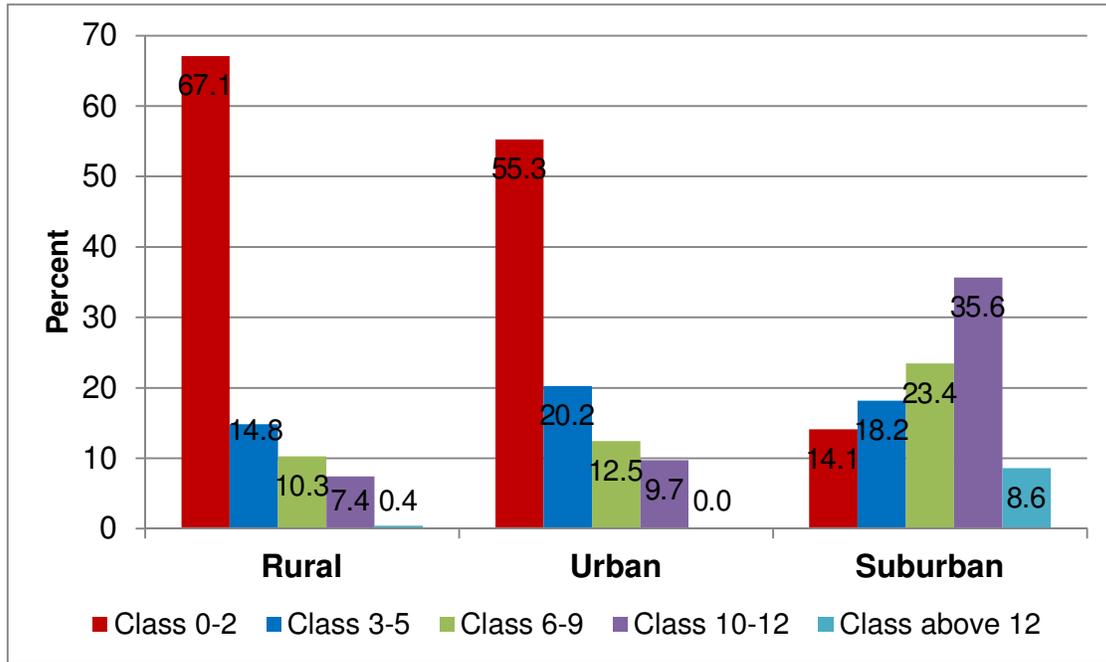


Figure 4.8. Distribution of households' highest class attendance

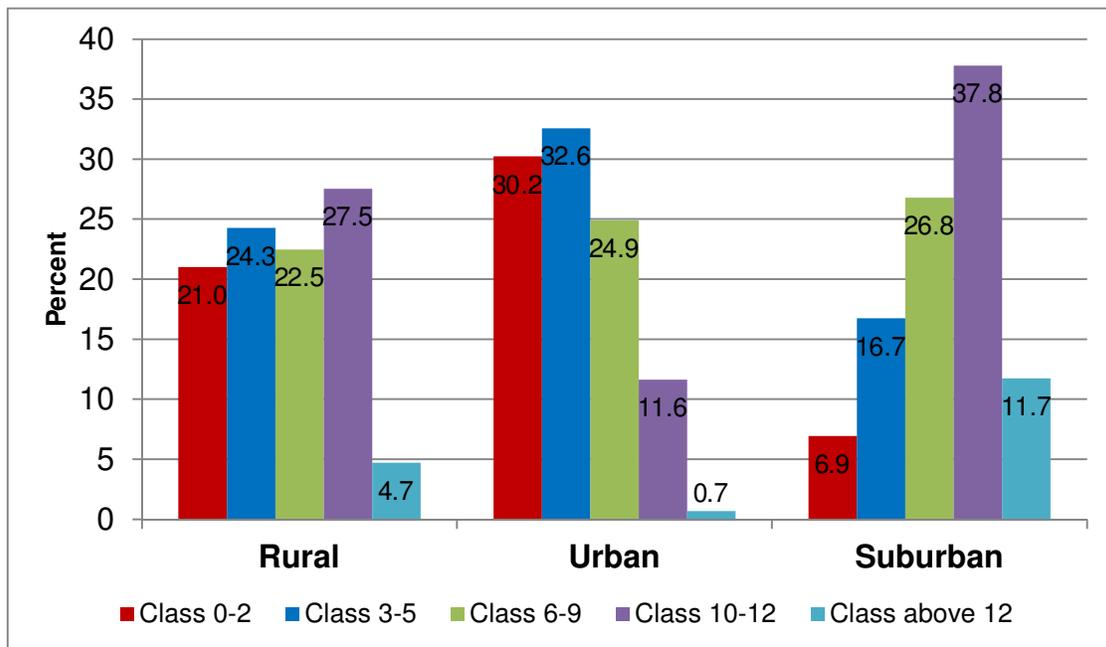


Figure 4.9. Distribution of occupation of women

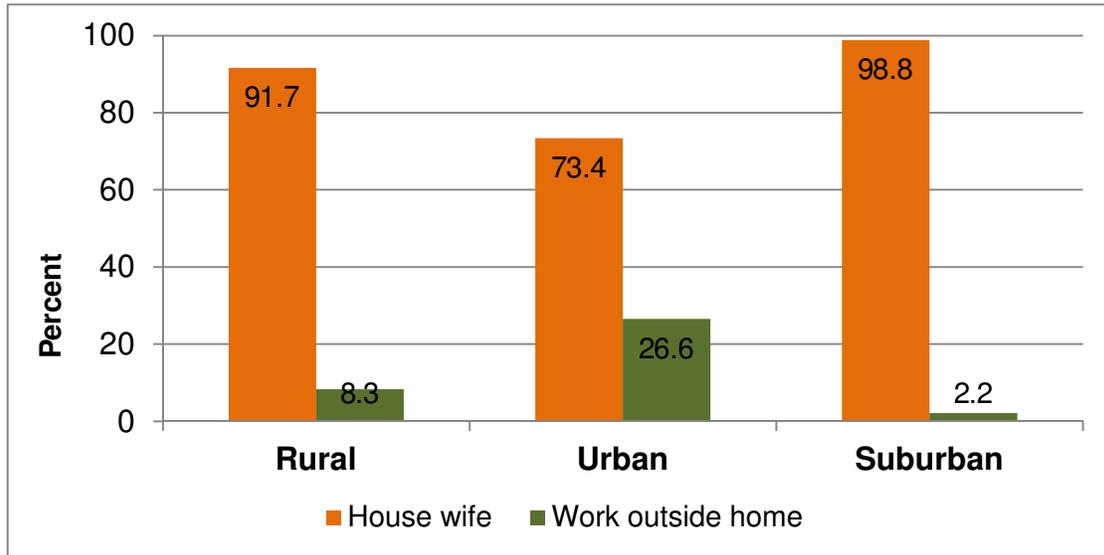


Figure 4.10. Distribution of occupation of husbands

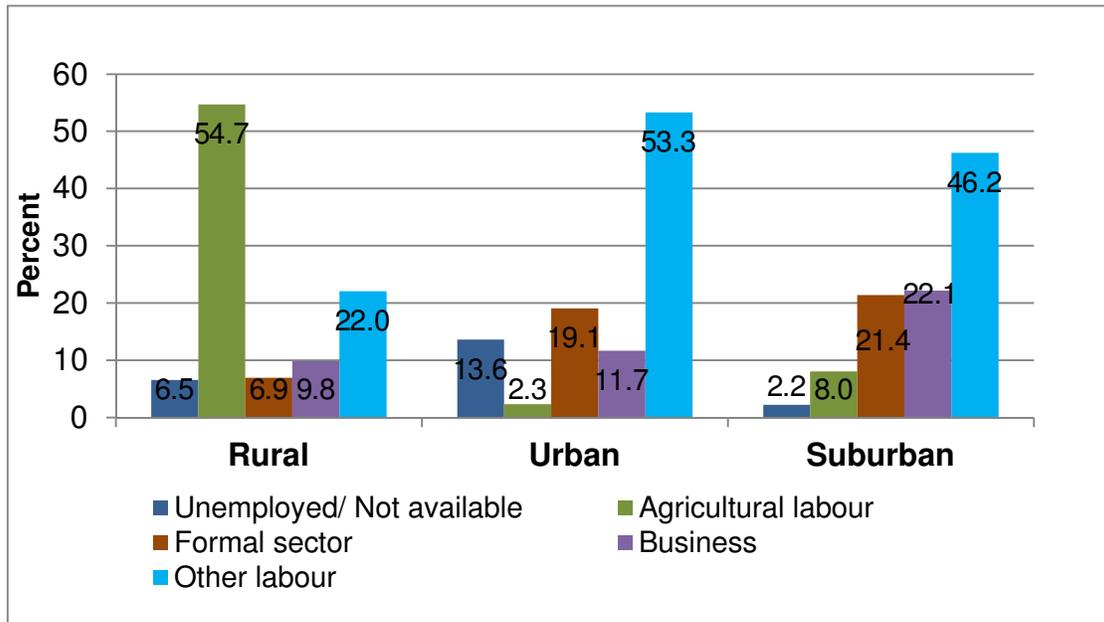


Figure 4.11. Distribution of the age of women

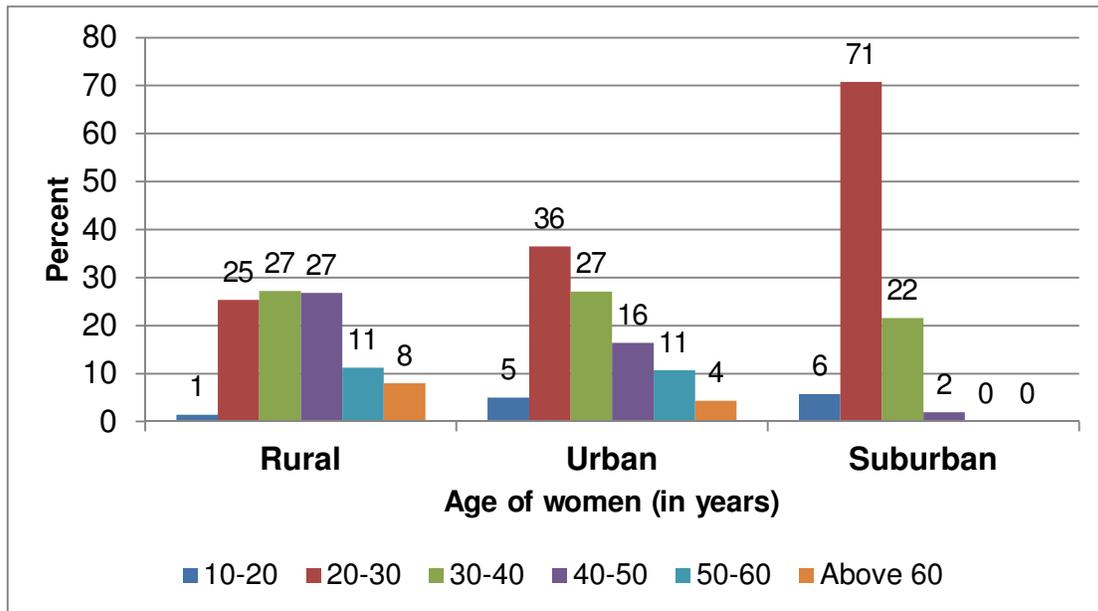


Figure 4.12. Distribution of the structure of family

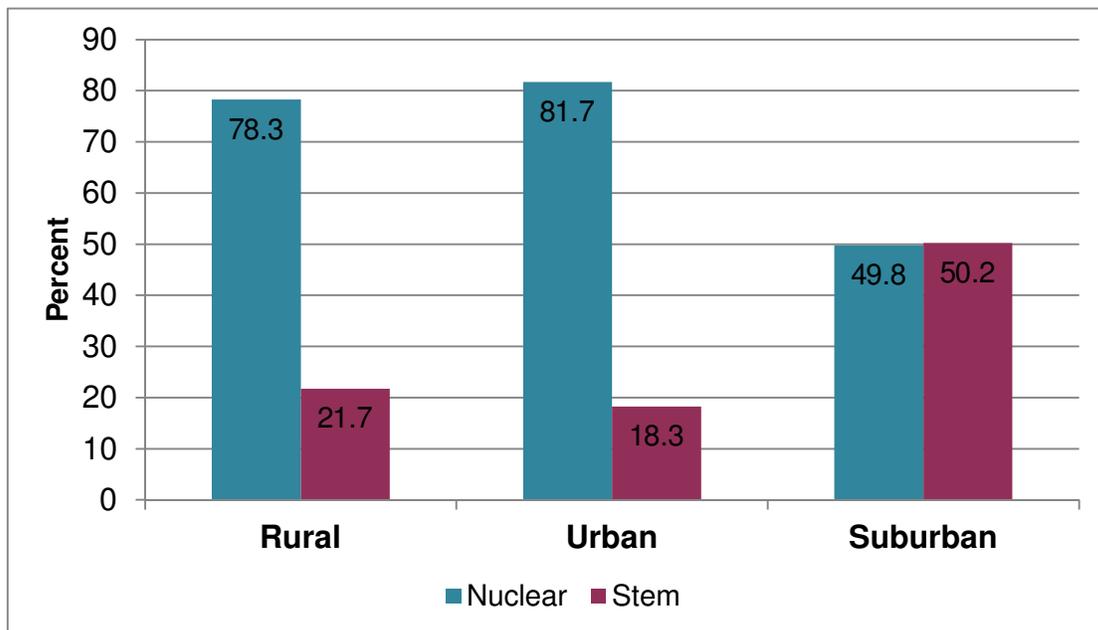


Figure 4.13. Distribution of households, by number of members smoking tobacco

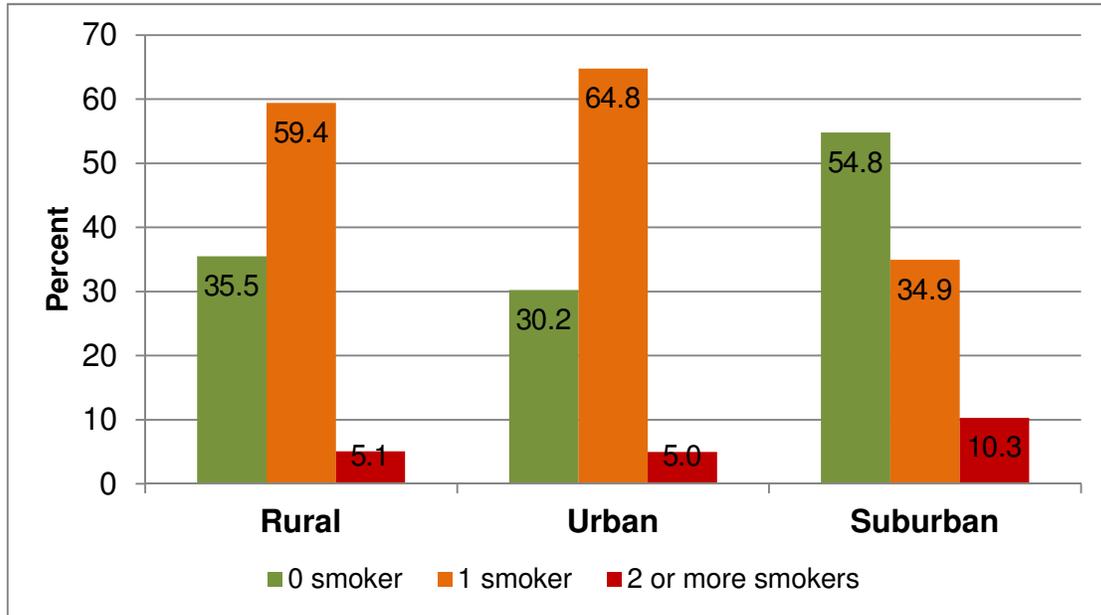


Figure 4.14. Share of spouses smoking tobacco

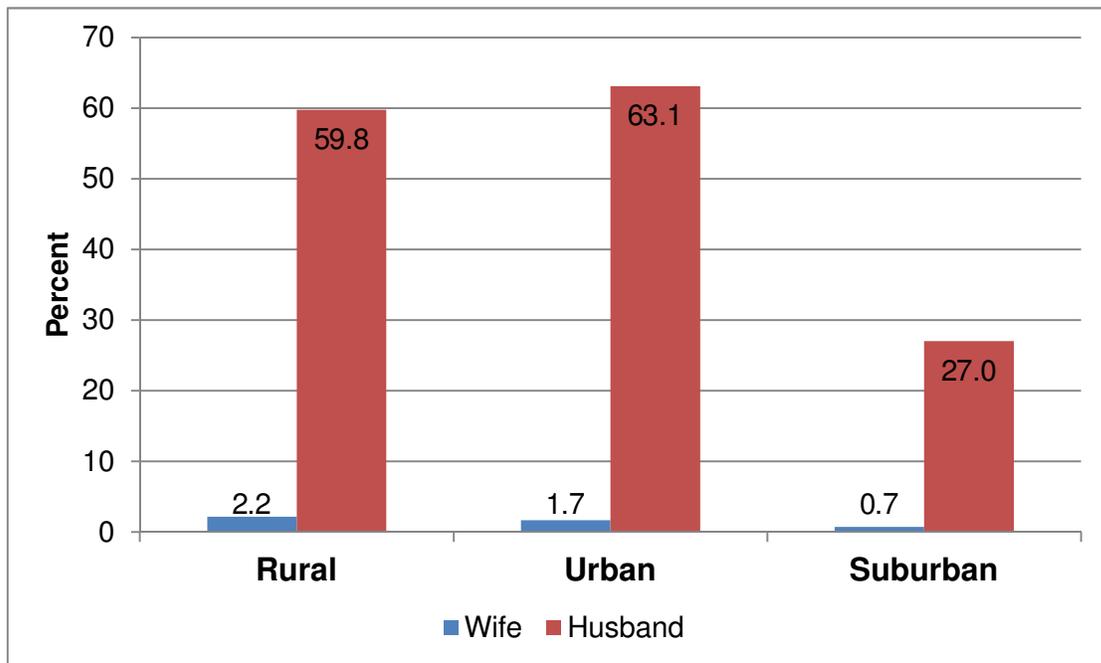


Figure 4.15. Distribution of estimated monthly expenditure on tobacco, by households with smokers

