Progress in Nutrition 2022; Vol. 24, N. 1: e2022007 DOI 10.23751/pn.v24i1.11758

Review

Is there a perfect way for food security measurement? Evaluation for Turkey

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Abstract. Even though food security is not a new topic, it is currently a global issue which is a matter of great concern especially in underdeveloped and developing countries. Discussions are ongoing as to how food security can be measured effectively due to the multidimensionality of the issue. The main objective of this study was to review the major methods used to measure food security and evaluate their applicability for Turkey. In this study, case studies in which these methods were applied as well as the possibilities for using these in Turkey were discussed. Although Turkey is among upper-middle income countries, it is a critical country for food security measurement due to the inequity in income distribution and socio-economic differences between the regions. For this reason, instead of applying solitary macro measurements, such as FAO method, using them along with a variety of micro measurements is considered to be more effective for Turkey. This study provides recommendations for governments and social organizations for developing policies and programs focused on solving public problems related to food security both in Turkey and other similar countries.

Key words: Food Security, Food Insecurity, Food Security Measurement, Turkey

Introduction

Food security is not a new problem. It continues to be a life and death issue for some developing countries, whereas domestic food security in developed countries tends to cause less concern in general. Some factors, such as climate change, oil shortage and increased use of biofuels pose a danger to food security in the 21st century (1). Food security has also been related to hunger, malnutrition, poverty and humanitarian aspects (2). According to FAO data, two billion people still experience hunger or don't have regular access to nutritious and sufficient food (3).

The issue of food security is closely related to the demographic structure of the country and particularly with the changes and developments that occur within the country (4-5). The rapid increase of the world population along with rising food demand and unbalanced distribution of food between the regions scale up the importance of food security issues; therefore, providing access to sufficient amount of food in a sustainable way has become one of the major concerns for all countries and, consequently, international organizations (6-8). In recent years, major events and instabilities in the world have brought more attention to the food insecurity problem (9). Negative developments such as climate change, population mobility caused by wars and finally the Covid-19 pandemic (10) have deepened the problem of food insecurity today and made it a subject that requires urgent measures.

Along with increasing interest towards food security and hunger throughout the world; the need for food security/insecurity measurement and new measurement methods development has been recognized (11). In particular, politicians and program executives search for simple methods to manage, analyze and

interpret food security issues (12). High effectiveness of the methods used in food security measurement and making right decisions about selecting the right method are very important in terms of easing the struggle with global problems such as hunger and food insecurity. Thus, comprehension of food security measurement methods the selection of the proper method in an accurate manner in accordance with the objective provide great benefits for solving the problem. For this reason, studies on the effectiveness of food security measurement methods and which methods will be more appropriate in which regions have gained importance today (13-15). Especially developing surveys suitable for countries' own conditions (16) and regular measurement of developments in food safety/food insecurity are among the social concerns of many countries.

Measuring food security regularly is important for Turkey as it has food security risks. Being in the Middle East region which has various civil wars, political instabilities is an important food security risk for Turkey (17-18). Being a water-stressed country and being in the vulnerable region in terms of climate change (19), high input prices and food inflation (20), inequality in income distribution (21-22) are other important potential food security risks for Turkey. However, Turkey lacks food security measurement on a regular basis as well as studies on food security: Only a few studies have been carried out up to the present. For this reason, it's necessary to discuss how to measure food security effectively in Turkey.

The main objective of the study was to reveal the methods applied in food security measurement and to evaluate the applicability of these methods in Turkey. Another objective was to demonstrate the current status and developments on the subject of food security measurement in Turkey. The study can also be helpful for other similar countries to review and discuss their food security measurement challenges.

In order to reach these goals, the concept of food security and food security components were included in the study. The classification based on FAO's food security measurement was used to evaluate the food security measurement methods (23). Five basic methods used in measurement formed the outline of the current study. These methods continue to be used combined or separately in food security measurement all over the world due to their wide scope and effectiveness.

