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Dietary change in Bangladesh from 1985 to 2010

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ABSTRACT

In many countries, dietary change is tracked using food supply data from the Food and Agriculture Organization's food balance sheets. It is difficult to draw conclusions on individual or sub-national food consumption from these data and impossible to study inequalities. We analyzed seven Household [Income and] Expenditure Surveys (H[I]ES) in Bangladesh from 1985 to 2010 to track changes in consumption patterns. There was a broad national trend of incorporating more non-starch foods into the diet, similar to what is seen in food supply data, but dietary diversification was limited among the poorest quintile. There were also several differences to estimates from food supply data, e.g. vegetable consumption was much higher. Further analyses of this kind will help to better understand dietary change.

1. Introduction

Due to a lack of individual-level dietary data in many countries, most national information on food consumption is derived from food supply information, compiled in food balance sheets by national statistical offices and the Food and Agriculture Organization of the United Nations (FAO). Food supply information is estimated from total available food stocks and population, while total available food stocks are calculated from agricultural production, existing food stocks, exports, imports, other uses of food, and to some degree, food waste and loss (Food and Agriculture Organization of the United Nations, 2001a). While food supply data can help to compare broad dietary trends over time and between countries, consumption surveys are needed "to obtain more reliable information on actual food consumption patterns and trends" (World Health Organization and Food and Agriculture Organization of the United Nations, 2003). Furthermore, food supply cannot be disaggregated by populations or regions within a nation and inequalities within a population can only be studied if disaggregated data are available.

Household Consumption and Expenditure Surveys (HCES) have been conducted in many low- and middle-income countries. HCES is an umbrella term that includes multiple survey systems that estimate the expenditure patterns of a population, develop the poverty line, and calculate the proportion of the population below the poverty line (Bangladesh Bureau of Statistics, 2012; Fiedler et al., 2012b). Though these surveys were not designed to assess diets, since 2006, they have been increasingly used for this purpose due to a lack of high-quality individual dietary consumption data in many countries (Fiedler et al., 2012a, 2012b). To date, most analyses relying on these rich survey systems have made use of only the most recent datasets and have not studied dietary change over a longer time period (Bermudez et al., 2012; Fiedler, 2014; Fiedler et al., 2016; Fiedler and Lividini, 2017).

Bangladesh is a compelling starting ground for increasing our understanding of dietary change, as rich secondary data are available and large changes in the agricultural system and reductions in undernutrition have occurred since independence in 1971. In contrast to much of South Asia, where there has been limited improvement in nutritional status despite great declines in poverty, Bangladesh has experienced declines in the proportion of children who are stunted and in the proportion of households below the poverty line (Food and Agriculture Organization of the United Nations, 2012). At the same time as childhood stunting fell from 51% in 2004 to 35% in 2014, Bangladesh experienced a large increase in overweight, with the proportion of overweight ever-married women increasing from 18% to 39%, and the emergence of diabetes and hypertension as public health concerns (Helen Keller International (HKI) and James P Grant School of Public Health (JPGSPH), 2013, 2016; National Institute of Population Research and Training (NIPORT) et al., 2013, 2016). Obtaining reliable and detailed information on actual food consumption patterns and trends is crucial for predicting future dietary changes, so adequate protective measures can be taken.

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In this manuscript, we trace dietary change in Bangladesh using available HCES datasets over 25 years, and we compare our findings to food supply information from food balance sheets and to current national dietary guidelines. Furthermore, we disaggregate the data by place of residence (rural/urban) and expenditure quintiles to study inequalities. In addition, we seek to establish a set of methods which researchers in other countries with similar datasets can adapt and use. Finally, with the compilation of these datasets, we enable future analyses on the causes and consequences of dietary change.

2. Methods

Since 1973, the Households [Income and] Expenditure Surveys (H[I]ES) system in Bangladesh has collected data every three to five years (Bangladesh Bureau of Statistics, 2012), but records from the earliest surveys were not archived at the Bangladesh Bureau of Statistics (BBS). Our analysis is thus limited to the surveys conducted in 1985, 1988, 1991, 1995, 2000, 2005, and 2010. For comparison, we reviewed and analyzed food supply information from the food balance sheets for Bangladesh as well as recently released national dietary guidelines (Bangladesh Institute of Research and Rehabilitation in Diabetes, 2016; Food and Agriculture Organization of the United Nations, 2014). As this is a secondary analysis of publicly available data, obtained from BBS, ethical approval was not required. This section contains a brief overview of the work carried out to compile these seven datasets into consistent estimates. More details on the datasets and methods are provided in the supplementary section "S1: Additional information on methodology."