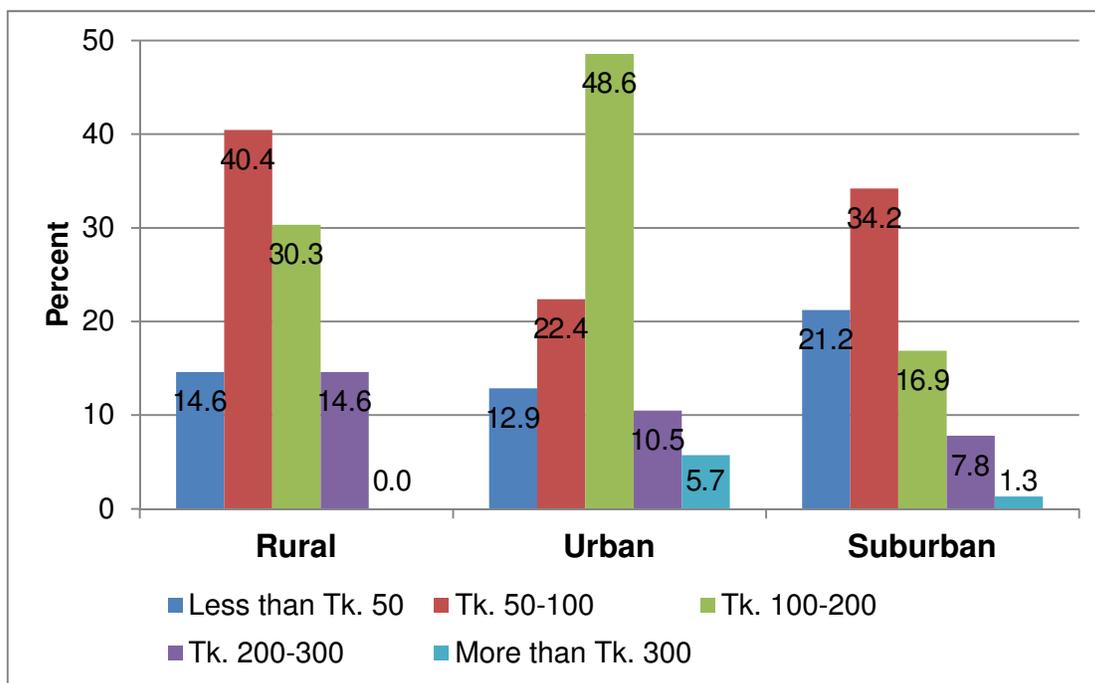


Figure 4.16. Distribution of households, by number of members chewing betel-nut

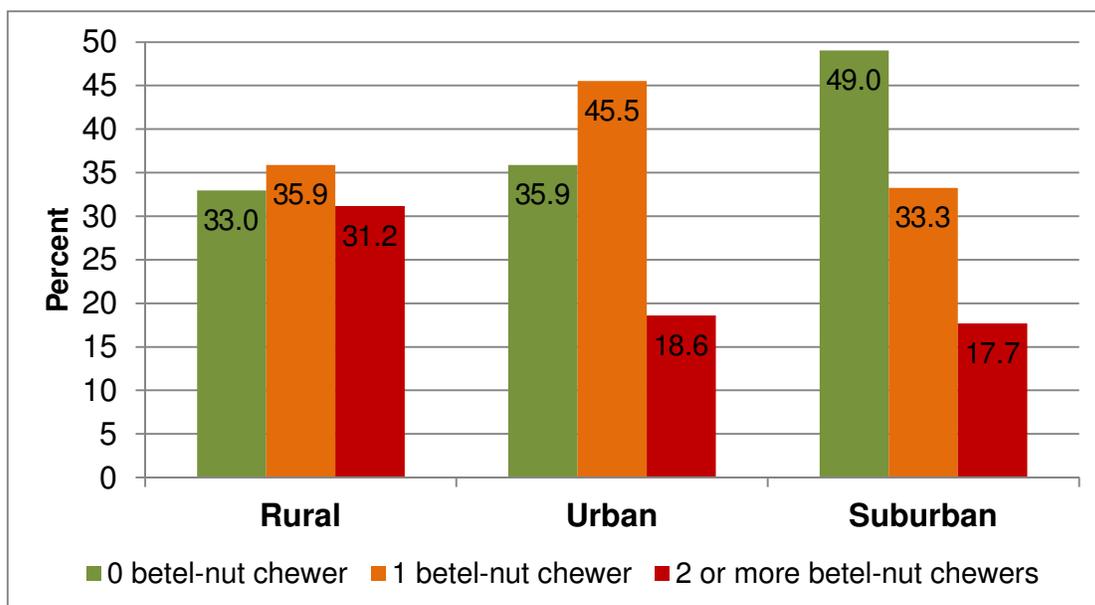


Figure 4.17. Share of spouses chewing betel-nut

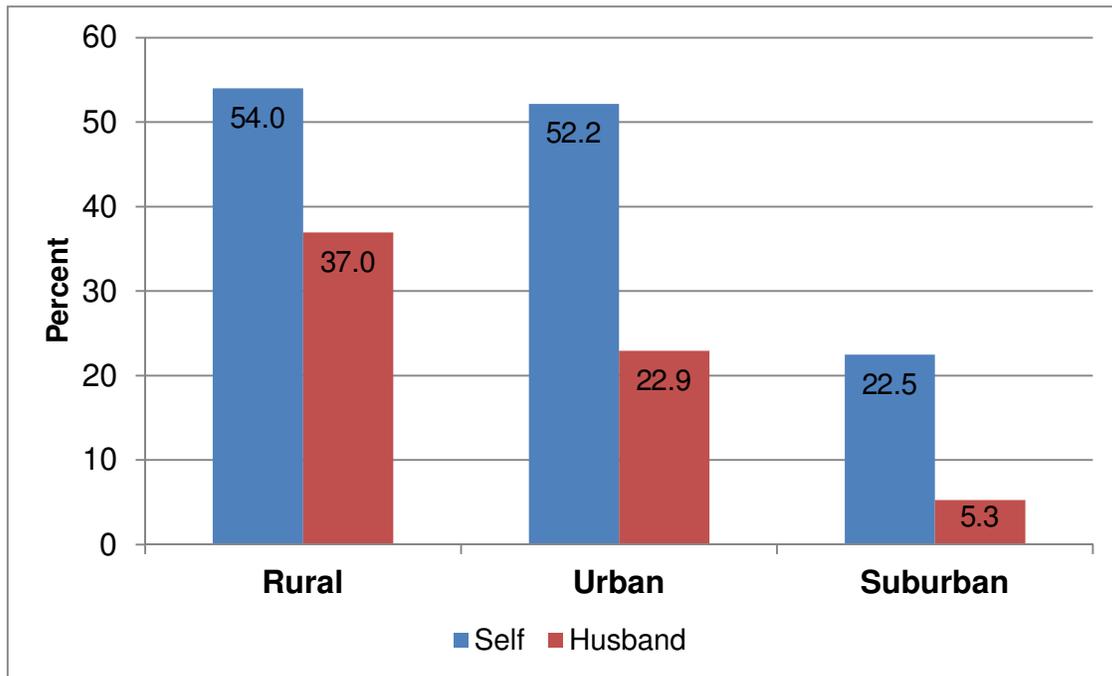


Figure 4.18. Distribution of estimated monthly expenditure on betel-nut, by households with betel-nut chewers

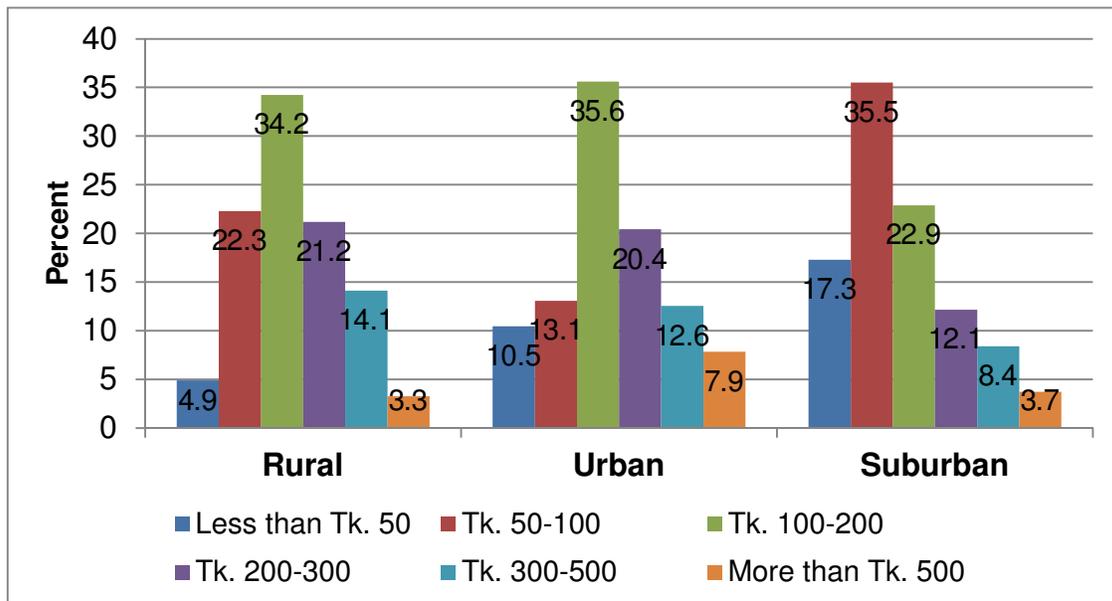


Figure 4.19. Distribution of households' food distribution pattern

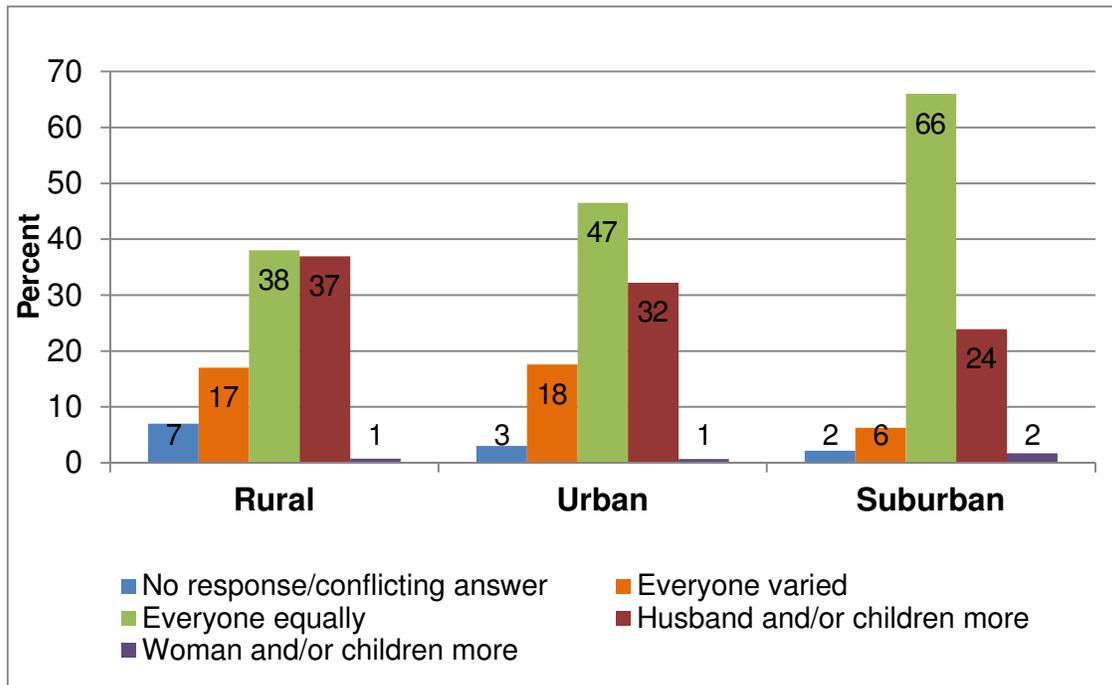


Figure 4.20. Distribution of drinking water, by source

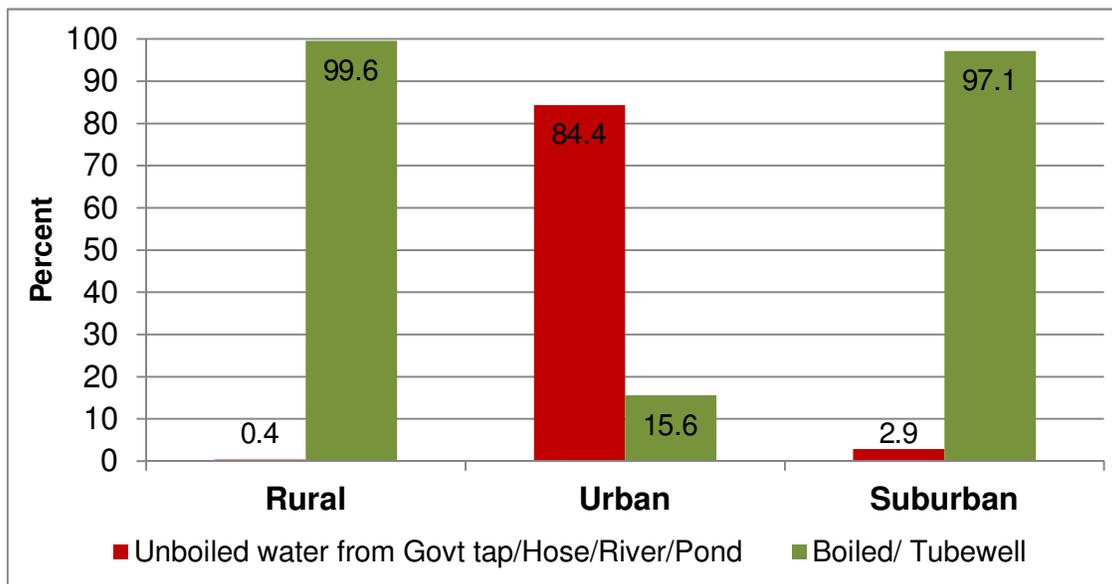


Figure 4.21. Distribution of the reasons for less food consumption

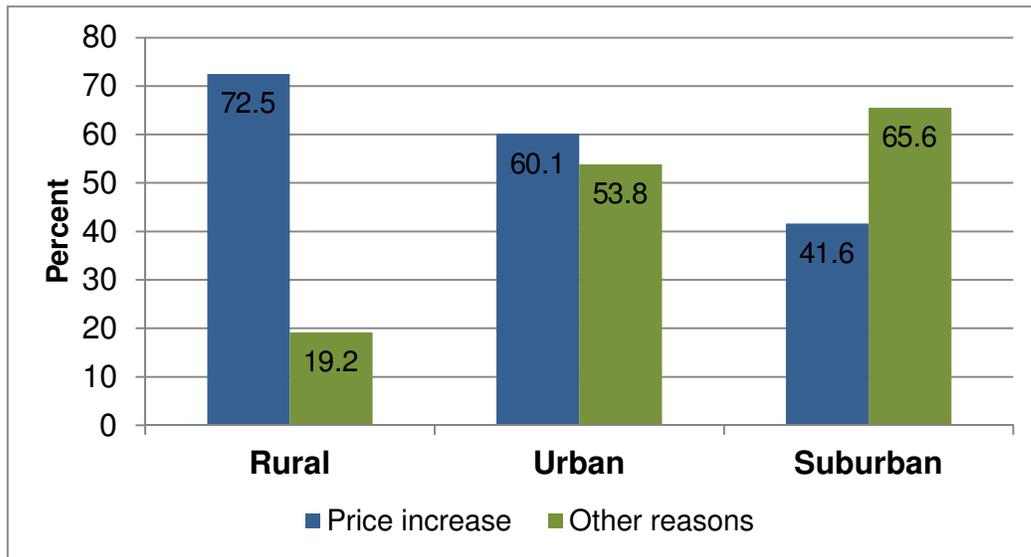


Table 4.2. Average food scores, by rural, urban and suburban samples and question

| Question | Average score by question | | |
|---|---------------------------|----------------|-------------------|
| | Rural (Jamalpur) | Urban (Uttara) | Suburban (Raozan) |
| 1 (Cereals and potato) | 0.99 | 0.95 | 0.99 |
| 2 (Vegetables and fruits) | 0.24 | 0.14 | 0.04 |
| 3 (Milk and products) | 0.00 | 0.00 | 0.00 |
| 4 (Meat and alternative) | 0.76 | 0.78 | 0.79 |
| 5 (fats, oils, sugar) | 1 | 1 | 0.91 |
| 6 (variety of cereals, vegetables and meat) | 0.44 | 0.42 | 0.66 |
| 7 (two fresh vegetables) | 0.58 | 0.49 | 0.46 |
| 8 (one fresh fruit) | 0.24 | 0.15 | 0.11 |
| 9 (nutritious snacks) | 0.26 | 0.22 | 0.08 |
| 10 (low fat food) | 1 | 1 | 0.91 |

Note. The green numbers indicate the highest and the red numbers indicate the lowest average scores for each question.