The Concept of Food Security and its Components

Even though it is a flexible concept that has been defined separately over the course of time, the concept of food security, is most widely used and defined in our day as "a constant physical and economic access to sufficient, healthy, safe and nutritious food with the aim to meet essential needs for nutrition and food priorities for active and healthy life of all the people at all times" (24-27).

The concept of food security consists of four different dimensions. These are availability, access, utilization and stability dimensions (28-30).

Availability: Food availability refers to the food supply. Availability dimension is stated to be imminently enough to meet the needs of the food supply (4). The concept of availability includes both domestic production and import.

Accessibility: The principle of accessibility is to have sufficient resources to reach sufficient food with the aim of carrying out sufficient and healthy nourishment. The accessibility dimension also includes economic and physical access (31). The amount of food production, distribution and income level are among the most important factors that affect access to food (32).

Utilization: Food availability and accessibility alone are not enough to provide food security. Safety and quality of the consumed food in addition to the acquisition of serious benefit from the food by the consumers are required. Utilization is considered as having four basic aspects: food standards suitability, micronutrient content, protein quality and food safety (33).

Stability: An individual is considered to be prone to individual food insecurity if he/she experiences periodical food access problems despite a sufficient daily intake of food. Bad weather conditions, political instability and/or economic factors (unemployment, increasing food prices) can have negative impacts on individual food security level (25).

Developments Related to Food Security Measurement in Turkey

When the efforts and studies made to ensure food security in the world in the recent past are examined, it is seen that the World Food Summit is an important preliminary. The first World Food Summit was held in Rome in 1996 for the purpose of eliminating hunger and malnutrition while also providing sustainable food security for all the people in the world, during which the Rome Declaration on World Food Security and World Food Summit Plan of Action were adopted. More detailed information is required on groups that are exposed to food security vulnerability as well as on the reasons of vulnerability and distribution in the world in order to provide a solution to the problem. Consequently, governments that participated in the Summit are obliged to develop and update national "FIVIMS- Food Insecurity and Vulnerability Information and Mapping Systems" in partnership with all civil society individuals in order to determine the regions and communities that are affected by or are at risk of hunger and malnutrition at the local level. Therefore, a study was carried out in 1999 under the coordination of the Food and Control General Directorate for the purposes of identifying the vulnerable groups exposed to food insecurity in Turkey. In this context, the definition of vulnerable groups, main subsistence strategies of the groups, reasons for possible vulnerability and factors that may increase this vulnerability, possible indicators in addition to regions where they are located were identified. In accordance with this, landless villagers, farmers with a small amount of land, small-scale stock farmers, forest villagers, city slum area residents, urban homeless and working children, women engaged in household farming were classified as vulnerable groups. An outsourced project containing a series of actions aimed at determination of the groups exposed to food insecurity in Turkey as well as the establishment of national FIVIMS system was prepared and sent to FAO by the Turkish Republic Ministry of Agriculture and Rural Affairs. However, it was concluded following the "Food Security Information and Early Warning System" Work Group meeting held on 15-16 June 2001 in Ankara that there is no need for FIVIMS project in Turkey (34).

But, regular researches carried out across the country on food consumption, health and nutrition are required in order to perform a detailed food security measurement in Turkey. The last surveys carried out regarding this issue at the national level in Turkey were conducted by Hacettepe University in 1974 and 1984; no study has been carried out until 2010. Turkey Nutrition and Health Survey (TBSA-2010) was carried out in 2010 in 81 provinces (throughout the country) under the leadership of the Turkish Republic Ministry of Health (35-37). The main objectives of these surveys are presented below (38).

- To create nutrition and health data throughout the country,
- To determine priorities, identify the reasons, monitor and evaluate the problems of the vulnerable groups exposed to insufficient and unbalanced nutrition that are at risk (babies, children, pregnant women, elderly people, etc.) and
- To give direction to effective nutrient enrichment and support programs in prevention of some major nutritional problems.

