Workshop on Measurement of Undernourishment and Food Insecurity

New Delhi
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Workshop Report

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Introduction

FAO India and the Society for Social and Economic Research organised a day-long workshop on "Measurement of Undernourishment and Food Insecurity" in New Delhi on March 15, 2016. The workshop was attended by senior officials from the National Statistical Commission (including the Central Statistical Office and the National Sample Survey Organisation), various Ministries of the Government, as well as members of the academia and civil society (Appendix I).

Session I and II. Prevalence of Undernourishment

Chair: Shyam Khadka

Moderator: Vikas Rawal

Lead Presentation: Carlo Cafiero

Prevalence of Undernourishment is a measure of proportion of population suffering from chronic deficiency of calories. The method used by FAO to estimate the Prevalence of Undernourishment is based on data on

- Aggregate food balances

- Demographic characteristics of the population

- Distribution of food consumption in the population

The estimation is based on a statistical model designed to avoid bias by controlling for differences in dietary energy requirements due to age, sex, height (as a proxy for the ideal body mass) and physical activity levels in the population. In comparison, an estimate based on comparing distribution of calorie consumption with average calorie requirements would be incorrect for several reasons.

It is noteworthy that, since it is not possible to reliably measure caloric requirement of an individual, it is not possible to estimate prevalence of undernourishment as a proportion of persons for whom their own dietary intake is lower than their dietary requirement. In view of this, FAO uses a statistical model to estimate the probability distribution of dietary intake of an average individual. For such a hypothetical average individual, there is a probability distribution comprising different levels dietary energy requirements that are all compatible with good health and normal physical activity in the population. The PoU is estimated as

the probability that calorie intake for the representative average individual is below the level called MDER. MDER is the average of minimum dietary energy requirements of individuals in the population given their age, sex and height. For obtaining MDER, the population is divided into groups of age, sex and height, and the MDER is computed as population-weighted average of the minimum calorie requirement for each such group. The minimum energy requirement for individuals belonging to different groups of age, sex and height are estimated by nutritionists through detailed measurement of energy consumption associated with different levels of physical activity.

It should be emphasized that the distribution of calorie consumption of the average individual is not the same as the empirical distribution of daily consumption of the population. FAO currently uses skew normal distribution – which uses mean consumption estimated from food balance sheets, and coefficient of variation and skewness estimated from household consumption surveys – to model the probability distribution of average calorie intake. In case of many countries, lack of availability of regular consumption surveys is a major limitation because of which the coefficient of variation and skewness cannot be updated as regularly as necessary.

In his comment, Abhijit Sen succinctly summarised the Indian poverty debate and highlighted common issues in the debate around Indian poverty measurement and FAO's measurement of the prevalence of undernourishment. The Indian poverty measurement has been based on comparing per capita consumption expenditure with consumption expenditure required to meet a normative calorie intake. He pointed out that, until 1993, in line with the FAO methods, India used the average consumption estimate from the National Account Statistics and estimate of variance in consumption expenditure associated with calorie intake from household consumption surveys conducted by the National Sample Survey Organisation. In 1993, an Expert Committee appointed by the Government of India rejected this methodology and recommended that both mean and variance of consumption be taken from the household surveys. This is one source of divergence between the methods used for poverty estimation in India and the FAO method of measurement of PoU.

In the discussion, it was pointed out that large-scale Consumer Expenditure surveys are conducted in India by the National Sample Survey Organisation once every five years. These provide detailed data on quality of different food items consumed, albeit at the household-level. It was suggested that these should be used to estimate PoU at the State-level. Estimating PoU at sub-national levels would be particularly relevant in the context of monitoring of the implementation of 2030 Agenda for Sustainable Development as PoU is one of the official indicators for Target 2.1.

It was also pointed out that it may be appropriate to introduce occupational distribution of the population, and if possible, physical activity levels associated with different occupations, in estimation of MDER. Data from NSS Employment-Unemployment surveys could be used for this.