Table 4.3. Distribution of Household per capita Income (percent)

| Category | Rural (Jamalpur) | Urban (Uttara) | Suburban (Raozan) |
|-------------------------------------|------------------|----------------|-------------------|
| Very low (Less than \$1.25 per day) | 25.7 | 9.0 | 1.9 |
| Low (\$1.25- \$2 per day) | 25.7 | 17.3 | 0.5 |
| Medium (\$2-4 per day) | 37.7 | 63.8 | 36.6 |
| High (\$4-10 per day) | 10.9 | 10.0 | 59.8 |
| Very high (More than \$10 per day) | 0.0 | 0.0 | 1.2 |

Table 4.4. Distribution of the sources of advice on healthy food (percent)

| | Rural (Jamalpur) | Urban (Uttara) | Suburban (Raozan) |
|-----------------------------------|------------------|----------------|-------------------|
| Family/Neighbour | 27.5 | 27.6 | 28.0 |
| Health facilities/ Doctors/ nurse | 16.3 | 15.9 | 31.1 |
| Health worker came to house | 50.4 | 36.2 | 9.8 |
| Public meeting/ NGOs | 14.5 | 8.0 | 1.4 |
| Radio/TV | 22.0 | 51.0 | 46.0 |
| Schools | 0.4 | 0.0 | 2.2 |
| Others | 13.3 | 1.2 | 0.0 |

Table 4.5. Distribution of the nutritional supplements consumption (percent)

| RURAL | <i>Iodized salt</i> | <i>Fortified yogurt</i> | <i>Sprinkles</i> | <i>Calcium tablet</i> | <i>Vitamin tablet</i> | <i>Zinc tablets/ syrup</i> | <i>Iron tablets/ syrup</i> |
|-----------------------------------|---------------------|-------------------------|------------------|-----------------------|-----------------------|----------------------------|----------------------------|
| Regularly | 81 | 0 | 0 | 3 | 2 | 0 | 3 |
| Sometime/Not regularly | 13 | 6 | 1 | 37 | 41 | 14 | 37 |
| When pregnant or nursing children | 0 | 1 | 0 | 7 | 5 | 2 | 14 |
| Never | 5 | 86 | 83 | 49 | 46 | 73 | 44 |
| Don't know | 1 | 6 | 14 | 3 | 6 | 10 | 2 |
| No response | 1 | 1 | 1 | 0 | 0 | 1 | 0 |
| URBAN | <i>Iodized salt</i> | <i>Fortified yogurt</i> | <i>Sprinkles</i> | <i>Calcium tablet</i> | <i>Vitamin tablet</i> | <i>Zinc tablets/ syrup</i> | <i>Iron tablets/ syrup</i> |
| Regularly | 89 | 0 | 0 | 3 | 3 | 0 | 1 |
| Sometime/Not regularly | 5 | 2 | 1 | 39 | 50 | 3 | 23 |
| When pregnant or nursing children | 0 | 1 | 0 | 8 | 11 | 2 | 9 |
| Never | 2 | 37 | 26 | 36 | 28 | 43 | 40 |
| Don't know | 0 | 16 | 35 | 6 | 3 | 27 | 14 |
| No response | 3 | 44 | 38 | 8 | 5 | 24 | 13 |
| SUBURBAN | <i>Iodized salt</i> | <i>Fortified yogurt</i> | <i>Sprinkles</i> | <i>Calcium tablet</i> | <i>Vitamin tablet</i> | <i>Zinc tablets/ syrup</i> | <i>Iron tablets/ syrup</i> |
| Regularly | 100 | 0 | 0 | 13 | 14 | 3 | 7 |
| Sometime/Not regularly | 0 | 3 | 0 | 18 | 21 | 8 | 10 |
| When pregnant or nursing children | 0 | 3 | 2 | 52 | 49 | 32 | 58 |
| Never | 0 | 90 | 80 | 14 | 13 | 47 | 22 |
| Don't know | 0 | 5 | 17 | 2 | 2 | 11 | 3 |
| No response | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

5. Analysis

The objective of the study is to relate women's nutritional status to different socio-economic characteristics and suggest policy for potential improvement based on that. However, due to data and time limitations, a multivariate regression analysis to explore causal relations has not been attempted. Cross-tab analysis has been used instead, which gives the distribution of nutritional status for different subsets of the women surveyed, the subsets defined by independent variables. Thus the results should be considered as indicative rather than as conclusive evidence.

The detail of the crosstab results is shown in appendix D. The analysis in this chapter illustrates the relationship between the variables (socio-economic characteristics) and the proportion in each sample subset with an inadequate diet (food score below 5).

5.1. The Education-Nutrition Link

I have constructed crosstabs between women's food score and each of women's literacy, women's highest class attendance, highest class attendance of their husbands, and household members.

5.1.1. Women's education

Among rural and suburban women literacy and higher class attendance both have positive effects on their respective food scores, lowering the prevalence of inadequate diet. Among urban women, the benefits are much more ambiguous (table 5.1).

For example, of those rural women who either can't read or can read a little, 42 percent have an inadequate diet score; of those who can read, this statistic falls to 37 percent. Of suburban women who can't read, 62 percent have an inadequate score; of those who can read or read a little the proportion with an inadequate score falls below 50 percent. However, of those urban women who can read or read a little, over half have an inadequate diet score; among those who cannot read their inadequate share is only 43 percent. In most cases urban households are newly migrated from rural areas and many cannot yet maintain a standard of living consistent with their educational qualifications.

Crosstab analysis with highest class attendance of women and their food score reveals similar results. For both rural and suburban women the most severe prevalence of inadequate diet is among women with the lowest class attendance (class 0-2). For both groups, women with the highest class attendance (class 10 and above) display the lowest prevalence of inadequate food score. This effect is clearer among suburban women who have more variability in class attendance than in the other two samples. Among urban women two-thirds have two years of schooling or less, one-fifth went to class 3-5. These two groups have a lower prevalence of inadequate diet than the one third with more schooling.

5.1.2. Husband's education and highest household education level

In general, women fare better in households where their husbands' literacy and class attendance are higher. The positive effect of husbands' education is most evident in rural households, less so in suburban households and non-existent in urban households (table 5.2).

Cross tab results on rural and suburban households show 'inadequate' food score is less prevalent among women whose husbands 'can read' including those whose husbands 'can read a little'. Among rural households there is a dramatic improvement in women's nutrition among households where the husband has class 6 or higher, relative to class 0-5. An analogous crosstab among suburban women demonstrates a modest

benefit in women's nutrition. Among urban women there is no benefit in women's nutrition until the husband achieves the highest education level.

Turn now to the highest household education level. Particularly for the rural sample, an increase in the highest household education level is associated with much better nutrition among women (table 5.3). Among both rural and urban households, all of which are poor, the distributions indicate much higher education levels than is the case for either husbands or wives. My analysis shows that, among poor households, children are often the highest educated person. In the suburban area where half of the families are stem type and children are younger, the most educated person in the household is either the husband of the woman or any other adult household member²⁵. Better educated children may have an important influence on building awareness about choice of food and nutrition of their mothers.

5.2. Gender-Nutrition

I have calculated cross tabs with 'occupation of women' and 'who get more food in the households' with food score (table 5.4 and 55). Women who work outside the home may have more autonomy and more influence in household decision making than women who are only housewives. On the other hand, women may work outside the home due to very low family income. As a measure of intra-household gender behaviour I posed a question asking 'who get more food'.

Only eight women in the suburban area work outside the home. Among this small group their food scores are considerably better than the women who don't work outside the home. However in urban areas, where women's working outside the home is more prevalent, it is associated with virtually no impact on nutritional status of women. And in the rural area, it is associated with markedly worse nutritional status.

²⁵ Household's highest level of education did not include the woman interviewed as another variable was constructed for women's highest level of education.

In Bangladesh, a number of obstacles at the family and social level limit women's participation in the formal labour force. Among suburban women, who have higher socio-economic status, women's participation in an outside job is an indicator of household level gender equity. Among poor households women's participation in income-earning jobs outside the home might be an indicator of the household's very low financial status.

Household food distribution behaviour appears to have only a minor impact on women's nutritional status in any region. To the extent there is an effect, it is opposite to that expected. This result is not particularly surprising because it is difficult to get the true picture of household gender behaviour by asking indirect questions. We could not ask direct questions to the respondents that might be regarded as offensive. Moreover, surveyors reported that the presence of other household members as well as neighbours may have influenced answers to the question.

5.3. Hygiene-Nutrition

Almost all women from rural and suburban households drink water from a hygienic source, so it is not possible to identify any effect of drinking unhygienic water on their nutritional status. However, the majority of the urban women drink non-boiled water from a municipal tap. The municipal water supply is not hygienic. Among urban women the share with an 'inadequate' food score is much higher among women who use non-boiled municipal water compared to women who use boiled water (table 5.6).

5.4. Income-Nutrition

There is some evidence of worse nutritional status among rural women with 'very low' and 'low' incomes relative to those with 'medium' and 'high' incomes. In the rural area the standard of living is quite homogeneous and women's nutritional status does not differ much with slight variations in income.

Among suburban women very few were from households from the 'very low' income category. The most important result is to be found in the urban area. Here, women from 'very low' income households experience a much higher prevalence of

inadequate diet than women with higher incomes. Also, the prevalence of inadequate diet among 'very low' income urban women is much higher than the comparable 'very low' income category experiences in the rural area (table 5.7).

5.5. Advice-Nutrition

For rural women several sources of advice may have a positive influence on nutritional status. Nutritional advice from family/relatives/neighbours, from health facilities / doctors / nurses, from public meetings and from radio / TV / posters has a positive effect on food scores (table 5.8). For urban women advice from family / relatives / neighbours and from TV / radio / poster has a positive relationship with food score. For suburban women advice from health facilities / doctors / nurses and radio / TV / poster seemed beneficial.

In Bangladesh community health workers, commonly known as *shasthyo-shebika*, from NGOs have been playing an important role to improve child and maternal health. There is recent evidence that, due to very low payment, the quality and quantity of the services of community health workers' have dropped in Bangladesh (Alam et al. 2011; UNICEF 2004). As a result health workers' advice may not play an effective role to improve women's nutritional status in any region.

Approximately one-third of women in all three regions received advice on nutrition from their family members, relatives, and neighbours. Among rural and urban women 'Inadequate' food scores are less prevalent among women who did receive such advice compared to women who did not. However such advice has no relationship to prevalence of inadequate food scores of suburban women.

Few rural and urban women received nutritional advice from formal health care providers in health facilities. Among rural women who received advice from these sources the prevalence of inadequate diet scores is much lower than among those who did not. Crosstab analysis shows this group of women could not incorporate the advice in their diets. Compared to rural and urban women, more suburban women got nutritional advice from formal health sources.

Very few women in the urban and suburban area received advice from public meetings. Among rural women, attending such meetings was more common and those who received advice from this source experienced much better food scores than those who did not. Getting advice from radio/ TV/ poster had positive effects on women's food scores in all three areas, most notably in rural areas. Among rural women who got nutritional advice from any of these sources 29 percent scored 'inadequate', as did 44 percent who did not. Though less effective than in the rural sample, there is some evidence of a positive effect of media advice in the urban and suburban samples.

5.6. Nutritional supplements-Nutrition

Almost all women in the three areas consume iodized salt, but almost no women either consumed or had heard about sprinkles and fortified yogurt. A small percent of women in all three regions consume calcium tablets, vitamin tablets and zinc irregularly or during pregnancy (table 5.9). There is some sign that the nutritional status of this group of women is better than those who never consumed, or never heard about those supplements. However the number in this category is too small to draw any conclusion. For these supplements the key point is that very few women know about them.

5.7. Addictions-Nutrition

Very few women smoke; in nearly all cases where a household member smokes it is the husband, male relative or male son. Cross tab analysis on the number of persons in the household who smoke and women's food score shows a negative correlation among these two variables in two of the three samples (table 5.10). Particularly among the rural population, the share of women with an 'inadequate' food score is much more prevalent where at least one member in the household smokes. A similar result obtains among the suburban women. Here the difference arising from the presence of a smoker in the family is smaller. However, in the urban sample the presence of a smoker in the family has no impact on prevalence of inadequate diet among women.

In many households both husbands and wives are addicted, either to tobacco or to betel nut. Separate crosstabs for each addiction may not give the total effect of addiction on nutrition. I have identified households with at least one addicted member and calculated crosstabs to see the effect of any type of addiction among members of in the household on women's nutrition. It should be noted that in the urban area all households have members using either tobacco or betel or both, so it was not possible to see the correlation between addiction and women's food score.

The cross tab result shows that in rural and suburban areas the nutritional status of women from 'addicted' households is worse compared to women from 'non-addicted' households (table 5.11). In the rural area 85 percent of households have at least one member addicted to either tobacco or betel nut. Almost half of the women in addicted households have an inadequate diet score, which is true of only 30 percent of the non-addicted households. Among suburban households two-thirds have at least one addicted member. Of suburban women from addicted households 52 percent scored inadequate, while from non-addicted households the rate is 45 percent.

5.8. Inflation-Nutrition

With cross-section data it is difficult to capture the effect of inflation over time. Crosstab analysis provides indirect evidence that inflation is a problem among some. Among rural women who mentioned food price hikes as the reason for consuming less food, the share of inadequate diets is much higher relative to women who did not mention inflation (table 5.12).²⁶ For urban women the result is similar, though the difference between the two groups of women is not as large as in the rural area. A similar conclusion can be drawn for the non-poor suburban women.

²⁶ Other reasons included change in preferences, sickness, change in the number of household members, etc. (see chapter 4 for detail).

6. Policy Analysis

As discussed in the previous sections, women's nutritional status depends on many factors. To improve on all these factors requires long-term integrated planning as well as huge resources. In this study I will focus on targeted, relatively low-cost policies, policies that can improve low-income women's nutritional status in the context of limited financial resources available. As discussed in the introduction, the options will be directed towards protein and micronutrient problems.

6.1. Policy options

6.1.1. Option 1: Nutritional supplements

The importance of micronutrient supplements as instruments to reduce mortality and morbidity in developing countries has been identified in discussions of the Millennium Development Goals (Klemm et al. 2009).

There are a number of ways to provide nutritional supplements. Providing direct oral micronutrient supplements requires women to go to health care centre and also large infrastructural arrangements. Home food fortification through micronutrient sachets (popularly known as sprinkles) is an effective method practised among 6-24 month-old children in many countries. Sprinkles provide iron, zinc, iodine and different types of vitamins (Micronutrient Forum 2008; WFP 2009). However the micronutrient sachets are specifically designed for children aged 6-24 months, who consume small amounts of food. More research is necessary to prove the effectiveness of sprinkles for adults (Sprinkles Global Health Initiative 2012).

Fortifying staple foods is an effective method of providing nutritional supplements for adults (Allen et al. 2006; Micronutrient Forum 2012). Food fortification involves the addition of vitamins and minerals to the principal foods of the targeted population. This

method has been successfully used to fortify rice in many countries, such as Brazil, India, China, Cambodia, Costa Rica and Nicaragua (The World Bank 2011). One of the advantages of this method is it does not require a change to the eating habits of the population.

A pilot project in Bangladesh identified wheat flour and edible oil as two potential vehicles for food fortification (Dary and Rassas 2004). In 2012, six edible oil refiners in Bangladesh have started to fortify edible oil. The cost of that oil is predicted to be higher than the available edible oils in the market²⁷. Grameen Social Business²⁸ is producing 'Shokti-doi', a fortified sweet yogurt containing vitamins, minerals and nutrients. It has been specifically designed for children. The price of this yogurt (Tk. 7 in rural area and Tk. 12 in urban area) is not easily affordable by poor people. Large scale production of this yogurt may reduce cost in the long run (Planète d'Entrepreneurs 2012).

In Bangladesh no initiative has yet been undertaken to fortify rice. In order to sell fortified rice commercially it is necessary to involve commercial rice producers in the production process. Countries like Philippines, Costa Rica and some states in United States have mandatory rice fortification programs. In those countries a specific percent of total rice production must be fortified and targeted for the poor population. India, Indonesia and China have also successfully introduced pilot programs of rice fortification for specific marginal groups.

Four main technologies can be used to fortify rice: hot extrusion, cold extrusion, coating and dusting.²⁹ Cold extrusion and coating are the cost-effective ways to fortify rice (Alavi et al. 2008). With coated rice, the nutrition value decreases if washed before

²⁷ http://www.thefinancialexpress-bd.com/more.php?news_id=98443&date=2012-02-14

²⁸ A wing of 'Grameen Bank', Bangladesh.

²⁹ Hot and cold extrusion produces rice shape kernels by mixing a rice made dough flours, a fortification mix and water either in hot (70-110°C) or in cold (below 70°C) temperature. Coating spread and layered fortification mix in wax or gum form on rice and dusting polish rice grains with micronutrient premix, stick with rice.

cooking. Country case studies show that rice fortification will increase the retail price of rice by 1.5 to 4 percent (Alavi et al. 2008; World Bank 2011).

Almost none of the women sampled have heard about fortified food and sprinkles, while the consumption of iron tablets/ syrups, vitamin tables, zinc and calcium tablet/ syrup is limited to only a small percent. Given the lack of use and knowledge of nutritional supplementation, the potential government policy options should include

- Subsidizing fortified rice to the poor such that its price is equivalent to the lowest price of unfortified rice for a period of at least the first year
- Popularizing fortified rice as an easy and cheap way of home food fortification to address vitamin and mineral deficiencies
- Extending the reach and popularity of fortified yogurt.

6.1.2. Option 2: Hygienic drinking water

The lack of access to hygienic water in Dhaka slums results in a high prevalence of various water-borne diseases among slum dwellers. According to the 2009 Multiple Indicator Cluster Survey, only 8.5 per cent of households in slum areas in Bangladesh use improved sanitation facilities that meet UNICEF monitoring standards (UNICEF 2012). Ahmed (2002) estimated the cost of treatment for hygiene-related diseases at US\$ 80 million per year. My survey results show almost all rural and suburban women have access to either safe tube well water or boiled water. In the Uttara slum however, 84 percent do not have access to hygienic drinking water. Other studies (Podymow et al. 2003) have found similar results in Dhaka slums.³⁰

³⁰ In this study on 3 slums located in Mohammadpur, Lalbagh and Dhanmondi in Dhaka city the authors found 87 percent of slum dwellers do not have access to safe drinking water.

However no significant initiatives have been undertaken to supply safe water in urban slums in Bangladesh. In 1999 the Bangladesh Association for Social Advancement (BASA), a local NGO, set up 15 tube wells for 700 people in slums in Gazipur, a suburban area near Dhaka city. This NGO has been carrying out another safe drinking water project in another slum located in Mirpur area of Dhaka. These projects are donor-funded. The slums are randomly selected without any well organized plan.

An appropriate reform is setting sufficient tube wells in slum areas to ensure that slum families can access hygienic water. Tube wells can be either deep or shallow.³¹ Deep tube wells are not suitable in slums as they are expensive to drill and maintain.³² Furthermore, urban slums are often transitory. Shallow tube wells, are small in size and less costly and are more suitable in the context of urban slums of Bangladesh.

Some areas in Bangladesh face a risk of arsenic in tube well water. In such areas, an alternate policy is selling low cost water purification tablets. ICDDR,B, the pioneer of diarrhoeal research in Bangladesh, recently has invented another type of cheap³³ water purification powder mixture called 'siraj mixture' which effectively reduces the contamination of arsenic and reduces the risk of diarrhoea (ICDDR,B 2012).³⁴

Subsidizing the entire cost of water purification tablets involves a huge monetary cost. It is not sustainable by either the government or NGOs. So the proposed policy in this regard is the following:

- Establish community tube wells in slum areas
- Sell water 'siraj mixture' at low cost in arsenic-risk areas.

³¹ A deep tube well is more than 50 feet deep, while a shallow tube well is defined as less than 50 feet deep.

³² The cost of setting one deep tube well is Tk.163200 (USD 2766) (Biswas 2004)

³³ The cost of siraj mixture to purify 15 liter water is Tk.0.35 (less than 0.5 cent).