Although various surveys were carried out on different dates under the leadership of the Turkish Republic Ministry of Health after 2010; regular, frequent and comprehensive studies are still needed to determine the existence and level of food security. As of 2019, Gini coefficient was 0,395 indicating that Turkey lacks equitable income distribution (39). Lack of equitable income distribution in Turkey is a threat to the access dimension of food security. Income level and lack of information about healthy diet are the most influential factors for food consumption pattern in Turkey. Households with low income consume more bread in Turkey, whereas households with high income consume more meat and meat products. This situation reveals the access problem; the main problem that affects food security in Turkey is related not to the availability of food but the lack of equitable distribution among different socio-economic groups (36). Consequently, it is very important to emphasize the evaluation in studies carried out on food security measurement that are particularly related to the access

dimension of food security in Turkey and carry out studies on measuring access.

Food Security Measurement Methods and Their Evaluation in Turkey

Multidimensionality and complexity of food security issue has led to the development of various methods for food security measurement. When the literature is examined, it is seen that many indicators have been suggested for the measurement of food security (40-41). For example, FAO refers to the country's agricultural production and trade, whereas International Food Policy Research Institute (IFPRI) uses household consumption, World Bank (WB)- general wealth level, World Health Organization (WHO)- as basis in food security measurement methods based on children and human health and since 2012, the "Economist Intelligence Unit" (EIU) uses main dimensions of food security (access, availability, quality and safety) and food prices correction factor (42). Consequently, different approaches with their unique advantages and disadvantages are used in food security measurement.

Despite the different approaches and indicators, food security measurement methods can be generally classified into five groups: FAO method, household income and expenditure surveys, individual food intake surveys, anthropometric methods and qualitative methods (23). Most of the food security measurement studies conducted today can be examined within the framework of this classification. In the following section, the evaluation of these methods have been realized for Turkey.

FAO Method

FAO method is one of the most common food security measurement methods and is based on identifying the proportion of undernourished people in the total population. This method aims to identify the number of people who consume fewer calories per day than needed in comparison to the minimum energy requirement norms. FAO collects and uses three data sets mentioned below in order to identify the relevant data (43).

a) Data about all food production, exports and imports are collected for the country where food security is measured after which the calorie content of each item of food is determined and is used to calculate the total number of calories in the country.

b) Population structure is determined in accordance with gender and age groups. Total calorie requirements for the entire population is estimated by considering the difference in minimum calorie requirements for the different age and gender groups.

c) The calorie distribution across the country can be determined by means of the data acquired from household survey results.

Taking this data into consideration helps to determine the population that consumes fewer calories per day than needed according to minimum energy requirement norms. This population is equivalent to the undernourished population of the country (44).

The population of Turkey can be classified as well-nourished when we take the "Food Balance Sheet" used in FAO method as a basis. Turkey has reached a sufficient level in terms of calories and amount of protein per capita. However, protein consumed by the Turkish population is mostly vegetable protein, whereas there are certain difficulties with regard to the provision of animal protein. On average, 44 percent of the daily energy intake in Turkey is provided solely by bread and thus a deficiency with regard to nutritional elements is observed as a result of the consumption of animal products in small amounts (45). Thus, the status of food security in Turkey cannot be analyzed properly via FAO "Food Balance Sheet" data since food distribution inequity and the quality of consumed food is ignored.

Income distribution inequity in Turkey is a factor that makes food security provision throughout the country difficult. FAO method provides general information about food security status; however, economic differences between the regions and income distribution inequity lead to insufficiency of FAO method in food security measurement. In addition, measurement by means of FAO method using the country's food balance sheet data may show erroneous results in case of inaccuracies in food balance sheet (44). At this

point, accuracy of the statistics sent by Turkey directly to FAO affects the success of the method.

FAO method in food security measurement proved to be beneficial and useful for carrying out a comparison among the countries thus providing general information for the total evaluation of Turkey. However, in conjunction with this method, there is also a need for implementing other methods that take food pattern, diet variety, food quality and regional differences into account while enabling micro analysis of the results. Thus, correct food security measurement in Turkey and its results will be more effective on behalf of developing solutions to problems.