Session III. Food Insecurity Experience Scale (FIES)

Chair: Abhijit Sen

Carlo Cafiero

Presentations in Session II dealt with experience-based measurement of severity of food insecurity. The discussion started with the lead presentation by Carlo Cafiero in which he introduced the Food Insecurity Experience Scale (FIES) developed by the Voices of the Hungry project (VoH) of FAO. The presentation started with a discussion of the foundations of measurement theory, followed by a detailed discussion of the conceptual framework used in building the Food Insecurity Experience Scale. Dr. Cafiero also presented results of the analyses of data collected through the Gallup World Poll (GWP) in 147 different countries in 2014.

Dr. Cafiero pointed out that measurement in the realm of social sciences is distinctly more complicated than in physical sciences due to the complex nature of the attributes of interest, and explained that a measurement system comprises of

- A *measurement tool* appropriate to the specific attribute, like *severity of food insecurity* that we are interested in measuring.

- A *protocol* that guides the application of this tool.

- A *standard of reference* against which the measure is calibrated.

Any measure must possess two basic properties: validity and reliability. A measurement system is considered to be *valid*, if any change in the attribute of interest determines a change in the numbers produced by the system in the same direction and by the same proportion. A measure can be considered *reliable* if measurement errors are rare, small and non systematic.

Various attempts to measure and eradicate hunger and food insecurity have been made over the last few decades but since no single indicator can account for the multiple dimensions of food security, it is imperative to understand the contribution of FIES as a measure in the area of food security assessment. This scale captures the *access dimension* of food security by providing the tools that gives reliable and valid indicators of the prevalence of food insecurity in the population that is being surveyed. It is based on an experience-based food insecurity scale module which is used as a common metric for measuring the severity of food insecurity and relies on people's direct responses to a series of eight questions regarding their access to adequate food.

The Food Insecurity Experience Scale is based on eight questions that are posed to a sample of individuals (Appendix II). Each question is designed to ask the respondent whether, over the reference period, they have experienced a particular situation – for example, having had to skip a meal or having had to consume inadequate quantity of food – because of lack of money or other resources. It is important to point out that, although these

questions are answered in Yes or No, and not on a quantitative scale, each question is factual and not about perception of the respondent.

Although FIES is framed at the individual level, consisting of eight questions (or items) that are asked for a reference period of 12 months, it can also be customised at the household level, can comprise fewer or more items, and can be constructed using a different reference period.

The FIES measure of prevalence of food insecurity is then constructed using single-parameter item response theory based estimation model commonly known as the Rasch model. The model assumes that all items (that is, questions) are conditionally independent and equally discriminate severity of food insecurity. Estimation of the model involves dealing with missing responses, testing the assumptions of the Rasch model and estimating item severity and respondent parameters. If assumptions of the Rasch model are found to be valid, it can be shown that the number of items to which a respondent gives an affirmative answer is a sufficient statistic to estimate the respondent's severity.

Conditional Maximum Likelihood method can be used to estimate these parameters as it imposes no assumption on the shape of the distribution of the latent trait in the population. It gives consistent estimates of standard errors under the Rasch model assumptions. It only uses non-extreme response patterns, as severity parameters for zero or maximum raw score (8) cannot be estimated.

In the last part of the presentation, Dr. Cafiero presented the results of the Gallup World Poll (GWP) survey of 147 countries in 2014. He showed the results on validity and robustness of the estimation, and showed that the FIES estimates of prevalence of food insecurity (severe and moderate) were strongly correlated with various indicators of poverty, Prevalence of Undernourishment, incidence of malnutrition, and other aspects of human development. The statistical analysis of GWP data shows validity and robustness of the FIES methodology as indicators for monitoring food security.

An analysis to show correlation between estimated prevalence of moderate or severe food insecurity rates and other indicators of human development was carried out which showed significant and high correlation in the expected direction with most of the indicators. He also discussed a regression analysis of food security and poverty indicators on child mortality rates across countries which showed statistically significant coefficients of the national rates of food insecurity prevalence.

Unlike an aggregate measure such as Prevalence of Undernourishment (PoU), FIES can be disaggregated not only at sub-national levels but can also be used to estimate prevalence of food insecurity among specific sections of the population (men and women, indigenous communities, occupational groups or economic classes).

FIES is a comprehensive food insecurity measurement system, able to produce formally comparable indicators of the prevalence of food insecurity across populations that differ by language, culture and economic conditions The reliabilty and validity of the FIES indicators establishes an important role for this scale to be used in monitoring the Sustainable

Development Goals (SDGs), in particular Goal 2 on eradicating hunger and all forms of malnutrition.