³⁴ For more detail, see: <https://centre.icddr.org/activity/index.jsp?activityObjectID=3512>

6.1.3. Option 3: Healthy food initiative through social enterprises

According to the British Columbia Centre for Social Enterprise, “social enterprises are revenue-generating businesses with a twist. Whether operated by a non-profit organization or by a for-profit company, a social enterprise has two goals: to achieve social, cultural, community economic or environmental outcomes; and, to earn revenue.”³⁵ A frequently cited example is Grameen/ Danone Foods, a partnership between Grameen Bank and Danone, a French manufacturer of dairy products. (See section 6.1.1.) The social enterprise manufactures *Shokti-doi* as means to introduce micronutrients into children’s diet. The enterprise is expected to operate efficiently, raise its revenue through sales, but pose rigid limits on any dividends to the shareholders.

Very few women, in all three sample areas, have adequate servings of vegetables, fruits and milk in their regular diet. Moreover many of them regularly consume unhealthy snacks such as *samosa*, chips, biscuits, *paratha* and different kind of sweets. These snacks are mostly deep fried, made of flour and potato. They are prepared without maintaining minimum standards of hygiene and cleanliness. In Bangladesh poor people are more concerned about filling their stomachs than nutrition. Such snacks are cheaper than fruits and vegetables. Nutritious snacks are available only in food shops targeting wealthy customers.

Access to fruits, vegetables and healthy snacks at a low cost will encourage people to buy those as their meal and snack. This is a potential focus for NGOs in Bangladesh. They can initiate social enterprises (small businesses with a social mandate, financed by a combination of sales revenue and donor funds). Such social enterprises can create work opportunities for women. A relevant social enterprise example is Mercy Corps, an Indonesian NGO. It has launched Kedai Balitaku (My

³⁵ BC Centre for Social Enterprise. Accessed on March 21, 2012.
<http://www.centreforsocialenterprise.com/what.html>

Child's Café) selling through street vans in Jakarta.³⁶ The goal is to provide access to healthy foods to school children, while raising awareness and increasing economic opportunity among local people. The cost of one meal for a child with chicken, rice, vegetable porridge is USD 0.20. The favourite local snack is a 10 cent gelatin pop. (Such pops are almost always made with artificial fruit flavors; these are made with real mango, strawberry, melon or other fruits.) Because of the attractive presentation skills focusing on healthy food, this initiative has become popular and has been spun off as a for-profit social enterprise.

In Bangladesh the only analogous initiative is *shokti-doi* (fortified yogurt as discussed in section 6.1.1). There are also examples of successful social enterprises producing handicrafts, dairy, poultry, etc. BRAC has nurseries to sell seeds and plants at cheap prices in different areas in Bangladesh. These are run as social enterprises. No direct initiative has been taken for sustainable community gardening through BRAC nurseries.

NGOs operating in Bangladesh can take social business initiatives in two ways:

- Sell 'Jakarta model' cheap nutritious meals and snacks through street vans in cities and suburban areas
- Initiate gardening to produce vegetables and fruits in the homestead gardens near homes in rural and suburban areas (if land is available). Unemployed women and children will work to produce fruits and vegetables for their households and community. Initially NGOs will support the gardens. Gardening will not be possible in urban slum areas due to unavailability of land and due to high mobility of slum families.

For both options I recommend to start with pilot projects.

³⁶ The New York Times; May 23, 2011 (<http://opinionator.blogs.nytimes.com/2011/05/23/in-food-deserts-oases-of-nutrition/>)

6.1.4. Option 4: Behaviour change through nutritional advice

In my survey, half of the women in the rural area, one-third in the urban area and only one-tenth of women in the suburban area received advice from health workers who visited them at home. The advice did not appear to have any effect on women's nutritional outcomes relative to those who did not receive such visits. The inadequacy of the health workers' knowledge and lack of enthusiasm during their visit might be the reason for lack of benefit. On the other hand, my analysis shows a positive relationship in all three regions between women's nutritional outcomes and receiving advice from the media; as well, advice from health facilities/ doctors/ nurses was beneficial. The media advertisements are generally attractive and eye-catching presentations. Advice from health facilities/ doctors/ nurses is also likely to be informative and valuable.

Moreover there are many examples of health-related advice programs in Bangladesh dealing with specific health problems such as diarrhoea, tuberculosis, malaria, HIV, hygiene and cleanliness, and pre- and post-natal care of mother and children (BRAC 2012³⁷, Khandoker et al. 2009, UNICEF 2004). These programs may contribute to better nutrition indirectly, but few programs aim is to promote healthy food preparation at low cost. So the fifth policy option is the following:

- Incorporate education on healthy food selection and preparation, maintaining nutrition during inflation, and balanced diet with existing health education programs
- Improve training of community health workers

6.1.5. Option 5: Controlling consumption of tobacco

Among the sample urban households, 70 percent have at least one member who smokes. For rural households the statistic is 65 percent and for suburban households it

³⁷ <http://www.brac.net/content/social-communication-advocacy-health>

is 45 percent.³⁸ The higher prevalence of women with inadequate food score in households with members who smoke points to the importance of reducing tobacco consumption. There are three general tactics to pursue: increasing the price of tobacco by taxation, restricting the advertising of tobacco and tobacco products, and restricting the shops able to sell tobacco products.

Tobacco is one of the cheapest consumer products in Bangladesh. The price of three sticks of *bidi*, the cheapest handmade cigarette, is less than one cent. Even the price of a packet (of 20 sticks) of one of the most expensive brands of cigarette is less than a dollar³⁹. The tax rate on tobacco in Bangladesh has remained stagnant for almost 10 years. The real price of tobacco has remained unchanged (Unnayan Shamannay 2010).

Table 6.1. Rates of tobacco taxes in Bangladesh, 2009

| Price segment | Price Range (Tk.) | Tax Rate | |
|----------------------|--------------------|--------------------|-----------------------|
| | | Supplementary Duty | Value Added Tax (VAT) |
| Low* | 14.60-17.60 | 32% | 15% |
| Medium* | 32.80-34.80 | 52% | 15% |
| High* | 46.72-58.72 | 55% | 15% |
| Premium* | 93+ | 57% | 15% |
| <i>Bidi (Akiz)**</i> | 6.00 | 20% | 15% |
| <i>Jorda, Gul***</i> | 2.00-4.00 | 10% | 15% |

Note: 1. * Cigarettes in 20 sticks per pack; ** Handmade cigarettes of 25 sticks per pack; *** smokeless tobacco

2. 1 USD = Tk. 80.43

Source: PATT Policy Brief- 1, Unnayan Shamannay 2010.

³⁸ In Canada 20.8 percent of the population aged 12 and above smoke (Statistics Canada, 2010), while in Bangladesh 43.3 percent of the adults use tobacco products, either smoking or smokeless (GATT 2010)

³⁹ Monthly Statistical Bulletin, Bangladesh Bureau of Statistics, August 2010.

A significant increase in the price of tobacco is considered the most effective way to reduce tobacco consumption and to encourage current users to stop smoking (WHO 2003, WHO 2009, Unnanyan Shamannay 2010). According to a WHO (1999) review report on tobacco, a 10 percent increase in the price of tobacco reduces consumption by 8 percent in low and middle income countries. However, the price elasticity of demand for cigarettes in Bangladesh is inelastic. It has been estimated at -0.4 in the short run and -0.3 in the long run (Shamunnay 2010, Barkat et al. 2008). Poorer households may be more responsive to price changes than are rich households in Southeast Asia (Guindon 2003). Shamunnay (2010) estimates the price elasticity of *bidi* as -0.64. Nonetheless, demand for cigarette and *bidi* is inelastic: a tax increase will reduce consumption but will also result in a larger drain of households income toward expenditure on smoking, and thus reduce the money available to buy foods. There is evidence, from Canada, that young adolescents are sensitive to price, that the elasticity of taking up the smoking habit displays an elasticity between -1.5 and -2.0 (Sen et al. 2010). This suggests that, intergenerationally, tobacco demand may be price elastic. But this is a very long-run policy. I do not recommend tobacco tax increases as an immediate policy to increase women's nutrition.⁴⁰

Countries may implement additional policies such as legislation to ban tobacco advertisements and restrict selling. Poland during the 1990s provides a good example. In Bangladesh there is no restriction on buying and selling of tobacco. Though smoking is completely banned in public places and work places, the law is often broken. Because of weak enforcement, laws often fail to achieve their anticipated benefit for the country.

In Bangladesh the first major law on tobacco control ('The Smoking and Using of Tobacco Products Control Act, No XI, 2005') was passed in 2005 when Bangladesh became a party to the WHO Framework Convention on Tobacco Control. There are some

⁴⁰ In 1997, South Africa increased cigarette tax by 52 percent, and reduced consumption by 30 percent. However, very high taxation of tobacco was not effective in Thailand: 80 percent tax rate on cigarettes resulted in tax avoidance and large cigarette sales in the black market. In Bangladesh, where law enforcement is quite weak, high tobacco taxes may result in a large black market.

restrictions on direct advertising of cigarettes, but tobacco companies can still advertise and promote sponsorship.⁴¹ According to the tobacco control law, health warning labels should cover 30 percent of the tobacco package, but this too has not been adequately enforced (Campaign for tobacco free kids 2012). Though a majority of smokers know that smoking is harmful, very few are aware of specific health effects of smoking such as cancer, respiratory diseases, stroke and heart diseases (Efroymson and Ahmed 2003).

In summary, my second policy option involves two elements:

- Restricting tobacco sold in specific areas such as near educational institutions.
- Legislating a ban on an all advertisement of tobacco and tobacco products.

The cross-tab analysis found the positive association between households' betel-nut addiction and women's poor nutritional status. However betel-nuts are produced and sold in local markets. It would not be possible to impose a tax on betel-nut.

6.1.6. Option 6: Status quo

Bangladesh has very few programs and policies to improve the overall nutritional status of low-income women. The 'National Nutrition Program' and 'Area based community nutrition (ABCN) program' are the two major programs initiated by the government of Bangladesh. Both programs target only pregnant and lactating women. They provide folic acid (IFA) and vitamin A supplements as part of pre- and post-natal care. In Bangladesh only 50 percent of women visit health facilities during pregnancy, and only 21 percent as part of post-natal care (The World Bank⁴²). Some NGOs currently

⁴¹ Source: Campaign for tobacco free kids (2012)
<http://www.tobaccocontrolaws.org/legislation/factsheet/aps/bangladesh>

⁴² <http://siteresources.worldbank.org/SOUTHASIAEXT/Resources/223546-1171488994713/3455847-1232124140958/5748939-1234285802791/BangladeshNutrition.pdf>

provide food supplements (called '*pushti*')⁴³ to underweight (BMI<18.5) pregnant women (Ortolano et al. 2003), but the coverage is limited. Because of the obvious inadequacies of the status quo, I will not consider it as a satisfactory option in my policy evaluation.

Besides these short term policies, a number of long term policies are important. Obvious priorities with indirect nutritional benefits for women include improving literacy and class attainment, creating income-generating opportunities for low-income women, and improving agricultural productivity.

6.2. Criteria for Analysis

In order to assess how well the aforementioned policy options can be expected to realize the policy objective of improved women's nutrition, I have identified the following criteria.

6.2.1. Effectiveness

The effectiveness of each policy option will be measured in two ways: first, how effective will the policy be in reducing women's deficiencies in protein and micronutrients; second, how effective will the policy be in reducing the likelihood of women succumbing to disease. If women are frequently ill, then their ability to derive nutrition from food will be lower.

The effectiveness will be measured as 'high', 'medium' and 'low'. In making my assessment, I will refer to the survey data and evidence from the literature:

- If a policy fulfills both objectives, it will score 'high'
- If a policy fulfills any one objective, it will score 'moderate'
- If a policy fulfills neither of the objectives, it will score 'low'

⁴³ '*Pushti*' is a bangla word means nutrition. This supplements consist of rice-flour, roasted pulse flour, molasses and oil, provides approximately 600 kcal per day.

6.2.2. Cost

This criterion involves the cost of implementing the specific policy by the relevant agency (either government or NGOs or both) without any external funding support. The costs will be approximate estimates. Actual costs involved will vary due to extent of corruption and administrative mismanagement. However due to the variability of these factors and the difficulty in getting an accurate estimate, I will not incorporate these factors.

I have assigned 'high', 'medium' and 'low' to rank cost. This ranking is based on cost per beneficiary and cost of the proposed program as a percentage of the total national budget (2011-12) of Bangladesh.

6.2.3. Administrative feasibility

This criterion assesses whether the new policy requires hiring administrative staff, acquiring new physical facilities, enacting new legislation, and the susceptibility to 'additional corruption'. (In Bangladesh it is difficult to find a sector with no corruption.) The expected implementation time lag will also be considered.

This criterion will be measured as 'high', 'medium' and 'low':

- If the policy does not require additional staff, administrative changes and new infrastructure, does not increase the likelihood of 'additional corruption', does not require additional legislation and can start implementation fully within six months, it will score 'high'.
- If the policy requires some additional staffs, some administrative changes and infrastructure but does not increase the likelihood of 'additional corruption', does not require new legislation and can start implementation fully within one year, it will score 'medium'.
- If the policy requires a large additional staffs, significant administrative changes and infrastructure and/or increases the likelihood of 'additional corruption', requires new legislation and cannot start implementation fully within one year, it will score 'low'.

6.2.4. Public acceptance

This criterion captures how the involved parties, such as the women themselves, their families and society in general, political parties, donors and businesses view the policy option. As before, this criterion will be measured as 'high', 'medium' and 'low':

- If the option is acceptable by all stakeholders, then it will score 'high'.
- If the policy is acceptable by the general public but not by other stakeholders, it will score 'medium'.
- If the policy is accepted by none of the above, it will score 'low'.

6.3. Assessment of options

In this section I will assess the proposed six policy options in relation to the four criteria. The summary of the analysis will be presented in table 6.1

6.3.1. Evaluation of Nutritional supplements program

Fortified rice will be highly effective in combating micronutrient deficiencies for poor women. My analysis shows almost all women in the three areas consume adequate servings from the cereals and potato group. The main food item in that group is rice. The average rice consumption among rural women sampled is 14.5 servings, for urban it is 10 servings, and for suburban 11 servings per day.⁴⁴ The effectiveness of fortified food to reduce short term deficiencies and to prevent long term illness has been established in many countries. The high incidence of night blindness in Denmark during 1900 was reduced by fortifying margarine with vitamin A and D. Fortification of flour eliminated pellagra in United States and thiamin and riboflavin deficiencies in Newfoundland. Hotz et al. (2008) showed that the consumption of iron-fortified rice for 6 months⁴⁵ resulted in

⁴⁴ 6 servings from cereals and potato group considered adequate.

⁴⁵ Each woman was provided 13 mg rice per day for 5 days per week.

80 percent reduction of iron-deficiency anemia among garment worker women in Mexico.

If the fortified rice is targeted to provide a subsidized price equivalent to that of coarse rice⁴⁶ for ultra poor households⁴⁷ (10 percent of the total population = 1.6 million), then it will require adoption of new technologies by commercial rice producers. The government may receive support from international organizations like Global Alliance to Improve Nutrition (GAIN).⁴⁸ The need for a partnership of government, international organizations and private rice producers may create new administrative complexities and some additional corruption.

The cost of fortification of rice using cold extrusion comprises the cost of machinery, fortification mix, labour and the cost of rice. Building a cold extrusion rice factory with fortifying capacity of 30 thousand to 60 thousand metric tonnes per year will require USD 0.75 million (Alavi et al. 2008). This will increase the final selling price of rice approximately 2 percent. Considering the current price of coarse rice of 30 Tk.⁴⁹ (= USD 0.375) per kg, fortification will increase the price of rice to Tk. 30.6 (USD 0.383) per kg. In Bangladesh rice consumption per capita per day is 0.44 kg (Abdullah et al. 2006). The cost of subsidizing fortified rice for the bottom 10 percent of the population⁵⁰ is Tk.154 crore (USD 19.3 million) per year.⁵¹

⁴⁶ The cheapest rice in Bangladesh

⁴⁷ Ultra poor households are those whose members live below USD1.00 per day (BRAC 2012)

⁴⁸ GAIN provided technological support in Brazil to fortify rice (<http://www.gainhealth.org/press-releases/path-gain-partner-advance-rice-fortification-brazil-tackle-malnutrition-globally>)

⁴⁹ Trading corporation of Bangladesh 2012.

⁵⁰ The NGO BRAC has identified the bottom 10 percent population of Bangladesh through a program named 'Challenging the Frontiers of Poverty Reduction, Targeting the Ultra Poor'. The criteria include 'household's ownership of land (less than 10 decimals – or less than one tenth an acre), no active male income earners, dependency on begging or female domestic work, no ownership in productive assets and no support from children engaged in wage earning' (BRAC 2012).

⁵¹ The reported USD 19.3 million = 16 million (10% of Bangladesh total population) x 2% x Tk.30 (cost of fortification) x 0.44kg/capita/day x 365 days/year. The exchange rate is USD 1 = Tk.80.

However my analysis shows that women from the extreme poor⁵² population (49.6 percent of the total population) and from better-off households also have severe micronutrient deficiencies. For these women fortified yogurt may be a preferable option for micronutrient supplements. Selling fortified rice at a subsidized price to an additional 40 percent of the population (includes all household members) will require an additional USD 80 million per year. Overall the monetary cost for the subsidy of fortified food will be high.

The fortified rice produced through cold extrusion is opaque and slightly off-colour, but the taste does not change (Alavi et al. 2008). In India and other developing countries such as Cambodia and Nicaragua, fortified rice is widely accepted and performed well in terms of 'taste'. In Bangladesh the social acceptance of fortified food will be high. Some small initial advertisements might be helpful. Word of mouth advice from shopkeepers and posters in the shops can be effective ways to inform people about the benefit of eating fortified rice and fortified yogurt.

6.3.2. Evaluation of providing hygienic drinking water

Access to hygienic water is a highly effective means to prevent water borne diseases among women and their families. A 2003-04 study of 225,000 in a rural area in Bangladesh showed that households with greater tube well density reported significantly lower incidence of diarrhoea (Carrel et al. 2011). The effectiveness of 'siraj' mixture has also been proved through a randomized control trial in rural Bangladesh (Islam et. al. 2011). Among the treatment group with 'siraj' mixture only 0.2 percent was subject to diarrhoea while among the control group it was 5.12 percent.