Household Income and Expenditure Surveys

Food insecurity increases within certain groups, certain regions or periodically in any country. Any individual, notwithstanding sufficient daily food intake, can periodically experience difficulties in economic access to food. Household income and expenditure surveys are very important in this aspect. Household surveys can examine basically three key measures of food insecurity (46).

Household Energy Deficiency and Its Depth

This indicator reveals the amount of energy gained from the food consumed by the household. Data obtained from the results of household surveys that take gender and age into consideration determine whether or not consumed food provides sufficient energy; providing that energy is insufficient, this data also reveals its depth (46). Most significant constraints of the method are: prediction of price stability in preparation of food at lowest cost by the households, and acknowledgement of the ability of the households to access foodstuff throughout a year (47).

Variety of Food Consumed (Diet Variety)

Diet variety is defined as a variety of food or groups of food consumed by the household. The latest research showed that the increase in dietary variety may be associated with increased birth weight, healthy anthropometric indicators of infants and hemoglobin concentration (48).

Share of Food Expenditure in Total Expenditure

It is very important in terms of food security measurement to determine expenditures on foodstuffs as a percentage of the total expenditure of the household. Assuming that more than 70 percent of the household income is spent on food, this household may be at risk in terms of food security with regard to periodical situations such as possible job loss, natural disasters that may occur, or possible changes in pricing policy (48). Household expenditure surveys enable multilevel screening. Interregional and international measurement can be carried out by means of the data obtained from the survey. The greatest drawback is the inability to collect data from every country on a regular basis. It is largely caused by financial resource requirements and need for qualified personnel to perform data collection and analysis (49). However, household expenditure research can increase the effectiveness of FAO method.

Data obtained from household income and expenditure surveys are considered to be more convenient for Turkey due to the fact that the FAO method provides a more macro and general measurement. In addition, provision of regional and local analysis by this method makes it more useful for countries like Turkey where differences between regions exist. As a matter of fact, along with food security that has emerged as a result of expenditure surveys conducted in 12 countries across Sub-Saharan Africa, a significant difference was revealed between food security levels measured by means of the FAO method. The main reason for this difference is the parameters of FAO method at the national level (50).

The first nationwide "Household Income and Expenditure Survey" in Turkey was conducted in 1987. In accordance with the purpose, the "Household Income and Consumption Expenditure Survey", conducted in 1994 arranged the consumption expenditures and income distribution individually. Annual "Household Budget Survey" has been conducted on a regular basis since 2002 (51).

According to the household budget survey carried out in 2019, 20.8 percent of consumption expenditures of households throughout Turkey consist of food and beverages. Indicators of the five 20 percent

groups ranged in accordance with the income have been detected as follows for consumption expenditure distribution: household food expenditures were 30.7 and 15.3 percent respectively in the first (lowest income) and fifth (highest income) 20 percent groups (52). This data is important for demonstrating that the proportional difference of food expenditure between the lowest and the highest income level groups has doubled in Turkey. Nevertheless, this survey did not determine the variety of consumed food and energy amount obtained from it in the households, included into lowest level group. However, there are differences between consumption patterns and food variety in the households with the lowest and the highest income. In fact, households in Turkey with the lowest income consume more bread, whereas households with the highest income consume more meat and meat products (36). Therefore, in accordance with the household income and expenditure survey data, obtaining more detailed data in households with the lowest income will increase the effectiveness of the method with respect to food security measurement in Turkey. In addition, detailed data may be used for developing effective measures intended for the elimination of food insecurity in relatively poor households.

Individual Food Intake Surveys

Individual food intake surveys are aimed at measuring the amount of food consumed at the household level or individually. Various methods such as weighing the food consumed or chemical analysis were applied for determining the dietary history throughout the course of this measurement method. In comparison with standard household surveys, this is a more reliable method for revealing food energy deficiency. Individual food intake surveys are technically difficult to implement despite their ability to enable high quality data collection. In addition, the need for qualified personnel and high cost are among other disadvantages of individual food intake surveys (44, 49, 53-54). Thorough dietary surveys are very costly and difficult to perform, when compared with some relatively quick and simple measurement methods for hunger assessment that are used today (55). Moreover, in this approach seasonal changes in food intake or food security cannot be measured in case data collection phase falls short or is limited to one season (56-57).