2.1. H[I]ES sampling

All surveys included a nationally representative sample of both rural and urban households. Sample sizes increased over time from 3,840 households in 1985 to 12,240 households in 2010 (Bangladesh Bureau of Statistics, 2012, 1987). All surveys collected data over twelve months, thus minimizing seasonal differences between years and producing annualized estimates.

2.2. H[I]ES data collection and management

No two years of H[I]ES used identical data collection mechanisms, and the data structure differed particularly between the early (1985–1995) and the later years (2000–2010). Differences and decisions taken to obtain a consistent overall dataset are described below for each of the three sections of H[I]ES used in the analyses: 1) food consumption, 2) household composition, and 3) expenditure information.

2.2.1. Food consumption data

H[I]ES sought to record all foods used by the household within the reference period. Based on the archived datasets, the reference period of household food consumption was 30 days from 1985 until 1995, and 14 days from 2000 to 2010. During the reference period, respondents – the head of the household, the person in charge of the kitchen, or another responsible adult – were visited daily by a locally employed "diary keeper", and interviewed about household food consumption, using a list-based questionnaire. Datasets from surveys with a 30-day reference period contained only totals of consumption by food item over the entire period. Datasets from later surveys (2000 onward) provided information on food items separately for each day of the reference period (or weekly for consumption of spices and tobacco), resulting in fewer implausible and missing entries compared to earlier surveys.

For each food item listed – with the exception in some years of some ready-made foods and foods consumed outside the home – two types of information were recorded: the amount of the food consumed and its monetary value. All food items were given a value by the H[I]ES field teams. The monetary value was the purchase price of the item or was based on local market prices if the food was self-produced or gifted to the household. As data cleaning methods which could rely on hard copy information or enumerator review were not possible, we used these two types of information (amount and value) on each food item for systematic consistency checks across all surveys, and to correct a few large outliers in the dataset by using imputation (see S1 for more information). We also used this method to correct for missing quantities of items for which only value information was provided. Overall, only 0.1% of quantities and monetary values were corrected.

After correction, all quantities of foods consumed by households were converted to grams and corrected for the edible portion - the portion of the food usually consumed – based on the edible portion amount in Food Composition Tables (Shaheen et al., 2013; U.S. Department of Agriculture, 2014) or through direct measurements. For composite food items, the edible portions of the component parts were averaged. We did not account for food waste or loss within the home, such as plate waste.

The codes used to categorize food items varied between each survey in composition and number, ranging from 222 food items in 1991 to 113 food items in 1995. To create a uniform categorization system, we grouped food codes into the lowest common group for all years except 1995.[1] In total, we constructed 97 food categories. For the analysis, we only retained categories of which at least 1 g was consumed per individual per day in the national sample,[2] and added the remainder to a mixed category, such as "other vegetables". Ready-made foods and foods consumed outside the home could not be fully included due to inconsistencies in the way the information was collected.

The prices of food items, either actual or estimated by the data collection teams, were recorded in their nominal value in Bangladeshi Taka at the time of the survey. As we examined this information across years as a proportion of total expenditure on foods, we were able to use the nominal values and avoid the need for conversion to real values.

2.2.2. Household composition

H[I]ES recorded household composition in two ways: 1) the household member list and 2) the sum of the number of individuals consuming food in the household by day over the reference period (summary information). The household member list includes the age in completed years, sex, and occupation of all household members. Information on pregnancy and lactation was not collected. The summary information disaggregated the number of person-days during which food was consumed by individuals of a given sex (male or female) and age (child of 0–9 years or adult of 10 or more years). While the household member list was available for all households, summary information was missing for some households in pre-2000 surveys.

Both these sources of information have utility as the household listing data provide better granularity for child age, but some information is only reflected in the summary information, such as household guests, household members not present, and if not all targeted days of food consumption were recorded. We identified inconsistencies between the two data sources that were due to apparent data entry error, particularly in surveys in which only the sum of all person-days was recorded (pre-2000). We prioritized the summary information in most cases but discarded it in favor of the household listing in certain situations, as outlined in Section 2.4 and in S1.

2.2.3. Household expenditure

We calculated total household per capita expenditure in two ways depending on the data format. For surveys pre-2000, BBS provided

[1] As the 1995 survey had far fewer food categories, missing codes were noted but did not inform categorization.

[2] As defined by Adult Male Equivalent (AME). See section 2.3.

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