The cost of a shallow tube well in Bangladesh varies on the basis of the depth of the pipe, quality of the hand-pump, construction materials, etc. Generally it varies

⁵² Population who live above \$1 per day but below \$1.25 per day. Ultra poor live below \$1 per day (World Bank 2010 and BRAC 2012).

between Tk. 5,000 (USD 60) and Tk. 8,000 (USD 100)⁵³. If one tube well is set for 10 households, then 100,000 wells are required. The total installation cost will be approximately Tk. 65 crore⁵⁴ (USD 8.13 million). The immediate cost of setting up tube wells is high but the operating costs are low. In my evaluation I considered the cost as moderate. If government subsidizes use of the 'siraj' mix in the arsenic contaminated areas, then its cost will depend on the percentage of subsidization. As mentioned earlier, one packet of siraj mixture purifies 15 liters of water and costs Tk. 0.35 (0.45 cent). If government does not subsidize the price, then the cost of providing 'siraj mix' to 29 percent arsenic contaminated population will be Tk. 98.4 crore (USD 12.3 million) per year.⁵⁵

Setting up approximately 100,000 tube wells requires large scale administrative coordination. Primarily the decisions will be taken by the Water Resources Planning Organization (WARPO) of Bangladesh and will be implemented by the two water supply and sewerage authorities (WASA) located in Dhaka and Chittagong, by four city corporations located in Rajshahi, Khulna, Barisal, Sylhet and by a number of municipal corporations in urban and suburban areas. No additional employees need to be hired beyond the labour to set up tube wells. There are some possibilities of additional corruption and administrative failure, which can be avoided by proper monitoring. Overall the administrative feasibility of good implementation over Bangladesh is low. So I

⁵³ The cost of pipes and hand pump of one 30 feet shallow tubewell for 10 families in Bangladesh is Tk. 6000 (USD 75) (WateAid 2012). There are some additional cost of drilling and digging which may cost additional Tk. 1000 to 2000 (USD 12 to 24). http://www.wateraid.org/uk/get_involved/community_groups/schools/buckets_of_water/5422.asp

⁵⁴ The total number of slum households in urban areas in Bangladesh is 1 million (Centre for Urban Studies, Bangladesh 2005). According to Water Aid (2012) each shallow tube well can be shared by 10 households. Then 100,000 tube well will be required to set up to cover all urban slums. Considering the cost of one shallow tube well to be approximately Tk. 6500, the total cost will be $100000 \times \text{Tk.}6500 = \text{Tk.} 650 \text{ million}$.

⁵⁵ In Bangladesh 29 percent people (=46.4 million) live in arsenic contaminated area (People's Daily Online, 2007). An adult person needs to drink 2.5 litres water per day. Then the total water demand in the arsenic contaminated area per year is $46.4m \times 2.5 \times 365$ litres. As one siraj mix purifies 15 litres water. So total siraj mix demand is $(46.4m \times 2.5 \times 365) / 15$. The cost of which is $\text{Tk.} 0.35[(46.4m \times 2.5 \times 365) / 15] = \text{Tk.} 98.4 \text{ crore}$

consider the administrative feasibility as medium. Distribution of 'siraj' mix requires medium level administrative arrangements.

The public acceptance of tube wells will be high as people in Bangladesh are already aware of the benefit of tube well water over other sources. Public acceptance of siraj mix requires a publicity campaign. If people need to buy it, acceptance will be low. If government distributes the mixture free of cost, public acceptance will be high.

6.3.3. Evaluation of healthy food initiative through social enterprises

The effectiveness of social enterprise initiatives as means to improve women's nutritional status and to prevent disease will be low. Availability of healthy foods does not ensure that people will purchase it if they have other options. Generally women who work outside purchase one full meal from a street food van. Moreover, women consume much of their daily food intake at home. The effectiveness of community gardens as means to improve women's nutritional status and to prevent disease is higher than street van food. Family gardens may be the major source of micronutrients for low-income rural and suburban women who do not work outside the home, and have unused land near home. During 1986 CARE, Bangladesh, a NGO, launched a pilot project named 'Local Initiatives for Farmers' (LIFT) in the district of Gaibandha and Tangail to promote homestead horticulture among landless and marginal farmers who own a little land beside their home. The benefits according to the participants were increased earnings and eating adequate vegetables and fruits (Midmore et al. 1991). However after CARE's withdrawal this project did not survive.

The cost of a van for selling healthy snack will be approximately Tk. 15,000 (USD 200).⁵⁶ There will be additional costs for cooking, storing and serving food of approximately Tk. 3,000 to Tk. 5,000 (USD 35 to USD 60). I assume that the cost of food and the salary of a van driver can be covered by the revenue of food selling. Initially a

⁵⁶ Source: author's own investigation

pilot project can be taken with 10 vans in Dhaka, which will move around near slum areas, garment factories and schools, locales where the urban poor and their children generally buy food. The expansion of the business will be dependent on public acceptability. The cost of household gardens will be low as gardens are located in homestead and underutilized lands in villages and suburban areas. The initial cost of a household garden will be seeds, plants and fertilizers.⁵⁷ The cost will be low.

There is a moderate level of administrative cost to start up healthy snack vans and household gardening. Some new employees are needed to manage all these initiatives. Public acceptance is uncertain before the pilot project. However considering the success of Jakarta food vans, public acceptance can be considered as medium in urban areas. The government has a higher priority in producing fortified rice and wheat (Midmore et al. 1991). If NGOs become involved in the process, they need to start a new program to reach the households. Thus the administrative feasibility of household gardening is low. The public acceptance of household gardening by low-income women might be high as it increases their earning and vegetable consumption potential.

6.3.4. Evaluation of behaviour change through nutritional advice

In many developing countries health education through community health workers has proved an effective tool for long-run behavioural change of people (WHO 2007). My analysis also shows the effectiveness of these two sources to improve women's nutritional status.

Currently many community health workers in Bangladesh work on a voluntary basis. In NGOs like BRAC the incentives to become a voluntary health worker are to gain easy access to microcredit and other services offered by BRAC, and to earn a profit from selling drugs (Prashad et al. 2007, Ahmed 2008). Currently BRAC has 80,000 unpaid volunteer health workers and 7,900 paid community health workers (BRAC

⁵⁷ Households with cow can use cow dung for fertilizing crops.

2012). The cost of providing small amounts of money to volunteer workers or increasing the salary of community health workers is high. Also providing some training to health workers involves moderate additional cost. Advertising through television also involves high cost. Currently, there is no discount on advertising rates charged for public awareness television advertisements broadcast by channels in Bangladesh (Ahmed 2011). However, given the high profitability of private television companies,⁵⁸ the government can probably oblige private television companies to broadcast health education spots at no or low public cost.

The administrative feasibility of hiring trained health workers is medium. It requires changing current requirements for volunteer health workers and hiring a new group of paid and trained health workers. Advertising health and nutrition education in television at minimal public cost may require bargaining with television owners and passing new legislation. Its administrative feasibility is considered as low. However, the public acceptance of both options will be high.

Table 6.1 shows a comparison of all five policy options with respect to the four policy criteria. I have assigned numerical scores; 1-3 for the performance of each policy option in the four criteria. A score of 3 implies a more favourable evaluation than a score of 2, and similarly a score of 2 is more favourable than 1.

6.3.5. Evaluation of tobacco control

Banning all advertisement of tobacco and tobacco products is expected to reduce tobacco consumption. However any behavioural change requires adequate time. Banning advertisements required a number of years to generate reduction of tobacco consumption in Finland, Norway, France, Canada and New Zealand (Willemsen and Blij 2012). In South Africa strong legislation, banning all advertisement and restricting sale of cigarettes among non-adults, reduced cigarette consumption by 4 to 7 percent among

⁵⁸ The cost of TV commercials per minute in Bangladesh varies between Tk. 40,000 – Tk.60,000 (USD 500-USD 750). This increase 4-5 times during major national and cultural festivals (The Daily Star 2010).

different groups of people from 1993 to 1999. So it can be expected that a combination of restricted selling and advertisement ban will reduce tobacco consumption in the long run.

There is no direct cost to government by banning advertisements. New staff may be necessary to impose restriction on tobacco selling, which add some cost for government but that will not be high. Government will face opposition from the tobacco industry to any advertising ban. Also some of the media, which are gaining large revenue from tobacco advertising, may indirectly oppose an advertisement ban. Some administrative restructuring may be necessary to implement a new policy. So the administrative feasibility of both tobacco control policies is low. The public support of both policies will be medium. A large percent of population in the country smoke, but there is wide civil society support for banning tobacco advertisement.

Table 6.1. Policy Matrix

| Policy Options | Effectiveness | Cost (\$) | Admin. feasibility | Public acceptance | Scores |
|---|---------------|---|--------------------|-------------------|--------|
| 1. Nutritional supplements (fortified rice) | High [3] | High [1] (\$19.3 million for ultra poor, \$80 million for extreme poor per year + some operating cost per year) | Medium [2] | High [3] | 9 |
| 2. Hygienic water for urban poor | | | | | |
| Setting shallow tubewell in urban slums | High[3] | Medium [2] (\$8.13 million for once + \$0.8 million operating cost per year) | Medium [2] | High [3] | 9 |
| Siraj mix in arsenic contaminated areas | High[3] | High [1] (\$12.3 million per year for 29 percent of the total population in Bangladesh) | Medium [2] | High [3] | 9 |
| 3. Healthy food initiative through social enterprising | | | | | |
| Jakarta model food van (urban) | Low [1] | Low [3] (\$2500 for 10 van pilot project) | Medium [2] | Medium [2] | 8 |
| Household gardening (rural-suburban) | High [3] | Low [3] | Low [1] | High [3] | 10 |
| 4. Nutritional advice | | | | | |
| Increasing salary and training of community health workers | High[3] | High [1] | Medium [2] | High[3] | 9 |
| Television advertisement | Medium [2] | Low [3] (no cost for government) | Low [1] | High[3] | 9 |
| 5. Tobacco control | | | | | |
| Restrictive selling | Low [1] | Moderate [2] | Low [1] | Medium [2] | 6 |
| Advertisement ban | Low [1] | Low [3] no cost for government | Low [1] | Medium [2] | 7 |

7. Conclusion and Recommended policies

Table 6.1 shows most of the options received equal scores (a value of 9). My policy options focused only on the policy options which are relatively low cost and can be initiated within a reasonably short period of time. All these options are useful to address the protein-energy malnutrition of the low income women.

In the context of Bangladesh, the government is the main institution to implement public policies. However, over the last two decades large NGOs have made significant contributions to improve social and human development programs. NGOs in Bangladesh provide an alternative institutional framework to reach the marginalized population, largely bypassing the 'centralized, corrupt and complex public bureaucracy' (Quddus et al. 2006). Micro-credit, non-formal education, basic health care services, social enterprises and (to some extent) women empowerment are examples of successful NGO programs. Funding of NGOs comes from overseas donors and, in a limited extent, through cross-subsidization from profitable business ventures (such as micro-credit) undertaken by NGOs (Davis 2006). Given the limited administrative capacity and lack of public mandate of the NGOs, large-scale public programs are still initiated by the government. Considering all these factors I have divided policy options between those better implemented by the government and those better implemented by NGOs. In table 7.1, I have ranked the policy options on the basis of the implementation priority.

In the context of Bangladesh the monetary cost is an important criterion. Each year the government faces a budget deficit.⁵⁹ Effectiveness is the most important criterion in the area of public policy. I will focus on these two criteria over others.

⁵⁹ During FY 2011-12 the government budget deficit is USD 5 billion, which is 5 percent of the country's total GDP (Centre for Policy Dialogue 2012)

However, any other significant and visible criteria, such as administrative feasibility and public acceptance, will be taken into account.

Table 7.1. Setting priorities of the policy options, by implementing agency

| Rank | Policies to be implemented by the government | Policies to be implemented by the NGOs |
|------|--|--|
| 1 | Nutritional supplements (fortified rice) | Increasing salary and training of community health workers |
| 2 | Setting shallow tubewells in urban slums | Household gardening (rural-suburban) |
| 3 | 'Siraj mix' in arsenic contaminated areas | Jakarta model food van (urban) |
| 4 | Television advertisement on nutrition | |

In Bangladesh large NGOs like BRAC are the main provider of door-to-door health education through community health workers. Approximately 80,000 BRAC voluntary health workers work in Bangladesh. Making community health workers more effective ranks as the highest policy to be pursued in the NGO sector. Better training has a high monetary cost. Government may bear a portion of the financial cost. The effectiveness of this policy option is also high. Though there is no successful evidence of household gardening in Bangladesh, because of its low cost and high effectiveness I would recommend NGOs start this initiative. The Jakarta model for selling nutritious food in urban areas might be easier for NGOs due to their experiences in social enterprises such as Grameen 'shokti-doi' and BRAC dairy. This is another potential area of NGO focus in Bangladesh.

Turn now to government policy recommendations. Subsidizing fortified rice supplementation to the ultra poor (10 percent of the total population) and providing 'siraj mix' for water purification for the arsenic contaminated population (30 percent of the total population) involve high monetary cost per year. However these two policy options directly address the policy objectives. Moreover effectiveness of these two options ranks high. It can be expected that large scale production of fortified rice will result in a decrease in unit cost eventually, and after time people will probably be willing to buy

fortified rice, even if the subsidy is eliminated. A similar argument is applicable for 'siraj mix'. However considering its high cost, I have ranked it as the 4th option for the government.

Setting up shallow tube wells in urban slums will probably be highly effective in reducing gastrointestinal disease and in indirectly improving nutrition. The cost for this option is medium and requires a one-time investment per well. I ranked this option second.

Nutritional advice through television advertisement is also moderately effective and involves no cost. However it will be difficult to convince television channels to assume the cost of broadcasting these advertisements free of cost. For that I ranked this as the fourth priority for the government. Because of the low score of tobacco control policy I have eliminated it for immediate consideration. This policy option has an impact on overall health improvement of the nation but is not directly related to women's nutritional status.

Protein-energy malnutrition and related illness are highly prevalent among low-income women in Bangladesh. The severity of this problem calls for a number of policies. The lack of effective policy at present will make almost any policy innovation useful in this area – provided it is sensitive to the cultural and political context. For a developing country like Bangladesh a combination of short-term, less costly, small-scale but successful policies might be more useful as a starting point than any broad policy that will inevitably be subject to a high risk of failure.

References

- Abdullah A.B., Ito S., Adhana K. (2006). Estimate of Rice Consumption in Asian Countries and the World towards 2050. Proceedings for Workshop and Conference on Rice in the World at Stake, 2. School Lunch Programs and Rice Consumption Behaviours: International Comparison.
- ADB. (2002). Beyond boundaries: Extending services to the urban poor. The Asian Development Bank. Manila, Philippines.
- Ahmed A. U. (1993). Patterns of Food Consumption and Nutrition in Rural Bangladesh. International Food Policy Research Institute. Bangladesh Food Policy Project, Dhaka, Bangladesh.
- Ahmed S., Sugimo, J., Shamim, A. A. (2009). Does Proximity to Market Influence Dietary Diversity of Pregnant Women in Rural Bangladesh? JiVitA - Maternal and Child Health Research Project, Bangladesh.
- Ahmed S.M. (2008). Taking Health Care where the Community is: The Story of the Shasthya Sebikas of BRAC in Bangladesh. BRAC University Journal. Vol. V. No. 1, 2008, (pp. 39-45).
- Ahmed S. (2011). Historical perspective of evaluation of advertising firms in Bangladesh. European Journal of Business and Management. Vol. 3. No. 5.
- Alam K., Tasneem S., Oliveras E. (2011). Performance of female volunteer community health workers in Dhaka urban slums: A case-control study. A Manoshi working paper. No. 12. International Centre for Diarrhoeal Disease Research, Dhaka, Bangladesh; Research and Evaluation Division, BRAC.
- Alam N., Roy S. K., Ahmed T., Ahmed A. M. S. (2010). Nutritional Status, Dietary Intake and Relevant Knowledge of Adolescent Girls in Rural Bangladesh. Journal of Health, Population and Nutrition. 2010 February; 28 (1). (pp 86 - 94). International Centre For Diarrhoeal Disease Research, Bangladesh.
- Alavi S., Bugusu B., Cramer G., Dary O., Lee T-C., Martin L., McEntire J., Wailes E. (2008). Rice Fortification in Developing Countries: A Critical Review of the Technical and Economic Feasibility. Academy for Educational Development. U.S. Agency for International Development (USAID). Washington, DC, USA.
- Allen L., Benoist B. D., Dary O. (2006). Guidelines on Food Fortification with Micronutrients. The World Health Organization; Food and Agricultural Organization; The United Nations.

- Auluck A., Hislop G., Poh C., Zhang L., Rosin MP. (2009). Areca nut and betel quid chewing among South Asian immigrants to Western countries and its implications for oral cancer screening. *Rural Remote Health*. Vol. 9. No. 2.
- Banarjee A., Duflo E. (2011). More than 1 billion people are hungry in the world: But what if the experts are wrong. *Foreign Policy*. May/ June 2011.
- Bangladesh Bureau of Statistics. (2000, 2003, 2010, 2011). *Monthly Statistical Bulletin*. BBS publication. Bangladesh.
- Bangladesh Bureau of Statistics. (2012). Area Population, Household and Household Characteristics. Accessed on January 2012. From, <http://www.bbs.gov.bd/WebTestApplication/userfiles/Image/SY2010/Chapter-02.pdf>
- Banglapedia. (2012). Accessed on November 2011. From, <http://www.banglapedia.org/httpdocs/english/index.htm>
- Barkat A., Chowdhury A.U., Nargis N., Rahman M., Khan M.S., Pk A. K., Bashir S. (2008). *The Economics of tobacco and tobacco taxation in Bangladesh*. Human Development Research Centre. Dhaka, Bangladesh.
- BC Centre for Social Enterprise. *What in social enterprise: Defining social enterprise*. Accessed on March 21, 2012. From <http://www.centreforsocialenterprise.com/what.html>
- Behrman, J.R., Deolalikar, A. B. (1990). The Intrahousehold Demand for Nutrients in Rural South India: Individual Estimates, Fixed Effects, and Permanent Income. *The Journal of Human Resources*, Vol. 25, No. 4 (Autumn, 1990), pp. 665-696
- Benson, T. (2007). *Study of Household Food Security in Urban Slum Areas of Bangladesh, 2006*. International Food Policy Research Institute. Washington, D.C. USA.
- Bhat D., Troy L., Karim R., Levinson F.J. (2002). Determining Food Consumption during Pregnancy in Rural Bangladesh. *The Bangladesh Development Studies*. Vol. XXVIII. December 2002. No.4. Dhaka, Bangladesh.
- Biswas W. K. (2010). Application of renewable energy to provide safe water from deep tubewells in rural Bangladesh. *Energy for Sustainable Development*. Volume 15. Issue 1. (pp. 55-60).
- Bloem M. W., Moench-Pfanner R., Graciano F., Stallkamp G., Pee S. D. (2004). Trends in health and nutrition indicators in the urban slums of three cities in Bangladesh, compared to its rural areas. *Globalization of food systems in developing countries: Impact on food security and nutrition*. FAO food and nutrition paper 83. Rome, Italy.