A comprehensive food intake survey in Turkey conducted under the auspices of the Turkish Republic Ministry of Health, revealed interesting results. According to the study, a major proportion of consumers in Turkey consume less than the daily-recommended amount of animal products, such as milk, meat, yogurt and cheese. In addition, the consumption of hard-shelled nuts, and oilseeds also well below the recommended levels (58).

Common implementation of individual food intake surveys throughout Turkey does not seem possible owing to the aforementioned difficulties and disadvantages. However, it may contribute to other methods. For instance, implementation of individual food intake surveys in groups or regions that are under risk in terms of food insecurity determined due to the results of other methods may contribute to various other methods with regard to the point of identification of necessary nourishment for the target groups. In addition, individual food intake surveys may provide important information for developing solutions to food security measurement and food security provision by revealing individual or household food consumption patterns.

Anthropometric Methods

Anthropometric methods are also applied in food security measurement. Methods, such as the measurement of height, weight, body mass index as well as measurements carried out for different body parts are among anthropometric methods that are used in food security measurement. Anthropometric methods are very advantageous in terms of traceability and evaluation. However, these measurements are not only related to food intake and food security; since they are also related to health measures taken, child care, natural conditions and diseases and thus they should not be used as solitary (specific) methods in food security measurement (54, 59-61).

Consequently, it was stated that, although anthropometry is beneficial in comparison with other food insecurity indicator trends confirmation, it

neither measures food security nor acts as a proxy indicator. In particular, temporal relations (correlations) between household food insecurity and anthropometric measurements are among the disadvantages of this method (62).

Nevertheless, anthropometric methods are easier to implement in comparison with other methods since they are carried out by relatively unqualified personnel and with the use of inexpensive equipment. Anthropometric measurement methods can be used as auxiliary methods in comparison with other methods due to the ease of data collection and their associated low costs even though they are affected by various factors such as diseases and poor child care which are not directly linked to food security (59-63). Indeed, anthropometric measurements were also carried out in Turkey within the context of the "Turkey Nutrition and Health Survey". These studies were conducted in 1974 for the first time in Turkey; it was then repeated in 1984, 2010 and 2017 (64).

Qualitative Methods

Qualitative methods used in food security measurement demonstrate a greater potential for easier control and analysis at the international, national and local levels when compared with other methods (12). Qualitative methods are also advantageous in terms of access to data which cannot be obtained by quantitative methods with regard to understanding the depth and perspective of the problem (65).

There is a high potential for the use of qualitative methods in food security measurement in Turkey. The most commonly used qualitative method is "Food Security Core Module" (FSCM), which was put forth in the USA in 1994. It is also as known as Food Security Survey Module (FSSM). This survey module has enabled the development of a standard measurement module in the area of food security and hunger in the USA. Information on different subjects such as the fear of households for not having sufficient food expenditure budget to cover expenses on basic food needs, experiencing hunger in case of not having sufficient financial resources, levels of hunger and their effects on children are acquired via this scale. Thus, it is advantageous that that the most affected conditions and perceptions for people are related to food insecurity and hunger (12). FSCM is widely used in food security measurement in many countries with different levels of economic development (66-73). The aforementioned scale was used to measure food security levels some cities in Turkey (74,75,76). The implementation of this method in different socio-economic regions in Turkey may be advantageous since it is easy to apply and is low in cost. Thus, it is possible to carry out regional comparisons as well as comparisons between different countries with the same method used by means of more detailed analysis of food security level.

Primary Problems Which May Arise in Food Security Measurement and Solution Suggestions

The problem related with the general approach to food security subject in Turkey is perhaps one of the most important issues that need to be accentuated with regard to food security measurement in Turkey before evaluation of possible problems which may arise during the implementation of potential methods. Technical implementations related to food security measurement are natural; consequently, they are directly affected by current approaches. Different methods of food security measurement and their various technical and economic constraints are also among the reasons of extremely limited number of studies on the subject. Indeed, lack of stable food security policy in Turkey complicates detailed food security analysis more than technical constraints throughout the country.