Vani Sethi

Vani Sethi, UNICEF India, presented a comparative review of various studies in India that have used experience-based scales for measurement of food insecurity. She began with a proposition that there should be a bridging of gap between those who develop these scales and those who use them on the field. Demonstrating the results of nineteen studies conducted all over India by five organisations, she discussed the internal validity and reliability of these scales. Their review found that only nine of these nineteen studies have used the Rasch model testing. Most other studies were unable to access the software or use it properly. She also pointed out that some of the researchers had found that the twelve month recall period was far too long for the respondents to be able to correctly respond to each item. Some of the researchers had argued that possible answer choices for the questions needed to include an option for *rare occurence of the event*. Many researchers had also pointed out that specific questions relating to diet quality were poorly understood, and resulted in responses with greater variance across samples and across studies.

Vikas Rawal

Vikas Rawal presented preliminary results of the FIES surveys conducted by the Society for Social and Economic Research (SSER) to analyse food security in selected villages in Jharkhand. The study, jointly authored with Vaishali Bansal and Prachi Bansal, uses data from the SSER survey in Jharkhand.

This presentation discussed the experience of conducting FIES surveys in India, a country characterised by vast linguistic diversity. The SSER survey was conducted among predominantly adivasi (indigenous tribes) communities with considerable linguistic and cultural diversity on the one hand and relatively low levels of formal schooling and literacy on the other. Given that FIES questions were designed to capture subtle variations in experiences of food insecurity, canvassing these questions required not just good translations but also rigorous training of investigators so that they could further adopt these translations to the local dialect.

It was pointed out typically persons regularly facing severe food insecurity often found it difficult to understand questions related to mild forms of food insecurity as those were such routine parts of their lives that they could not distinctly identify them. As a result, the preliminary results of the data show that the variance of item severity typically associated with mild food insecurity tended to be high and tended to deviate considerably from international estimates based on the Gallup World Poll survey. However, given the level of redundancy in the design of FIES model, it is still possible to make the scale of the SSER survey comparable with the global FIES scale.

Discussion and main outcomes

Discussions in the workshop focused around adopting FAO methodology for estimation of undernourishment at the State and district levels in India and including FIES survey module in the large nationally-representative surveys conducted by NSSO and other agencies.

It was pointed out that both PoU and FIES have been proposed by the Inter-agency and Expert Group on Sustainable Development Goal Indicators (IAEG-SDGs) as indicators for Target 2.1. If accepted, countries would be required to report estimates of undernourishment and severity of food insecurity based on the agreed FAO methodology. For national- and sub-national monitoring, countries – in particular, large countries like India – would need to estimate these not just at the national-level but also at the sub-national levels.

In view of this, it was proposed that FAO methodology for estimation of Prevalence of Undernourishment should be applied to existing large-scale consumer expenditure surveys to estimate Prevalence of Undernourishment at the national and State levels. It was also proposed that efforts should be made to have the FIES questions introduced in large-scale nationally-representative surveys so that national and state-level measurement of severity of food insecurity could be done using the agreed FIES framework.

Appendix I: List of Participants

1. Abhijit Sen, Former Member, Planning Commission, Government of India, and Professor, Jawaharlal Nehru University, New Delhi.

2. Ashish Kumar, I.E.S, Senior Advisor, Ministry of Road Transport Highways & Shipping, Government of India.

3. Bhaskar Goswami, Policy Specialist, Food and Agriculture Organization of the United Nations, India.

4. Bulushan Negi, Research Scholar, Centre for Studies in Regional Development, Jawaharlal Nehru University, New Delhi.

5. Carlo Cafiero, Senior Statistician, Food and Agriculture Organization of the United Nations, Rome.

6. Dhrijesh Tiwari, ISS Director, Field Operations Division, National Sample Survey Office, Ministry of Statistics & Programme Implementation, Government of India, New Delhi.

7. Dinesh Kumar Nayak, Economist, National Institute of Public Finance and Policy, 18/2 Satsang Vihar Marg, Special Institutional Area, New Delhi.

8. H. Borah, Director, SSD, Central Statistical Office, Ministry of Statistics and Programme Implementation, Government of India, New Delhi.