- Bose, M.L., Dey, M. M. (2007). Food and Nutritional Security in Bangladesh: Going beyond Carbohydrate Counts. *Agricultural Economics Research Review* Vol. 20 July-December 2007 (pp. 203-225)
- BRAC. (2012). Economic Development: Targeting extreme poverty. Accessed on February 04, 2012. From <http://www.brac.net/content/economic-development-targeting-extreme-poverty>.
- BRAC. (2012). Social Communication and Advocacy: Health. Accessed on March 15, 2012. From <http://www.brac.net/content/social-communication-advocacy-health>
- Cairncross S., Hunt C., Boisson S., Bosteon K., Curtis V., Fung I. C., Schmidt W-P. (2010). Water, sanitation and hygiene for the prevention of diarrhoea. *International Journal of Epidemiology*. Vol. 39, Issue suppl 1. (pp i193-i205).
- Campaign for tobacco free kids (2010). Bangladesh: Tobacco Burden Facts. Accessed on October 20, 2011. From http://global.tobaccofreekids.org/files/pdfs/en/Bangladesh_tob_burden_en.pdf
- Campaign for tobacco free kids (2012). Global toll of tobacco: Bangladesh. Accessed on March 04, 2012. From http://www.tobaccofreekids.org/facts_issues/toll_global/bangladesh
- Carrel M., Escamilla V., Messina J., Giebultowicz S., Winsom J., Yunus M., Streatfield p. K., Emch M. (2011). Diarrheal disease risk in rural Bangladesh decreases as tubewell density increases: a zero inflated and geographically weighted analysis. *International Journal of Health Geographics* 2011, 10:41.
- Chen, L. C., D'Souza, S. (1981). Sex Bias in the Family Allocation of Food and Health Care in Rural Bangladesh. *Population and Development Review*, Vol. 7, No. 1. (pp. 55-70).
- Corsi D. J., Kyu H. H., Subramanian, S. V. (2011). Socioeconomic and Geographic Patterning of Under- and Overnutrition among Women in Bangladesh. *The Journal of Nutrition*. 141: 631–638, 2011.
- David J.K. (2006). NGOs and Development in Bangladesh: Whose sustainability counts?, in *Global Poverty: Sustainable Solutions*. Proceedings of the Anti-Poverty Academic Conference with International Participation, Institute for Sustainability and Technology Policy, Murdoch University, Perth, Netherlands.
- Dary O., Rassas B. (2004). Elements of a national food fortification program in Bangladesh. USAID Micronutrient Program. U.S. Agency for International Development (USAID). Virginia, USA.
- Efroymson D., Ahmed S. (2003). Building Momentum for Tobacco Control: The Case of Bangladesh. In Beyer J.d. and Brigden L.W. (Ed.). *Tobacco Control Policy: Strategies, Success and Setbacks*. (pp. 13-37). Washington, DC. The International Bank for Reconstruction and Development and the World Bank.

- Efroymson D., Alam S.M. (2009). Enforcement of Tobacco Control Law: A Guide to Basics. Health Bridge.
- Efroymson, D., Ahmed, S., Townsend, J., Alam, S.M., Dey, A. R., Saha, R., Sujon., A. I., Ahmed, K. U., Rahman, O. (2001). Hungry on Tobacco: An Analysis of Economic Impact of Tobacco Consumption on the Poor in Bangladesh. *Tobacco Control* 2001;10:212–217.
- ESCAP, ADB, WHO, UNDP, UNFPA, UNICEF. (2012). Accelerating Equitable Achievement of the MDGs: Closing Gaps in Health and Nutrition Outcomes. Asia-Pacific Regional MDG Report 2011/ 12. United Nations Economic and Social Commission for Asia and Pacific, The Asian Development Bank, The World Health Organization, The United Nations Development Programme, The United Nations Population Fund, United Nations Children’s Emergency Fund.
- FAO. (2011). Gender and Nutrition: Key facts. Accessed on November 15, 2011. From <http://www.fao.org/docrep/012/al184e/al184e00.pdf>
- Fogel R. W. (1992). Second Thoughts on the European Escape from Hunger: Famines, chronic Malnutrition, and Mortality Rates. In S. R. Osmani (Ed.). *Nutrition and Poverty*. World Institute for Development Economics Research Studies in Development Economics. Oxford University Press, Clarendon Press. Oxford, New York, Toronto and Melbourne.
- GLOBOCAN 2008. Cancer incidences and mortality worldwide: Bangladesh. Accessed on November 11, 2011. From, <http://globocan.iarc.fr/factsheet.asp>
- Grameen Danone (2012). Accessed on February 28, 2012. Form, <http://www.muhammadyunus.org/Social-Business/grameen-danone/>. Yunus Centre.
- Griffiths P. L., Bently M. E. (2001). The Nutrition Transition is underway in India. *Journal of Nutrition*. Vol. 131. No. 10.
- Guindon G. E., Perucis A-M., Boisclair D. (2003). Higher Tobacco Prices and Taxes in South-East Asia. HNP Discussion Paper. Economics of Tobacco Control Paper No. 11. Tobacco Free Initiative. Tobacco Free Initiative, The World Health Organization.
- Halder S., Urey I., Barua P. (2003). Patterns and Trends in Food Consumption in Poor Urban and Rural Households in Bangladesh: The Field Survey Results. Research and Evaluation Division (RED), BRAC, Bangladesh.
- Haque I. (2009). Urban Slum Mapping in Bangladesh. Centre for Environmental and Geographic Information Services, Dhaka, Bangladesh. Presentation in the Expert Group Meeting on Slum Mapping. Organized by Socioeconomic Data and Application Centre, USA on June 11, 2009.

- Haseen F. (2005); Malnutrition among Bangladeshi women in ultra poor households: prevalence and determinants. Research and Evaluation Division, BRAC, Dhaka, Bangladesh.
- Hossain, S. (2006). Rapid Mass Urbanisation and Its Social Consequences in Bangladesh: The Case of the Megacity of Dhaka. Paper presented to the 16th Biennial Conference of the Asian Studies Association of Australia in Wollongong 26 June – 29 June 2006.
- Hotz C., Porcayo M., Onofre G., Garcia-Guerra A., Elliott T., Jankowski S., Greiner T. (2008). Efficacy of iron-fortification ultra rice in improving iron status of women in Mexico. *Food and Nutrition Bulletin*. Vol. 29, No. 2 (pp 140-149).
- Hove, J. (2007). Barriers to Girls' Secondary School Participation in Rural Bangladesh. CPR Commentary No. 5. Centre for Policy Research, IUBAT- International Business Agriculture and Technology, Dhaka, Bangladesh.
- Hurt, L.S., Ronsmans, C., Saha, S. (2004). Effects of education and other socioeconomic factors on middle age mortality in rural Bangladesh. *Journal of Epidemiology, Community Health* 2004;58:315–320.
- Hyder, S.M.Z., Persson, L., Chowdhury, M., Loñnerdal, B., Ekström, E. C. (2004). Anaemia and iron deficiency during pregnancy in rural Bangladesh. *Public Health Nutrition*: 7(8), 1065–1070.
- ICDDR, B. (2012). Activity 6: Safe Water. Accessed on March 01, 2012. From, <http://www.icddr.org/what-we-do/health-programmes/improved-health-for-the-poor/activity-6-safe-water>
- Jha, R., Gaiha, R., and Anurag S. (2009). Calorie and Micronutrient Deprivation and Poverty Nutrition Traps in Rural India. *World Development*. Vol 37. Issue 5. May 2009. (pp 982-991).
- Kinh H.V., Ross H., Levy D., Minah N. T., Ngoc V. T. B. (2006). The effect of imposing a higher, uniform tobacco tax in Vietnam. *Health Research Policy and Systems* 2006, 4:6. BioMed Central. June 2006.
- Klemm R. DW, Harvey P. WJ, Wainright E., Faillace S., Wasantwisut E. (2008). Scaling up micronutrient programs: What works and what needs more works?. *Micronutrient Forum*.
- Kraemer K., Zimmermann M.B. (2007). *Nutritional Anemia. Sight and Life*, Basel, Switzerland.
- Kunz R. (2009). Technical Profile: A Breakthrough in Rice Fortification. *World Grain*. August 2009.
- Latham M. C. (1997). *Human Nutrition in Developing World*. FAO Food and Nutrition Series. No 29. Rome.

- Leslie J. (1991). Women's nutrition: the key to improving family health in developing countries?. *Health Policy and Planning*; 6(1): 1-19
- Mananr V., Gallego E.R. (2002). Iron Fortification: Country Level Experiences and Lessons Learned. *The Journal of Nutrition*. Vol. 132, No. 4. American Society for Nutritional Sciences
- Matin I., Hadi A., Ahmed S.M. (2004). Towards a profile of the ultra poor in Bangladesh: Findings from CFPR/TUP baseline survey. Research and Evaluation Division, BRAC, Bangladesh; Aga Khan Foundation, Canada.
- McKeown T. (1976). *The Modern Rise of Population*. Arnold. London.
- Micronutrient Initiative (2010). Annual Report 2008-2009. <http://www.micronutrient.org/cmfiles/MI-AnnualReport0809-EN-web.pdf>
- Midmore D.J., Ninez V., Venkatratnam R. (1991). Household gardening projects in Asia: Past experience and future directions. Technical Bulletin No. 19. Asian Vegetable Research and Development Center. Taipei 10099, Taiwan.
- Ministry of Food and Disaster Management, Dhaka, Bangladesh (2008). National Food Policy Plan of Action (2008-2015). Food Planning and Monitoring Unit (FPMU). Ministry of Food and Disaster Management. Dhaka. Bangladesh.
- Ministry of Food and Disaster Management, Dhaka, Bangladesh (2008). The National Food Policy Plan of Action: A Framework for Investing in Food Security. Food Planning and Monitoring Unit (FPMU). Ministry of Food and Disaster Management. Dhaka. Bangladesh.
- Muhuri, P. K., Preston, S. H. (1991). Effects of Family Composition on Mortality Differentials by Sex Among Children in Matlab, Bangladesh. *Population and Development Review*, Vol. 17, No. 3 (September, 1991), (pp. 415-434). Dhaka, Bangladesh.
- Narayan, A., Yoshida, N., Zaman, H. (2007). Trends and Patterns of Poverty in Bangladesh in Recent Years. The World Bank, South Asian Region.
- National Institute of Population Research and Training, Dhaka, Mitra and Associates, Dhaka; ORC Macro, Calverton, Maryland, USA. (2005). Bangladesh Demographic and Health Survey 2004. Bangladesh.
- OANDA. (2012). <http://www.oanda.com/>
- Ortolan, S. E., Mahmud Z., Kabir A.F.M., I., Levinson J. (2003). Effect of Targeted Food Supplementation and Services in the Bangladesh Integrated Nutrition Project on Women and their Pregnancy Outcomes. *Journal of Health, Population and Nutrition*. 21(2). (pp. 83-89)

- Osmani, S. (1997); The Abraham Horwitz Lecture: Poverty and Nutrition in South Asia, Chapter 3 in the 'Nutrition Policy Discussion Paper No. 16', ACC/SCN, World Health Organization.
- Pathak P., Kapil U., Kapoor S. K., Saxena R., Kumar A., Gupta N., Dwivedi S. N. Singh R., Singh P. (2004). Prevalence of Multiple Micronutrient Deficiencies amongst Pregnant Women in a Rural Area of Haryana. *Indian Journal of Pediatrics*. Vol. 71. November 2004.
- Planete D'Entrepreneurs (2012). Grameen Danone Foods Ltd: How to deal with children nutrition in Bangladesh. Accessed on March 07, 2012. From http://www.danonecommunities.com/sites/default/files/grameen_danone_foods_ltd_version_site.pdf
- Podymow T., Turnbull J., Islam M. A., Ahmed M. (2009). Health and Social Conditions in the Dhaka Slums. Paper presented in the '9th International Conference on Urban Health'. The International Society for Urban Health. New York, USA.
- Prashad B., Muraleedharan V. (2007). Community Health Workers: A review of concepts, practice and policy concerns. Working paper. London School of Hygiene and Tropical Medicine. UK.
- Quddus M., Rahman S., Quazi R. (2006). The impact of NGOs in alleviating poverty in Bangladesh. Accessed on April 21, 2012. From <http://cob.pvamu.edu/business/WorkingPapers/NGO-Bangladesh-JBS.pdf>
- Rahman, A. and Razzaque, A. (2000). On Reaching the Hardcore Poor: Some Evidence on Social Exclusion in NGO Programmes. *The Bangladesh Development Studies* 26.1. (pp: 1–35). Bangladesh Institute of Development Studies. Bangladesh.
- Ramachandran, P. (2007). Poverty Nutrition Linkages. *Indian Journal of Medical Research*. 126, October 2007, (pp. 249-261).
- Rao, K. M., Balakrishna, N., Arlappa, N., Brahmam, G.N. V. (2010). Diet and Nutritional Status of Women in India. *Journal of Human Ecology*. 29(3): 165-170 (2010)
- Raut, N. R. (2009). Food Consumption Pattern and Nutritional Status of Women in Orissa: A Rural-Urban Differential. *Journal of Human Ecology*. 25(3): 179-185 (2009).
- Ravindran S. 1986. Health implications of sex discrimination in childhood: a review paper and an annotated bibliography. World Health Organization. Geneva, Switzerland.
- Razzaque A., Nahar L., Sarder A. M., Ginneken J. K., Shaikh M. A. K. (1998). Chapter 5: Women's Status. From the report, Demographic Surveillance System-Matlab: Vol. 29. (pp. 28-35). International Centre for Diarrhoeal Disease Research, Bangladesh.
- Richards J., Shahrin A., Lund K. (2010). Benchmarking the Nutritional Status of Women in the Tongi-Ashulia Road Slums. CPR Commentary No. 7. Centre for Policy

Research, IUBAT- International Business Agriculture and Technology, Dhaka, Bangladesh.

Ross C. E., Mirwosky C. E. (1999). Refining the association between education and health: The effects of quality, credentials and selectivity. *Demography*. Vol. 36. No. 4. (pp. 445-460).

SCN News (1995). Interview with Dr. A. Hortwiz: SCN Chair 1986-1995. Accessed on September 2011. From <http://www.unsystem.org/scn/archives/scnnews13/ch2.htm#b1-Interview%20with%20Dr%20A%20Horwitz,%20SCN%20Chair,%2019861995>

Sen A., Ariizumi H., Daciana Driambe D. (2010) Do Changes In Cigarette Taxes Impact Youth Smoking? Evidence from Canadian Provinces. *Forum for Health Economics & Policy*.. Vol. 13. No. 2

Seshadri S. (2001). Prevalence of micronutrient deficiency particularly of iron, zinc and folic acid in pregnant women in South East Asia. *British Journal of Nutrition* (2001), 85. Suppl. 2, S87±S92

SEWA, India. (2009). Impact of Price Rise on Poor Households: Survey by SEWA. Accessed on June 20, 2011. From <http://www.sewa.org/pdf/IMPACT%20OF%20PRICE%20RISE%20ON%20POOR%20HOUSE%20HOLDS%20-%20Surved%20by%20SEWA.pdf>

Shetty P. (2002). Measures of nutritional status from anthropometric survey data: Keynote paper. Food and Agricultural Organization. Rome. Italy.

Sprinkles Global Health Initiative (2012). Frequently asked questions. Accessed on March 07, 2012. From http://www.sghi.org/about_sprinkles/faqs.html.

StatPac. (2012). Survey sampling methods. Accessed on February 10, 2012. From <http://www.statpac.com/surveys/sampling.html>

Sulaiman M., Parveen M., Das N.C. (2009). Impact of the Food Price Hike on Nutritional Status of Women and Children. Research Monograph Series No. 38, Research and Evaluation Division (RED), BRAC, Bangladesh.

The Financial Express. (February 14, 2012). Food Fortification. http://www.thefinancialexpress-bd.com/more.php?news_id=98443&date=2012-02-14. Accessed on March 02, 2012.

The New York Times (2011). In 'Food Deserts', Oases of Nutrition. <http://opinionator.blogs.nytimes.com/2011/05/23/in-food-deserts-oases-of-nutrition/>

Tobacco Free Centre, Bangladesh. (2010). Bangladesh Tobacco Burden Facts. Tobacco Free Centre.

- Transparency International, Bangladesh. (2011). What is the corruption perception index. Accessed on November 04, 2011. From http://cpi.transparency.org/cpi2011/in_detail/#myAnchor1
- UNDP (2011). Human Development Report 2011. The United Nations Development Programme. New York. United States.
- UNICEF (2004). What works for children in South Asia: Community health workers. The United Nations Children's Fund (UNICEF). Kathmandu, Nepal.
- UNICEF (2009). The State of the World's Children 2009. United Nations Children's Fund. New York. United States.
- UNICEF (2010). Women and Girls in Bangladesh: Key Statistics. Accessed on 22 September 2011. From http://www.unicef.org/bangladesh/Women_and_girls_in_Bangladesh.pdf
- UNICEF (2011). Child and Maternal Nutrition in Bangladesh: Key Statistics . Accessed on 04 November 2011. [http://www.unicef.org/bangladesh/Child_and_Maternal_Nutrition\(1\).pdf](http://www.unicef.org/bangladesh/Child_and_Maternal_Nutrition(1).pdf)
- UNICEF (2012). Urban Water Challenges in Bangladesh. Accessed on February 27, 2012. From http://www.unicef.org/bangladesh/Urban_water_challenges_in_Bangladesh.pdf
- United Nations (2008). The World Population Prospects: Table A.1. Accessed on October 04, 2011. From http://www.un.org/esa/population/publications/wpp2008/wpp2008_text_tables.pdf
- United Nations (2011). World Urbanization Prospects: The 2005 Revision. Accessed on November 04, 2011. From http://www.un.org/esa/population/publications/WUP2005/2005WUP_FS7.pdf
- United Nations Refugee Agency (2007). Micronutrient Powder (MixMe™) Use in Kauma Refugee Camp in Kenya (AFRICA). Nutrition Review Program. Accessed on March 04, 2012, from http://www.nutritionimprovement.com/pdf/kenya_briefing.pdf
- Unnayan Shamannay (2010). Raising Tobacco Taxes: Taking Care of Public Health. PATT Policy Brief-1. An Unnayan Shamannay Publication.
- Unnayan Shamannay (2010). Consumption and Revenue Implications of Tobacco Taxation in Bangladesh. PATT Policy Brief-2. An Unnayan Shamannay Publication.
- Walbeek C. V. (2003). Tobacco Excise Taxation in South Africa. The World Health Organization.
- Water Aid Bangladesh, ARBAN Bangladesh, ASD Bangladesh, DSK Bangladesh, NGO Forum, PHULKI, PSTC, PRODIPON, UST, VERC, Green Hill (2003). A national strategy for Economic Growth, Poverty Reduction and Social Development: Poverty Reduction Strategy Paper. Presented to the GED, Planning Commission. March 05, 2003.