There are also some disadvantages related to food security measurement methods, especially with regard to Turkey in addition to the aforementioned constraints that restrict the commonness of the studies on food security and research of effective measuring methods. Problems that arise from the methods used in food security measurement were evaluated for Turkey, and solution suggestions are listed below (45, 77-79).

First of all, it should be emphasized that FAO method, based on adequate caloric intake, which is one of the most common food security measuring methods currently used in Turkey, is far from detailed

measurement of food security in Turkey. Effectiveness of FAO method decreases due to socio-economic differences between different regions in Turkey and income distribution inequity. Therefore, it is considered that implementation of household income and expenditure survey method together with qualitative methods in low income regions, with respect to food security in Turkey, can lead to a more detailed analysis of food security levels of vulnerable groups.

The most significant difficulties that arise in implementation of household income and expenditure surveys or individual food intake surveys, used in food security measurement, are data collection and costs of work. NGOs, universities in the regions where the research is carried out, local governments and international organizations can provide help for overcoming these difficulties. Relatively poor people living in rural areas should be assisted in developing solutions since they neither put forward their problems nor analyze them which is a very important issue. Organizations such as Local Food Policy Councils that exist in countries such as USA can be adapted to the conditions in Turkey. In particular, establishment of these organizations in regions vulnerable with regard to the subject of food security in Turkey can provide effective local support and direct contribution to solution development in food security measurement.

Another important issue to focus on is the necessity of taking food safety into account with regard to food security measurement. Quality and hygiene problems of food products in Turkey, especially in this context, must be taken into consideration as is the case in many other countries.

The combined application of more than one method in food security measurement is possible by means of revealing different dimensions of food security and it can be more useful for large countries such as Turkey that have different socio-economic classes. Drought, erosion, depletion of water resources and the narrowing of agricultural land in Turkey as well as in other countries are factors that threaten food security. In particular, the importance of food security measurement and its continuation become apparent when we consider the rapid increase of population in Turkey as well as the constantly increasing need for food.

Results and Discussion

Multidimensionality and numerous components of the concept of food security make it difficult to both understand and measure the different opinions and thus different methods have been brought about (78). Food security can be said to be a valuable concept that puts forth how known restraints interact with non-food factors thus enabling us to fully understand the meaning of the concept (8, 80). As a matter of course, the selection of the appropriate methods for food security measurement is directly related to complete comprehension of the concept of food security. Choosing the most effective measurement method among a multitude of methods is only possible if the concept of food security is understood clearly and if specific objectives for measurement are determined (7, 81). It is also critical that researchers, policy makers, governmental and non-governmental agencies intensify their efforts to further develop tools that provide valid and reliable measures of food security in diverse population groups (82).

Food security level in Turkey is not measured regularly at the national or regional level. However, politicians should know the number of people at risk, who these people are and how they can be reached (11). A low-cost regular national system must be established to monitor food security status in Turkey. New approaches and methodologies are urgently needed to address food insecurity risks at the local and national level to support national planning (83).

Reliable data that is representative of the nation is required in order to monitor and evaluate food security status at the national level. In addition, more localized studies are needed to interpret the reasons and implications of insecurity in different conditions and at different levels (49).

The use of multiple food security measurement methods instead of a single one is considered to be more appropriate with regard to the evaluation of the issue in Turkey. Moreover, the use of combined research methods in extent permitted by technical, human and financial resources would enable a more in-depth analysis. One of the most important issues that should not be ignored is the fact that food security is an issue that is debated intensely discussed in our day

and thus, to achieve its objectives, appropriate food security measurement methods ought to be discussed by the relevant Turkish institutions and organizations. In addition, it is obvious that scientific research on this subject need support.

Conflict of interest: The authors declare no conflict of interest.

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