9. Jayan T, Assistant Professor, Institute of Economic Growth, Delhi.

10. Jesim Pais, Assistant Professor, Institute for Studies in Industrial Development, New Delhi.

11. Jirlyne Katharpi, Consultant, Food and Agriculture Organization of the United Nations, New Delhi.

12. Jitendra, Senior Correspondent, Down To Earth, New Delhi.

13. Karuna Krishan, INDE Consultancy.

14. Lipika Roy, Research Scholar, Centre for Economic Studies and Planning, Jawaharlal Nehru University, New Delhi.

15. Mool Chand Bhaskar, Director, SSD, Central Statistical Office, Ministry of Statistics and Programme Implementation, Government of India.

16. Mukesh, Deputy Director, Ministry of Road Transport & Highways, Government of India, New Delhi.

17. Mukesh Kumar Srivastava, Senior Statistician, Regional Office for Asia and the Pacific, Food and Agriculture Organization of the United Nations, Bangkok.

18. Panchanan Das, Deputy Director, General Computer Centre, Ministry of Statistics & Programme Implementation, Government of India, New Delhi.

19. Prachi Bansal, Research Associate, Society for Social and Economic Research, New Delhi.

20. Priya Yadav, Growth Foundation, New Delhi.

21. Rajesh Chadha, Senior Fellow, National Council of Applied Economic Research, New Delhi.

22. Rajiv Mehta, Member, National Statistical Commission, Government of India, New Delhi.

23. Richa Shanker, Central Statistical Office, Ministry of Statistics and Programme Implementation, Government of India, New Delhi.

24. Roshan Kishore, Journalist, Live Mint, New Delhi.

25. Sagarika Ghosh, Executive Editor, Business and Economics/Law/Statistics.

26. Saksham Sood, Research Scholar, Centre for Economic Studies and Planning, Jawaharlal Nehru University, New Delhi.

27. Sarvjit Dudeja, Consultant & Advisor, Science & Technology.

28. Shyam Khadka, FAO Representative, India.

29. Siddhanth Singla, Advocate.

30. Siladitya Chaudhuri, Consultant, Food and Agriculture Organization of the United Nations, India.

31. Surajit Das, Assistant Professor, Centre for Economic Studies and Planning, Jawaharlal Nehru University, New Delhi.

32. Sushil Kumar, Ph.D Consultant, Research and Information System for Developing Countries, New Delhi.

33. Vaishali Bansal, Research Associate, Society for Social and Economic Research, New Delhi.

34. Vani Sethi, UNICEF India, New Delhi.

35. Vikas Rawal, Professor, Centre for Economic Studies and Planning, Jawaharlal Nehru University, New Delhi.

Appendix II: FIES Questions

We would like to ask you some questions about food. These questions are intended to be about your own experiences and not about rest of the household.

During the last 12 months, was there a time when:

1. You were worried you would not have enough food to eat because of a lack of money or other resources?

2. Still thinking about the last 12 months, was there a time when you were unable to eat healthy and nutritious food because of a lack of money or other resources?

3. Was there a time when you ate only a few kinds of foods because of a lack of money or other resources?

4. Was there a time when you had to skip a meal because there was not enough money or other resources to get food?

5. Still thinking about the last 12 months, was there a time when you ate less than you thought you should because of a lack of money or other resources?

6. Your household ran out of food because of a lack of money or other resources?

7. You were hungry but did not eat because there was not enough money or other resources for food?

   IF ANSWER "YES" TO Q7

   7A. During the last 12 months, how often did it happen that you were hungry but did not eat because there was not enough money or other resources for food? Did this happen only once or twice, in some months but not every month, or almost every month?

   a) Only once or twice
   b) In some months but not every month
   c) Almost every month
   d) Don't know
   e) Don't want to answer

8. You went without eating for a whole day because of a lack of money or other resources?

   IF ANSWER "YES" TO Q8 8A During the last 12 months, how often did it happen that you went without eating for a whole day because there was not enough money or other resources for food? Did this happen only once or twice, in some months but not every month, or almost every month?

9

a) Only once or twice

b) In some months but not every month

c) Almost every month

d) Don't know

e) Don't want to answer

9. Was there a time when you were unable to include fruits and green vegetables in your diet because of lack of money or other resources?