- WaterAid, Bangladesh (2012). How Money Helps. Accessed on January 30, 2012. From http://www.wateraid.org/uk/get_involved/community_groups/schools/buckets_of_water/5422.asp
- WFP. (2004). Micronutrient deficiencies: Prevalence in Anaemia in Women. Accessed on February 11, 2011. From, <http://www.foodsecurityatlas.org/bgd/country/utilization/micronutrient-deficiencies>
- WFP. (2009). Micronutrient powder use and outcomes in refugee camps in Nepal. Issue 1. No. 1. The United Nations World Food Programme. Rome. Italy.
- WHO (2006). Global database on Body Mass Index: an interactive surveillance tool for monitoring nutritional transition. Accessed on April 06, 2012. From, <http://apps.who.int/bmi/index.jsp?introPage=intro.html>
- WHO. (2005). Healthy food and Nutrition for women and their families: Training course for health professionals. WHO Regional office for Europe. Copenhagen.
- WHO. (2005). Impact of Tobacco- related Illness in Bangladesh. SE/BAN TOB/NCD/001 DOC/1. World Health Organization.
- WHO. (2007). International action needed to increase health workforce. Accessed on January 15, 2012. From, <http://www.who.int/mediacentre/news/releases/2007/pr05/en/>
- WHO. (2009). Communication strategy for tobacco control in South-East Asia. The World Health Organization. Regional Office in South-East Asia.
- WHO. (2011). WHO Report on Global Tobacco Epidemic. Accessed on March 30, 2012. From, http://www.who.int/tobacco/surveillance/policy/country_profile/bgd.pdf
- Willemsen M. C., Blij B. D. (2012). Tobacco Advertising. Globalink: Global Tobacco Control. Accessed on March 12, 2012. From <http://www.globalink.org/en/advertising.shtml>
- World Bank (2005). The Bangladesh Integrated Nutrition Project Effectiveness and Lessons. Bangladesh Development Series - Paper no. 8. The World Bank Office, Dhaka.
- World Bank (2007). Dhaka: Improving living condition of urban poor. Bangladesh Development Series. Paper no. 17. The World Bank Office, Dhaka, Bangladesh.
- World Bank (2010). Extreme poverty rate continues to fall. Accessed on February 12, 2012. From <http://data.worldbank.org/news/extreme-poverty-rates-continue-to-fall>.
- World Bank (2011). Rice fortification: A key part of the solution to micronutrient deficiencies. The Agriculture and Rural Development and the Health, Nutrition and Population Team. The World Bank. Washington DC.

World Bank (2011). The World Development Indicators. The World Bank. Washington DC. United States.

World Bank (no date). Bangladesh: Overview of Childhood Under nutrition. Accessed on March 26, 2012. From, <http://siteresources.worldbank.org/SOUTHASIAEXT/Resources/223546-1171488994713/3455847-1232124140958/5748939-1234285802791/BangladeshNutrition.pdf>

Yunus Centre (2012). Social business: Grameen Danone. Accessed on April 19, 2012. From <http://www.muhammadyunus.org/Social-Business/>

Appendices

Appendix A: Survey Questionnaire

Diet Recall:

We would like to ask you about the food **you** personally ate in the last 24 hours.

1. Looking at the **largest** of the cups provided, how much of each type of food did **you personally** eat yesterday? (cooked volumes). If you did not eat any category keep blank under number column.

[Be sure to emphasize the idea of a full day's set of meals – early morning to evening.]

| | <i>Breakfast</i> | <i>Lunch</i> | <i>Supper</i> | <i>Others</i> |
|---|------------------|--------------|---------------|---------------|
| Rice [large cups] | | | | |
| Lentil (Daal) [large cups] | | | | |
| Beef/Mutton/ lamb [small cups] | | | | |
| Chicken/ other birds [small cups] | | | | |
| Egg [number] | | | | |
| Fish [small cups] | | | | |
| a) | a) | a) | a) | a) |
| b) | b) | b) | b) | b) |
| Leafy vegetables/shak [small cups] | | | | |
| a) | a) | a) | a) | a) |
| b) | b) | b) | b) | b) |
| c) | c) | c) | c) | c) |
| Other vegetables [small cups] | | | | |
| a) | a) | a) | a) | a) |
| b) | b) | b) | b) | b) |
| Potato [small cups] | | | | |
| Milk [small cups] | | | | |
| a) Powder milk (mixed with water) | a) | a) | a) | a) |
| b) Liquid milk | b) | b) | b) | b) |
| Butter [small cups] | | | | |
| Yoghurt/ Cheese [small cups] | | | | |
| a) Sweet Yoghurt | a) | a) | a) | a) |
| b) Sour Yoghurt | b) | b) | b) | b) |
| c) Cheese | c) | c) | c) | c) |
| Tea/Coffee [actual cups consumed] | | | | |
| a) Tea with milk and sugar/ condensed milk | a) | a) | a) | a) |
| b) Tea with sugar and without milk | b) | b) | b) | b) |
| c) Tea with milk and without sugar | c) | c) | c) | c) |
| d) Tea without milk and sugar (e.g. lime tea/ ginger tea) | | | | |
| Bread/ Roti [pieces] | | | | |
| Fruits [pieces] | | | | |
| a) | a) | a) | a) | a) |
| b) | b) | b) | b) | b) |
| c) | c) | c) | c) | c) |
| Snacks (halka/faltu foods, like chips/ shingara) [pieces] | | | | |

| | | | | |
|--|----------------|----------------|----------------|----------------|
| a) b) c) | a) b) c) | a) b) c) | a) b) c) | a) b) c) |
| Others [list and record units] a) b) | a) b) | a) b) | a) b) | a) b) |

2. How do you identify your own or your household's cooking in terms of oil?

- More oily
 Less oily

3. Compared to last year at this time, how have you changed **your** regular food diet? (Put \checkmark on appropriate box)

| | <i>I eat more of this food than last year</i> | <i>I eat the same amount of this food as last year</i> | <i>I eat less of this food than last year</i> | <i>I have started eating this food recently</i> | <i>I no longer eat this food</i> |
|--|---|--|---|---|----------------------------------|
| Rice | | | | | |
| Lentil (Daal) | | | | | |
| Beef/mutton/ lamb | | | | | |
| Chicken/ other birds | | | | | |
| Egg | | | | | |
| Fish a) b) | | | | | |
| Leafy vegetables/shak a) b) c) | | | | | |
| Other vegetables a) b) | | | | | |
| Potato | | | | | |
| Milk a) Powder milk (mixed with water) b) Liquid milk | | | | | |
| Oil | | | | | |
| Butter [woodblock] | | | | | |
| Yoghurt/ Cheese a) Sweet Yoghurt b) Sour Yoghurt c) Cheese | | | | | |
| Tea/Coffee [Actual cups consumed] a) Tea with milk b) Tea with condensed milk c) Tea without milk | | | | | |
| Bread/ Roti | | | | | |
| Fruits | | | | | |

| | | | | | |
|--|--|--|--|--|--|
| a) | | | | | |
| b) | | | | | |
| c) | | | | | |
| Snacks (halka/faltu foods, like chips/ shingara) | | | | | |
| a) | | | | | |
| b) | | | | | |
| c) | | | | | |
| Others [list] | | | | | |
| a) | | | | | |
| b) | | | | | |

4. If you have stopped eating, or are eating less of, particular food(s), what are the reasons? (can check \checkmark multiple reasons)

- Don't like them
- Overall, food prices are higher and decided to buy less or cut out some foods
- Household members changed.
- Other, please specify _____

** [If the respondent mentions 'high prices' in question 4, please do question 5 and 6, otherwise go to question 7].*

5. How serious a problem has been higher food prices for you and your household? (put \checkmark on appropriate box)

- Very Serious
- Serious
- Somewhat serious
- No problem at all

6. How have you adjusted to the high food prices? (can check \checkmark multiple reasons)

- I ate less
- Everyone in the family ate less
- Buy lower quality foods
- Spent less on non-food items
- Working family members earning more
- New family members are working. Who? _____
- Moved to city
- Sold assets
- Borrowed money from _____
- Stopped sending one or more children to schools
- Received help from the government/ NGOs/ school stipend

7. Who eats fish/ meat/ milk/ fruits in your family? (put \checkmark on appropriate box or boxes)

- Everybody does, but varied amounts for different family members
- Everybody does, about the same amount each
- My husband gets more
- My children get more
- I get more than others

Sources of minerals and vitamins:

8. As you may know, we need certain minerals and vitamins to be healthy. I would like to ask you whether you are eating/consuming any of the following. (Put \checkmark on appropriate box)

| | <i>Regularly</i> | <i>Not regularly</i> | <i>When I am pregnant or nursing my children</i> | <i>Never</i> | <i>Don't know</i> |
|--------------------------------------|------------------|----------------------|--|--------------|-------------------|
| Iodized Salt | | | | | |
| Calcium Tablets | | | | | |
| Fortified Yogurt | | | | | |
| Vitamin tablets | | | | | |
| Sprinkles | | | | | |
| Zinc tablets or syrup | | | | | |
| Iron tablets or syrup | | | | | |
| Other supplements or fortified foods | | | | | |

Hygiene and cleanliness:

9. Where do you usually get water for different everyday uses? (Put \checkmark on appropriate box).

| | <i>Drinking?</i> | <i>Cooking?</i> | <i>Washing Clothes?</i> | <i>Bathing/ hand washing?</i> | <i>Dish washing?</i> |
|------------------------|------------------|-----------------|-------------------------|-------------------------------|----------------------|
| Government (tap, hose) | | | | | |
| Tube Well | | | | | |
| Stored rain water | | | | | |
| River/Pond | | | | | |

10. Do you boil water before drinking?

- Yes
 No

11. What is your toilet facility? (Put \checkmark on appropriate box)

- Here and there
 Open hole
 Drain to pond/canal/ river
 Hanging latrine (over water)
 Pit (with cement)
 Ring slab
 Sanitary
 Other (specify): _____

Smoking and Betel-Nut chewing:

12. How many members of your household smoke, including you? _____
[If none put 0, go to Question 16]

13. How many cigarettes/ *bidis* do you think members of your household smoke in a day?

| | <i>Number/ Range of numbers</i> |
|----------|---------------------------------|
| Self | |
| Husband | |
| Children | |
| Others | |

14. Among members of your household who presently smoke, do they smoke more or fewer cigarettes/ *bidis* in a day now than they did one year ago? (Put ✓ on appropriate box)

- More
 Fewer
 Same

15. Is there any member of your household who started smoking within the last year (started smoking)?

- Yes
 No

16. Is there any member of your household who smoked earlier but does not smoke now (stopped smoking)?

- Yes
 No

17. If your household smokes less, or any member stopped smoking, what was the reason? (can check ✓ multiple reasons).

- Worried about health
 Too expensive
 Prices of other foods are higher now
 Religious reasons
 Disapproval of family/ community
 Other, please specify: _____

18. How many members of your household chew paan, including you? _____
 [If none put 0, go to Question 22]

19. How many times a day does your family members take paan?

| | <i>Number/ Range of Numbers</i> |
|----------|---------------------------------|
| Self | |
| Husband | |
| Children | |
| Others | |

20. Among members of your household who presently take paan, do they use more or less paan in a day now than they did one year ago?

- More
 Less
 Same

21. Is there any member of your household who started taking paan within the last year (started)?

- Yes
 No

22. Is there any member of your household who used paan earlier but does not use it now (stopped)?

- Yes

- No
23. If your household uses less, or if any member stopped using paan, what was the reason? (can check \checkmark multiple reasons).
- Worried about health
 - Too expensive
 - Prices of other foods are higher now
 - Disapproval of family/ community
 - Other, please specify _____

Awareness/ Education:

24. People around you, like your family members/ doctors/ health workers may talk about health/ nutrition/ smoking etc. Also you may see programs on TV regarding these. Have you received advice on these different things from any of these sources? (Put \checkmark on appropriate box).

| <i>Received Advice from</i> | <i>Healthy food?</i> | <i>Managing healthy food during price increase?</i> | <i>Sanitation?</i> | <i>Smoking?</i> | <i>Chewing paan?</i> |
|---|----------------------|---|--------------------|-----------------|----------------------|
| None | | | | | |
| Husband | | | | | |
| Other family members/ Relatives | | | | | |
| Neighbours | | | | | |
| School Teachers | | | | | |
| Health facilities/ Doctor/ Nurse | | | | | |
| Health/ Community workers came to house | | | | | |
| Religious leader | | | | | |
| Television | | | | | |
| Radio | | | | | |
| Newspaper | | | | | |
| Posters | | | | | |
| Public meeting with health workers | | | | | |
| Others (please specify) | | | | | |

25. When you get together with other women do you discuss any of the following things? (can check \checkmark multiple reasons)
- Health issues/ problems
 - Nutritious food
 - No we don't discuss any of the above issues [if this is the answer move to question 28]

26. How often do you discuss those issues?

- almost everyday
- 2-3 times a week
- once a week

- once a month
- once a year or less often

27. Where do you meet?

- family home
- community center
- children's school
- near tube well/ water tap/ pond/ river
- other, please specify: _____

28. Would you be interested in health classes at Oasis Medical Center?

- Yes (proceed to next question)
- No (go to question 30)

29. Which of the following classes interest you? (can check \checkmark multiple reasons)

- healthy pregnancy care
- infant feeding
- breastfeeding
- child feeding
- family feeding
- using ORS
- immunizations
- diet
- diabetes
- blood pressure
- joint pain
- weakness, headache, dizziness
- family planning
- healthy eating for weight
- other: _____

Assets/ Wealth and Income:

[Note to the surveyor: Fill out question 30 and 31 by yourself (without asking the respondent)]

30. Material of the house in which the respondent is living: (Check \checkmark multiple boxes if house made with more than one material)

- Mud
- Tin
- Bamboo
- Plastic
- Other (specify): _____

31. Does the house in which the respondent is living have electricity?

[The surveyor can look at whether any electric wear is outside the house]

- Yes
- No

32. Who owns the house in which you are living? (Put \checkmark on appropriate box)

- You or your husband
- Rented house
- Sharing houses with others not paying rent
- Other (specify) _____

33. Which of the following things do you/ your household own? Note: Assets will include only the currently usable ones. [The surveyor should use common sense in filling out this section]. Put '0' if they does not have any.

| Type of Assets | Numbers | Comments |
|---------------------------------|---------|----------|
| Homestead Land (in 'katha') | | |
| Cultivable Land (in 'katha') | | |
| Chicken/ Duck/ Pigeon | | |
| Goat/ Lamb | | |
| Cow | | |
| Mosquito Net | | |
| Land/ Mobile phone | | |
| Radio | | |
| Fan | | |
| TV | | |
| Bicycle | | |
| Rickshaw | | |
| Motorbike | | |
| Other vehicle (please specify) | | |
| Refrigerator | | |
| Computer | | |
| DVD player | | |
| Internet | | |
| Other important asset (specify) | | |

34. How do you assess the situation of overall food adequacy of your family/ household? (Put ✓ on appropriate box)

| Current situation | Situation one year before |
|---|---|
| <input type="checkbox"/> Enough | <input type="checkbox"/> Enough |
| <input type="checkbox"/> Sometimes not enough | <input type="checkbox"/> Sometimes not enough |
| <input type="checkbox"/> More than enough | <input type="checkbox"/> More than enough |
| <input type="checkbox"/> Never enough | <input type="checkbox"/> Never enough |

35. If your family/ household had more money, how would you spend it? (Put ✓ on appropriate box)

- buy more rice
- buy other foods
- buy some vitamin/ mineral supplements
- spend on clothing
- spend on children's education
- spend on health treatments
- buy a radio/ television
- repair house
- save for future
- repay debt
- other, specify _____

Demographic and Socio-Economic Status:

36. Name of the respondent (Optional): _____

37. Height (centimeters): _____ Weight (kilograms): _____

38. How many members are in your household? (write down numbers): _____

39. Family members' information:

| Member of the household | Age (in Years) | Can Read? (Y = Yes N = No) | Highest class attended (in numbers) | Occupation | Hours worked per day | School attendance of Children | |
|-------------------------|----------------|----------------------------|-------------------------------------|------------|----------------------|-------------------------------|--------------------|
| | | | | | | C / F | If C, then A/ M/ S |
| Respondent | | | | | | | |
| Husband | | | | | | | |
| Child 1 | | | | | | | |
| Child 2 | | | | | | | |
| Child 3 | | | | | | | |
| Child 4 | | | | | | | |
| Other members | | | | | | | |
| 1. | | | | | | | |
| 2. | | | | | | | |
| 3. | | | | | | | |
| 4. | | | | | | | |

Note: C = Continuing to the school, F = Finished at school

A = Always, M = Most of the days, S = Stopped attending for some days

40. If one or more of your children has stopped attending school, what was the most important reason? Any other reason? Keep going...

[Note for the surveyors: Rank the most important reason as 1, the second most important reason as 2, etc].

- We could not afford the costs of school (such as tutoring, school supplies)
- The child was not interested in school work
- We needed the child to help with housework (such as caring for younger children)
- We need the child to earn some money for the family
- Other (please specify): _____

48. Any important observation by the surveyor:

[Questions to ask of local merchants]

We are interested to know about the food price changes compared to the last year. Women may not properly know the price if the male member(s) of the household purchased the necessary commodities. The shopkeepers near the house may ask about their selling prices. The surveyors are advised to take help from the local people. The number of shopkeepers interviewed may vary on the basis of spread of the interviewed households and the availability of shops nearby. Please write down the selling prices by the local shops of the following commodities. If don't know put '0'.

| <i>Commodity</i> | <i>Current price (taka)</i> | <i>Price one year before (taka)</i> |
|---|-----------------------------|-------------------------------------|
| Rice | | |
| Lentil (Mosuri Daal) | | |
| Flour | | |
| Chicken | | |
| Beef | | |
| Fishes: a) b) c) | | |
| Egg | | |
| Potato | | |
| Onions | | |
| Oil | | |
| Milk a) Powdered milk b) Liquid milk c) Condensed milk | | |
| Sugar | | |
| Salt | | |

Appendix B: Food Scoring Method

We used a modified version of the ten-question food scoring instrument proposed by the WHO (2001). Below are the ten WHO questions and detailed notes on our scoring procedure.

Legend

s: serving

cup: one cup is 250 ml.

tsp: tea-spoon

Q1: Did the individual eat at least 6 servings from the cereals and potato group?

- $s \geq 6$ from cereals and potato group: 1 point
- $3 \leq s < 6$ from cereals and potato group: 0.5 point
- $s < 3$ from cereals and potato group: 0 point

where

- $\frac{1}{2}$ cup cooked rice = 1 serving
- $\frac{1}{2}$ cup potato (cooked/ fried) = 1 serving (not considered in vegetables group)
- 1 roti/bread = 1 serving
- 1 pitha/ pan cake/ cup cake = $\frac{1}{2}$ serving
- 1 cup puffed rice/ chips = $\frac{1}{2}$ serving
- 1 biscuits = $\frac{1}{3}$ serving

Q2: Did the individual eat at least 5 servings from vegetables and fruits group?

- $s \geq 5$ from vegetables and fruit group: 1 point
- $2.5 \leq s < 5$ from vegetables and fruit group: 0.5 point
- $s < 2.5$ from vegetables and fruit group: 0 point

where

- $\frac{1}{2}$ cup vegetables = 1 serving
- 1 banana or 1 apple or 1 orange or 1 mango = 1 serving
- $\frac{1}{2}$ cup grapes/ jack fruit = 1 serving

Q3: Did the individual have at least 2 servings from the milk products group?

- $s \geq 2$ from milk products: 1 point
- $1 \leq s < 2$ from milk products: 0.5 point
- $s < 1$ from milk and milk products: 0 point

where

- 1 l cup milk = 1 serving
- 4 small cups tea (with milk) = 1 serving of milk

We considered 1 large cup of tea (250 ml, used in the survey) equivalent to 4 small cups of tea. Lower income people in Bangladesh usually use small cups. We assumed each cup of tea contains some milk and the milk in 4 cups equals one milk serving.

Q4: Did the individual eat at least 1 serving from meat and alternatives group (meat, fish, eggs, daal or other pulses)?

- $s \geq 1$ from meat and meat alternatives group: 1 point
- $0.5 \leq s < 1$ from meat and meat alternatives group: 0.5 point
- $s < 0.5$ from meat and meat alternatives group: 0 point

where

- $\frac{1}{2}$ cup of meat (any kind) = 1 serving
- $\frac{1}{2}$ cup fish (any kind including dried fish/ shutki) = 1 serving
- 1 egg = 1 serving
- $\frac{1}{2}$ cup daal or other pulses = 1 serving

Q5: Did the individual consume fewer than 2 servings from the fat, oils and sugar group?

- $0 \leq s \leq 2$ from fats, oils and sugar group: 1 point
- $2 < s < 4$ from fats, oils and sugar group: 0.5 point
- $s \geq 4$ from fats, oils and sugar group: 0 point

where

- 2 tsp of oil = 1 serving
- 2 tsp butter = 1 serving
- 2 tsp sugar = 1 serving

For this question we made the following detailed scoring assumptions:

- 1 biscuit = $\frac{1}{2}$ serving from fat, oil, sugar group
- 1 packet chips = 1 serving from fat, oil, sugar group
- 1 large cup of tea or 4 small cups of tea = 2 servings of sugar (assuming 1 tsp sugar per small cup)
- 1 cup halka/faltu food = 1 serving of fat, oil, sugar group
- 1 pitha/ pan cake = $\frac{1}{4}$ serving from fat, oil, sugar group (lower income people generally prepare pitha with or without oil, but sugar/gur is a common ingredient. As types of pitha were not specified in the survey, we assumed each pitha contributed a small portion of a fat, oil, sugar group serving)
- 1 puri/ samosa/ singara = $\frac{1}{4}$ serving of fat, oil, sugar group

We also assessed the impact of meat, fish, vegetables, eggs and daal consumption on the fat, oil, sugar group. In Bangladesh, most people use oil (as much as they can!) when they prepare curries. Also meat and fish contain fat:

- 1 cup of meat = $\frac{1}{2}$ serving of fat, oil, sugar group
- 1 cup of fish = $\frac{1}{2}$ serving of fat, oil, sugar group
- 1 cup of vegetable = $\frac{1}{2}$ serving of fat, oil, sugar group
- 1 cup of daal = $\frac{1}{4}$ serving of fat, oil, sugar group (usually less oil use to cook daal than curry)
- 1 egg = $\frac{1}{2}$ serving of fat, oil, sugar group (fried is the most common means to consume eggs for lower income people) where 1 cup egg = 2 eggs
- 1 sweet = 1 serving from fat, oil, sugar group

Q6: Did the individual eat a variety of foods within each of four main food groups ([1] cereals and potato, [2] fruits and vegetables, [3] meat, fish, eggs, daal) [4] milk and milk products?

- 2 items in each of 4 food groups: 1 point
- 2 items in each of 2 or 3 food groups: 0.5 point
- 2 items in 0 or 1 food group: 0 point

Very few low-income Bangladeshi consume a variety of milk products. To include this group, as recommended by the WHO, would have generated unreasonably low scores on this question.

Q7: Did the individual eat at least 2 fresh vegetables?

- 2 or more fresh vegetables: 1 point
- 1 fresh vegetable: 0.5 point
- 0 fresh vegetables: 0 point

Here I considered leafy and other vegetables in terms of number of items, as opposed to quantity of servings.

Q8: Did the individual eat at least one fresh fruit?

- 1 or more fresh fruit: 1 point
- 0 fresh fruit: 0 point

As for Q7, we considered number of items, not quantity of servings. We awarded no intermediate 0.5 scores to this question.

Q9: Did the individual eat mostly nutritious snacks?

- 0 snacks and 1 fruit: 1 point
- 0 or 1 processed snacks (shingara, samosa, puri, packet of chips) plus 1 or more fruit: 1 point
- 1 or 2 processed snacks plus 1 or more fruit: 0.5 point
- 2 processed snacks plus 1 or more fruit: 0 point

- 0 or 1 biscuit and 1 or more fruit: 1 point
- 1 or 2 biscuits plus 1 or more fruit: 0.5 point
- 2 biscuits and 1 or more fruit: 0 point

- 0 – 2 pitha and 1 or more fruit: 1 point
- 2 – 3 pitha and 1 or more fruit: 0.5 point
- 3 pitha and 1 or more fruit: 0 point

As snacks we considered the halka/faltu foods. Respondents reported consuming biscuits, chips, shingara, samosa, puri, pitha, puffed/beaten rice (khoi/chira) as snacks. We gave more points if the foods contain hygienic/nutritious items and were probably produced in hygienic situations. Shingara, samosa, puri, and chips are widely available in Bangladesh; however they are often cooked in unhygienic situations by street vendors, and most contain lots of oil. Pithas (sweet breads or pastries) are mostly home-cooked in more hygienic situations and contain less oil. We considered fruits as potential snacks.

Q10: Did the individual consume mostly lean or low fat content foods?

This question was scored identically to Q5.

Appendix C: Income and Asset Index Calculation

From the survey I had data on the occupation of each member of the households and how many hours each household member works per day. I have categorized the professions broadly into 6 categories, such as,

- Agricultural labour
- Other labour
- Business
- Official jobs (including driver)
- House worker (maid servant)
- Garment worker

Then I have categorized each person who work in the households as,

- Full time worker (If works 5 hrs or more per day)
- Part time worker (If works less than 5 hrs per day)

For each category of worker I have taken data for the per day wages (from the data of Bangladesh Bureau of Statistics). Due to high variability in the wage of business occupation I considered wage data of the other labour for that. Then I have multiplied the hours of work with the approximate wage to get individual members wage per day. For each profession I have considered 24-30 days per month as working day. Then I have added the income of the all members in the household and calculated the annual household income.

To calculate the income from the assets I have considered cultivable land, cow, chicken, duck and income generating vehicle such as rickshaw, van, etc. I considered the average productivity of each type of asset per unit (e.g. the production of milk per cow per day) from the literature. Then I multiplied of the quantity of production with the price and got the total income from assets for the households. Adding the income from labour and assets I calculated the total annual income for the households. Per capita income was calculated by dividing the total annual household income by the square-root of the number of household members.

Appendix D: Results from cross tabulations

Table 5.1. Share of women sampled with "inadequate" diet, by education level and region

| Highest class attended | Rural (Jamalpur) | | Urban (Uttara) | | Suburban (Raozan) | |
|------------------------|------------------|-------|----------------|-------|-------------------|-------|
| | share | total | share | total | share | total |
| 0 - 2 | 0.428 | 187 | 0.442 | 197 | 0.658 | 38 |
| 3 - 5 | 0.373 | 51 | 0.524 | 63 | 0.463 | 67 |
| 6 - 9 | 0.393 | 28 | 0.419 | 31 | 0.533 | 105 |
| ≥10 | 0.300 | 10 | 0.429 | 7 | 0.466 | 208 |
| Literacy | | | | | | |
| can't read | 0.423 | 182 | 0.429 | 189 | 0.618 | 34 |
| can read a little | 0.421 | 19 | 0.500 | 40 | 0.458 | 24 |
| can read | 0.373 | 75 | 0.515 | 68 | 0.492 | 360 |

Table 5.2. Share of women sampled with "inadequate" diet, by husbands' education level and region

| Highest class attended | Rural (Jamalpur) | | Urban (Uttara) | | Suburban (Raozan) | |
|------------------------|------------------|-------|----------------|-------|-------------------|-------|
| | share | total | share | total | share | total |
| 0 - 2 | 0.421 | 164 | 0.430 | 142 | 0.571 | 56 |
| 3 - 5 | 0.583 | 36 | 0.558 | 52 | 0.487 | 76 |
| 6 - 9 | 0.240 | 25 | 0.531 | 32 | 0.520 | 98 |
| ≥10 | 0.158 | 19 | 0.400 | 25 | 0.473 | 188 |
| Literacy | | | | | | |
| can't read | 0.420 | 162 | 0.456 | 136 | 0.540 | 50 |
| read a little | 0.375 | 16 | 0.450 | 20 | 0.348 | 23 |
| can read | 0.379 | 66 | 0.484 | 95 | 0.504 | 174 |

Table 5.3. Share of women sampled with "Inadequate" diet, by households' education level and region

| Highest class attended | Rural (Jamalpur) | | Urban (Uttara) | | Suburban (Raozan) | |
|------------------------|------------------|-------|----------------|-------|-------------------|-------|
| | share | total | share | total | share | total |
| 0 - 2 | 0.517 | 58 | 0.473 | 91 | 0.552 | 29 |
| 3 - 5 | 0.478 | 67 | 0.459 | 98 | 0.557 | 70 |
| 6 - 9 | 0.387 | 62 | 0.44 | 75 | 0.446 | 112 |
| ≥10 | 0.303 | 89 | 0.432 | 37 | 0.5024 | 207 |

Table 5.4. Share of women sampled with "inadequate" diet, by participation in work outside home and region

| Occupation of women | Rural (Jamalpur) | | Urban (Uttara) | | Suburban (Raozan) | |
|------------------------------|------------------|-------|----------------|-------|-------------------|-------|
| | share | total | share | total | share | total |
| Housewife (work in home) | 0.391 | 253 | 0.448 | 221 | 0.502 | 410 |
| Women with work outside home | 0.609 | 23 | 0.475 | 80 | 0.375 | 8 |

Table 5.5. Share of women sampled with "inadequate" diet, by family dynamics and region

| Household's food distribution pattern | Rural (Jamalpur) | | Urban (Uttara) | | Suburban (Raozan) | |
|---------------------------------------|------------------|-------|----------------|-------|-------------------|-------|
| | share | total | share | total | share | total |
| Everyone served equally | 0.415 | 106 | 0.429 | 140 | 0.502 | 277 |
| Husband and/or children more | 0.349 | 106 | 0.443 | 97 | 0.560 | 100 |

Table 5.6. Share of Women Sampled with "Inadequate" Diet, by source of drinking water and region

| Source of drinking water | Rural (Jamalpur) | | Urban (Uttara) | | Suburban (Raozan) | |
|--------------------------|------------------|-------|----------------|-------|-------------------|-------|
| | share | total | share | total | share | total |
| Boiled/tube well | 0.411 | 275 | 0.383 | 47 | 0.507 | 406 |
| Other | 0.000 | 1 | 0.469 | 254 | 0.250 | 12 |

Table 5.7. Share of women sampled with "inadequate" diet, by income category and region

| Income category | Rural (Jamalpur) | | Urban (Uttara) | | Suburban (Raozan) | |
|-------------------------------------|---------------------|-------|-------------------|-------|----------------------|-------|
| | share | total | share | total | share | total |
| Very low (less than \$1.25 per day) | 0.437 | 71 | 0.593 | 27 | 0.429 | 7 |
| Other (above \$1.25 per day) | 0.4 | 205 | 0.442 | 274 | 0.502 | 410 |
| Low (\$1.25- \$2 per day) | 0.451 | 71 | 0.327 | 52 | 0.000 | 2 |
| Medium (\$2-4 per day) | 0.375 | 104 | 0.479 | 192 | 0.484 | 153 |
| High (\$4-10 per day) | 0.367 | 30 | 0.400 | 30 | 0.482 | 255 |

Table 5.8. Share of women sampled with "inadequate" diet, by sources of advice and region

| Sources of advice | Rural (Jamalpur) | | Urban (Uttara) | | Suburban (Raozan) | |
|--|---------------------|-------|-------------------|-------|----------------------|-------|
| | share | total | share | total | share | total |
| Family/ Neighbour | | | | | | |
| Yes | 0.368 | 76 | 0.41 | 83 | 0.496 | 117 |
| No | 0.425 | 200 | 0.472 | 218 | 0.5 | 301 |
| Health facilities/ Doctors/ Nurse | | | | | | |
| Yes | 0.2 | 45 | 0.542 | 48 | 0.477 | 130 |
| No | 0.45 | 231 | 0.439 | 253 | 0.51 | 288 |
| Healthworker came house | | | | | | |
| Yes | 0.429 | 140 | 0.459 | 109 | 0.585 | 41 |
| No | 0.39 | 136 | 0.453 | 192 | 0.491 | 377 |
| Public Meeting | | | | | | |
| Yes | 0.275 | 40 | 0.5 | 18 | 0.5 | 6 |
| No | 0.432 | 236 | 0.452 | 283 | 0.5 | 412 |
| Radio/ TV/ Poster | | | | | | |
| Yes | 0.293 | 58 | 0.42 | 143 | 0.476 | 185 |
| No | 0.44 | 218 | 0.487 | 158 | 0.519 | 233 |

Table 5.9. Share of Women Sampled with "Inadequate" Diet, by the frequency of nutritional supplements consumption and region

| Frequency of nut. supplements consumption | Rural (Jamalpur) | | Urban (Uttara) | | Suburban (Raozan) | |
|---|------------------|-------|----------------|-------|-------------------|-------|
| | share | total | share | total | share | total |
| Calcium tablet | | | | | | |
| Regularly | 0.333 | 9 | 0.625 | 8 | 0.5 | 54 |
| Not regularly | 0.461 | 102 | 0.5 | 118 | 0.558 | 77 |
| Pregnancy/ nursing children | 0.35 | 20 | 0.417 | 24 | 0.468 | 218 |
| Don't know | 0.556 | 9 | 0.316 | 19 | 0.778 | 9 |
| Never | 0.375 | 136 | 0.435 | 108 | 0.5 | 60 |
| Vitamin tablet | | | | | | |
| Regularly | 0.2 | 5 | 0.25 | 8 | 0.567 | 60 |
| Not regularly | 0.42 | 112 | 0.444 | 151 | 0.523 | 86 |
| Pregnancy/ nursing children | 0.538 | 13 | 0.485 | 33 | 0.485 | 206 |
| Don't know | 0.294 | 17 | 0.625 | 8 | 0.4 | 10 |
| Never | 0.406 | 128 | 0.447 | 85 | 0.464 | 56 |
| Zinc tablet/ syrup | | | | | | |
| Regularly | 0 | 0 | 0 | 0 | 0.385 | 13 |
| Not regularly | 0.605 | 38 | 0.4 | 10 | 0.406 | 32 |
| When pregnant/nursing children | 0.2 | 5 | 0.4 | 5 | 0.462 | 132 |
| Don't know | 0.321 | 28 | 0.341 | 82 | 0.5 | 46 |
| Never | 0.391 | 202 | 0.531 | 130 | 0.549 | 195 |
| Iron tablet/ syrup | | | | | | |
| Regularly | 0.444 | 9 | 1 | 3 | 0.414 | 29 |
| Not regularly | 0.471 | 102 | 0.414 | 70 | 0.5 | 40 |
| Pregnancy /nursing children | 0.289 | 38 | 0.692 | 26 | 0.467 | 244 |
| Don't know | 0.5 | 6 | 0.419 | 43 | 0.667 | 12 |
| Never | 0.388 | 121 | 0.467 | 120 | 0.591 | 93 |

Table 5.10. Share of women sampled with "inadequate" diet, by presence of family member who smokes and region

| Number of family members smoking | Rural (Jamalpur) | | Urban (Uttara) | | Suburban (Raozan) | |
|----------------------------------|------------------|-------|----------------|-------|-------------------|-------|
| | share | total | share | total | share | total |
| 0 | 0.323 | 96 | 0.456 | 90 | 0.485 | 229 |
| 1 | 0.452 | 166 | 0.469 | 196 | 0.541 | 146 |
| ≥2 | 0.500 | 14 | 0.267 | 15 | 0.442 | 43 |

Table 5.11. Is anyone in the household tobacco or betel nut addicted?

| Is anyone in the household tobacco or betel nut addicted | Rural (Jamalpur) | | Urban (Uttara) | | Suburban (Raozan) | |
|--|------------------|-------|----------------|-------|-------------------|-------|
| | share | total | share | total | share | total |
| Yes | 0.47 | 236 | 0.455 | 301 | 0.523 | 287 |
| No | 0.3 | 40 | 0 | 0 | 0.45 | 131 |

Table 5.12. Share of Women Sampled with "Inadequate" Diet, by reasons of less food consumption and region

| Reasons of less food consumption | Rural (Jamalpur) | | Urban (Uttara) | | Suburban (Raozan) | |
|----------------------------------|------------------|-------|----------------|-------|-------------------|-------|
| | share | total | share | total | share | total |
| Price hike | 0.464 | 207 | 0.462 | 182 | 0.546 | 174 |
| Other reasons | 0.246 | 69 | 0.445 | 119 | 0.467 | 244 |